



# How the COVID-19 pandemics inspired the development of analogical games: database review and game development

Pedro Henrique G. N. Marques  [ Laboratório de Protozoologia, Instituto Oswaldo Cruz | phnithack@gmail.com ]

Leticia Leal do Nascimento  [ Laboratório de Protozoologia, Instituto Oswaldo Cruz | letticeleal@gmail.com ]

Tânia Zaverucha do Valle  [ Laboratório de Protozoologia, Instituto Oswaldo Cruz | taniazv@ioc.fiocruz.br ]

## Abstract

COVID-19 pandemics impacted everyone's lives. Risk of infection by the SARS-CoV-2 virus imposed severe restrictive measures, submitting the population to home isolation, daily use of face masks and restringing social encounters. In this work we present the results of a research on analogical game databases where we searched for COVID-19-themed tabletop games, discussing which health concepts were presented on these games and what kind of structure and mechanics were used. Subsequently, we present the development of a serious board game, thought to call attention of the prevention measures to reduce the risk of infection by SARS-CoV-2 and other respiratory viruses. We discuss the rationale for the selection of game mechanics and how do they fit on the health concepts that we wanted to reinforce. The product is a print and play serious game that will be available as an open educational resource.

**Keywords:** *Serious game, COVID-19, public health, prevention, viral transmission, game mechanics*

## 1 Introduction

On 11th March 2020 the World Health Organization declared the COVID-19 pandemic (WHO, 2020). Caused by the Coronavirus SARS-CoV-2, the disease is characterized by a flu-like syndrome, which may include fever, cough, shortness of breath, fatigue, loss of smell and taste, among other symptoms (Adil et al., 2021). Disease may also progress to an acute respiratory syndrome with the activation of an exacerbated immune response, which is fatal in 1 to 3% of the cases (Asselah et al., 2021). Data from 8th February 2023 show more than 755 million COVID-19 confirmed cases around the world, leading to more than 6.8 million deaths (WHO, 2023). Due to its high propagation capacity, high mortality rate and high infectivity, since the pandemic began severe social measures were imposed by health authorities, including suspension of public events, circulation restrictions and mandatory use of facial mask, among others. Empirical evidences show that non-pharmacological measures were effective in reducing virus circulation and, as a result, COVID-19 incidence (Ferreira Caceres et al., 2022; Fong et al., 2020). Almost three years after pandemic began, most measures of social distancing have been withdrawn, but normal life has not yet resumed. The rapid development and production of vaccines has lowered disease severity and mortality, however, waves of transmission occur periodic, even in countries with high vaccination rates (Callaway, 2022). A literature review in South Korea argues that although vaccines are a key component of the pandemic response, it may fail without the aid of non-pharmaceutical interventions such as masking and social distancing (Nham et al., 2022). On the other hand, severe distancing measures have left a heavy social and economic burden, leading to prolonged loneliness, mental distress, unemployment, income loss, food insecurity, widened inequality and disruption of access to social support and health services, especially in vulnerable groups (Li et al., 2023). Moreover, misinformation have played a nefarious role on the pan-

dem course perpetuating beliefs that led to vaccine hesitance, mask refusal and utilization of medications with no scientific support data (Ferreira Caceres et al., 2022). In this context, information and educational measures are of upmost importance. Population should be well informed on the effective preventive measures for avoiding COVID-19 and other air-borne viral diseases.

This work presents the results of a search on COVID-19-themed boardgames developed or adapted during the pandemic. We listed and analyzed the games for its structure, mechanics, and health concepts. Moreover, we present here the rationale for the development of the boardgame “Sai pra lá” (“Keep your distancing” in English). On this game we focused on the prevention of virus with airborne transmission. We used the procedural rhetoric (Bogost, 2007) to transmit health concepts like social distancing, the correct use of face masks, hand sanitizing, environment ventilation and vaccination inserted on the game dynamics rather than using texts or a quiz. The player will understand and use those concepts during the gameplay. The boardgame has a contemporary model, based on players decisions rather than luck (Sousa et al., 2019). It is highly strategic, focused on the mechanics and can be played in 30-40 minutes. Although several COVID-19-themed boardgames have been developed, few focus on mechanics or bring more than 3 health concepts and some bring wrong concepts. We intended here to develop a scientifically accurate material that bring 8 different health concepts which are addressed on the game mechanics.

## 2 COVID-19 in games

Prior to game development, we carried out a search on Boardgamegeek ([www.boardgamegeek.com](http://www.boardgamegeek.com)), Ludopedia ([www.ludopedia.com.br](http://www.ludopedia.com.br)) and SBGames proceedings from 2020 and 2021, looking for games with COVID-19 theme. The search used the keywords “COVID”, “corona”, “pandem\*”, “infec\*” or “SARS” and then selected only the

games registered from January 2020 forward, which mentioned the COVID-19 pandemics anywhere on its documentation. This search was then updated in February 2023, when we noticed a newly created “family” on BoardGameGeek named “Medical: COVID-19”, intended to gather all COVID19-themed games. Therefore, we added all games on this family, many of which had not appeared in the previous search because their name lacks the keywords used. For all the included games we searched for the game rules, print and play version, game website or any other source of information available. Eventually we posted a comment on the game entry asking the authors for the print and play version or rules, but we never got responses. The number of documents that we had access varied from game to game so some we could read the rules and even play the free version, while others we could only read its description and access some photos on BoardGameGeek.

Based on all the information we could gather, we analyzed each game on its format, structure and mechanics, using as a base the classification described by Engelstein and Shalev (Engelstein et al., 2019). Finally, we listed the health concepts that we could identify in each of the games.

Our search came to a total of 45 games that mentioned the COVID-19 pandemics on its theme or description. From those, 3 were new versions of older games (*Bandido COVID 19*, *Monopoly: at home reality* and *We care: a grizzled game*) and 2 were expansions for previous games (*Clinic: Deluxe edition COVID 19* and *Pandora's Box Card Game: Covid-19 Expansion*). Except for those, the others were homemade games (entered as self-published) or from small publishers, many of them with no other published game, showing that game production was mostly amateur. Three of the games were new games developed based on older game rules (*COVID deniers*, *Xô Corona* and *Pandemiepoker*).

Nine of the games were print and play games, free games for people to print at home. When we look for the number of games registered on the “print and play” category on BoardGameGeek, we find an average of 401 games a year between 2015 and 2019. However, the number increased to 621 on 2020 and 507 on 2021. The peak in 2020, suggests that it might be influenced by social distancing, when people were looking for alternatives for in home activities. Indeed, boardgames sales have increased in 2020 due to social distancing (Tolloti, 2022; Williams, 2022). In 2022, with the release of most restrictive measures, the number of print and play games dropped again to 397, the same as the previous average, but boardgame sales continue to increase as people could finally meet with friends to play in person and need to detox from digital activities (Sweney, 2021; Williams, 2022).

As for the game format, 25 of the 45 games in our search (56%) were only or mostly composed of cards, which are easily produced and affordable. Four of the games were Paper and pencil, another cheap format.

## 2.1 Health concepts

Although most of the analyzed games were not included in the BoardGameGeek category “educational”, they used

health concepts or situations that happened during pandemics on its theme, mechanics, or components, showing that games meant for entertainment purposes can also bring valid health concepts. These concepts and situations could integrate the game in different ways. Some game designers took a diegetic approach, including health concepts on the game narrative, as the objective or history behind it. For example, in *Operation research for COVID-19*, players must make management decisions in the face of deaths from COVID-19. In *Corona Yuga*, player cannot be in the same board space, representing that they must keep social distancing. Those game used the procedural rhetoric (Bogost, 2007) to transmit health concepts for players, independent if they had a formal educational objective or not. In those game health concepts are an intrinsic part of the game mechanics and narrative. In some other games, however the concepts are displayed on cards or on the board but do not interfere with the mechanics. For example, in *What a wonderful Covid vaccine*, players collect vaccine ingredients to win points. Although the game designer decided to dress the game in a COVID-19 theme, health concepts do not influence game mechanics. Players could be collecting any other resource like vegetables for a salad, and it would change the game theme but not its mechanic.

Either way, we tried to identify these concepts, which are summarized on **Table 1**. It is important to note that for most games we had access only to the documentation and some photos of the components. It is possible that we missed some concepts. This is even more true for *Destroy Covid* which is an escape room created to be played during social isolation in an online meeting. Because of the nature of the game its components are kept in secret so it's difficult to identify the health concepts in the game. In two games we could not identify any health concept: *CoronaLine* is an abstract game developed to entertain people during social isolation; and *Corona Wars: survivor* uses the pandemics in the game description but only to place the time where the history takes place. These two were included on the tables but excluded from the rest of the health concepts analysis.

Among the 43 games included in this analysis, 21 (49%) used management concepts. From these, 11 games used individual resource management while in home isolation, such as food, face masks or toilet paper. Nine worked with health management, mostly managements of hospital beds, but also diagnosis kits and personal. Four games included crisis managements, either economic or political. Additionally, two games talked about fake news, including negationist issues. Although these are not health concepts per se, we decided to include in the analysis due to the impact they had in the pandemics, with people (or even governors) refusing to quarantine or get vaccine shots.

The use of face masks was included in 14 of the 43 games (33%), whereas hands hygiene appeared in 9 (21%) of them. In this case, we did not distinguish hands hygiene with alcohol or hands washing with water and soap, although both appear in some of the games. Only one game discussed diagnosis, although diagnosis kits are present as a resource to be managed in other games.

Perception of risk is present in 5 (12%) of the games. For example, the game *Coronavirus: le jeu* demonstrated how some behaviors, like going to a party or doing handshakes, can increase the chances of infection. The game also discusses methods to reduce the risk of infection, such as the use of face masks, hands hygiene and self-isolation.

On the other hand, it also contains “infusion” and “absinth” cards, that you can play to heal from infection. In the rules it says that these cards can reduce the viral load of the player subjected to its effects. This is a stereotyped example on how a game, if not carefully thought, can lead to wrong conclusions. Although it is intended to be a humor rather than an

**Table 1.** Health concepts found in COVID-19-themed games

Game	Face masks	Hands hygiene	Patient isolation	Social isolation	Physical distancing	Resource management	Health management	Risk perception	Vaccines	Others
3rd world labour: pandemic edition				X				X		
Against COVID-19							X			Crisis management
American pandemic: the party game				X		X				
Ay, Corona!								X		
Bandido COVID 19		X	X		X					Sneezing Etiquette
Can you survive 2020?			X			X				
Cats with Covid	X							X	X	
Clinic: Deluxe edition COVID 19			X				X			
Combate ao Corona							X			
Corona chase	X				X					
Corona nervt										
Corona vírus - o jogo	X	X		X					X	Fake news
Corona wars: survivor										None
Corona Yuga		X	X		X					
Corona: mit eifer ins geschäft				X		X				Solidarity
CoronaLine										None
Coronavirus card game	X			X		X				
Coronavirus: le jeu	X	X		X				X		
Coronials										Mental health
COVID	X			X	X				X	
COVID 19	X			X		X				
COVID deniers										Fake news
COVID Survivor	X			X		X				
CovidParty!										Transmission
Destroy COVID				X					X	Maybe others in puzzles
Dokter Li	X					X			X	
État d'urgence							X			Crisis management
HERO: the pandemic			X				X			
Hey, Corona! 2020				X		X				
Infection			X				X			Treatment
Lockdown! A card game							X		X	Crisis management
Lockdown! the game	X			X		X				
Maradj-otthon!	X	X		X						
Monopoly: at home reality				X						
Oltakozz okosan!									X	
Operations research for COVID 19			X							Crisis management
Pandemia			X						X	
Pandemiepoker	X	X			X					
Pandora's box card game: Covid-19 expansion		X	X	X						
People vs pandemic			X	X		X				
The big lockdown	X	X		X		X		X		
The COVID containment			X				X			Diagnosis
We care: a grizzled game							X			Mental health
What a wonderful Covid vaccine									X	
Xô Corona	X	X	X					X		

educational game, it mixes correct and incorrect concepts, disseminating misleading information. Recently an international group of game designers have published a code of respect and responsibility where the signees agree to “thoroughly research the cultural, social, historical, and scientific contexts represented in their games” (Spiele-Autoren-Zunft, 2021). We hope that this document helps to avoid this kind of situation.

The concept of treatment only appeared in the game *Infection*, probably due to the lack of specific treatment for COVID-19. Even on this game there is no mention on a specific medicine. As said on the documentation, players should use a “vaccine treatment” to treat patient in a hospital and avoid virus spread. It is not clear what the authors meant as treatment or it is possible that the information was lost in translation as the game is Korean. Vaccination, on the other hand, was mentioned in 9 of the 43 games (21%), being mostly present on games developed on 2021 or 2022, since vaccination was not available before that. Depending on the game, vaccination was treated as a resource to be managed or produced or as the final objective of the game, i.e., the first to get vaccinated wins. Although vaccination must be encouraged and boardgames should try to pass this concept, the run to be the first one to get a dose does not seem ethically acceptable. Vaccines are an essential resource, especially during a pandemic, and doses distribution must be managed strategically, for the most vulnerable groups, not for the first one to arrive. Therefore, in our opinion this type of victory condition should be avoided.

The game *CovidParty!* presented the term virulence but, as far as we could understand, it was mistakenly used as the ability of the virus to spread among the population, which is a concept of transmission rather than virulence. Two games were focused on mental health, either to allow the general population to talk about it or to discuss the difficulties on being on the frontline. Solidarity, which is not actually a health concept, was mentioned in one game, *Corona: mit eifer ins geschäft*. In this German game developed by teenage sisters confined at home, each player must help their senior neighbor to buy food and other resources so that he can be protected at home.

Finally, concepts of social distancing including quarantine, physical distancing and self-isolation were present in 29 of the 43 games (67%), but in different ways. Some considered that people were restricted to their homes and must manage their resources, while others put the self-isolation as a way to reduce the risk of getting infected. In *Coronavirus: le jeu*, for instance, the “confinement” card allows you to protect yourself from the virus, whereas in *Corona Yuga* quarantine is an area of the board where we put players who happen to end their movement in a “sneeze/cough” spot, and therefore can be infected. In addition, in *COVID-19*, player must manage resources to survive a 40-days quarantine. The term quarantine, isolation and social distancing are confused in people talking, media, as well as in the games. According to Huremovic (Huremovic, 2019), isolation is the term used to separate infected from health people, preventing the spread of the pathogen. The term quarantine is used when we sepa-

rate health individual who might been exposed to the pathogen from other who were not exposed. The term quarantine is commonly associated with the period of 40 days during which the infectious plague could manifest as an acute and fatal disease, although today it can be used for any infectious disease and its actual period depends on the characteristics of each pathogeny (Conti, 2008). Sanitary cordon refers to the restriction of movement of a population in a determined geographical area where transmission of a pathogen is localized. It isolates a community from the rest of the population to contain virus spread. Finally, protective sequestration refers to the auto-imposed isolation of a community or an individual in order to avoid been reached by a pathogen (Huremovic, 2019).

Wilder-Smith and Freedman (Wilder-Smith et al., 2020) define social distancing as measures to reduce interactions between people in a broader community, in which individuals may be infectious but have not yet been identified and therefore not yet isolated. Such measures may include closing schools, canceling activities with large audiences, shutting down public markets, among others. “Physical distancing” is also a social distancing measure and requires people to keep a minimum distance between each other. The distance is defined by the distance reached by the droplets formed when an individual speaks, coughs or sneezes [11]. Regardless of the name used in the game, in our review we tried to organize the concepts. We called “patient isolation” games that deal with the isolation of patients or people exposed to the virus; “social isolation” for games that address the issue of decreasing circulation in general and healthy people staying at home to avoid being infected; and “physical distancing” for games that discuss the distance between people in the same environment. Although many games use the term “quarantine”, they generally refer to self-enclosure to prevent infection rather than quarantining potentially infected people away from unexposed people. Thus, we avoided using this term in our analysis.

Among the 29 games that deal with the topic, 12 address the isolation of patients, 17 social isolation and 5 physical distancing. Of those that address physical distancing, in *Bandido COVID 19* and *Corona virus, the game*, distancing is represented by a card that prevents the passage of the virus or protects players; while in *Corona Yuga* and *Corona chase*, it is represented by the impossibility of two players staying in the same house; and in *Pandemiepoker* for the impossibility of playing adjacent cards.

Only a single game (*Bandido – COVID-19*) mentions sneezing etiquette. None of the games addresses ventilation or differentiates between closed and open environments, although we know that these characteristics influence the transmission of SARS-CoV-2 [12]

## 2.2 Game mechanics

Regarding Game structure (Engelstein et al., 2019), games were divided into competitive (28 games; 62%), cooperative (8 games; 18%) and solo games (7 games; 16%). From those, two had cooperative and solo rules, two could be played as competitive or cooperative and one had competitive or solo modes. Besides those, two games were semi-cooperative,

meaning players should cooperate to avoid the premature end, but at the end only one wins; and two were games with a traitor, which means that players play cooperatively but one of them is secretly chosen to betray the rest, winning, or losing alone (Engelstein et al., 2019). Finally, in one of the games the structure could not be identified in the documentation. **Table 2.**

We expected the predominance of competitive games since this is the most known and widespread structure. The development of solo games, in our opinion, reflects the moment of self-isolation experienced especially at the beginning of the pandemic, when most people were restricted to their homes. All game events were suspended, establishments frequented by players were closed and even games among friends were avoided. Many players found themselves with no company to play with and turned to solitary games. Game developers, which were also in self-isolation, noticed this moment, resulting in the development of 7 games with solo rules. Interestingly enough, 6 of them address management issues, whether it is management of resources needed to remain in isolation, management of hospital resources or the hospital itself, or even crisis management. This theme reflects, in a way, the change in routine of the population, who had to learn to manage their own lives from inside their homes. Indeed, Jess (Jess, 2021) discussed how solo games were already in ascension before the COVID-19 pandemics, but social isolation induced an even higher increase in the demand for this type of game.

Various mechanics were used in COVID-19 games, including dice rolling, card selection, point-to-point movement, area movement, negotiation, component collection, among others. Hand management, for example was found in 10 games, which could be expected for resource management games, while work placement, a mechanic usually found in more complex euro games, was present in only two of the games. Among the competitive games, one fact caught our attention: we noticed that 11 games (42% of the competitive games) used the “player elimination” mechanics as victory condition, i.e. the last player who manages to stay in play, in this case the one who manages not to get infected, is declared the winner. As discussed by Engelstein and Shalev (Engelstein et al., 2019), it is usually a victory condition to be avoided in contemporary games as it may leave one or multiple players waiting for the others to finish the game, leading to awkward social situations. On the other hand, if it is used in short games and specially if it fits the narrative, which is actually the case, it may be effective.

We found that most games associated player elimination with the “Take that” mechanics, in which one player directly targets one opponent’s progress in the game, usually by stealing, nullifying, or force-discarding of one opponent’s resources, actions, or abilities (BoardGameGeek, n.d.-b). In the case of COVID-19 themed games, one player would be able to facilitate the other to get in contact with the virus, get infected and being eliminated from the game. Again, the mechanics seems to fit the narrative, however it does not feel right for the moment of a pandemic when the world health authorities were asking for support and solidarity from the population, in order to contain the virus. What is the message

behind a game in which you root for your friend to get infected and leave the game? Or worse, how could you be responsible for him getting infected? However, if we look at these mechanics thinking about the aesthetics they reinforce, we see that they convey the feeling of danger and uncertainty experienced during the pandemic, highlighting attitudes that can lead to infection. Thus, in the game *COVID survivor* one player can cough on another; and in *Coronavirus: le jeu*, a player can force the other to go to a party, increasing their chances of being eliminated. In the game, the situation is treated with humor, but there is a chance that the player who was eliminated for being infected in a party, actually realizes the real danger of this behavior, especially if the game is used in an environment that allows this discussion. The game *Xô Corona*, in addition to player elimination and take that, uses a “Push your luck” mechanism, where the player can choose to play more safely – using protection cards such as face masks or soap - or make riskier moves and run a greater risk of contamination. According to the authors, this dynamic creates an aesthetic of fear and apprehension during the game, which is essential for the perception of the risk of contamination (Kritz et al., 2020).

In terms of structure, other games are spectrally opposite, focusing on teamwork and solidarity among players to achieve a common goal, which can be preventing the spread of the virus (*Corona virus – the game*) or simply going shopping for the elderly neighbor (*Corona: mit eifer ins geschäft*). In *Maradj-otthon!* players may forfeit some of their victory points to prevent virus spread and the premature end of the game, when everyone would lose. An observational study with adolescents who play solitary, competitive or cooperative electronic games showed that positive attitudes in cooperative games lead to better quality friendships (Verheijen et al., 2019). Another study showed that the practice of cooperative games in the physical education class was able to drastically reduce the occurrence of bullying among students (Valentim-Silva et al., 2017). Cooperative games gained recognition and exploded in the gaming market in 2008 with the release of *Pandemic*, by Matt Leacock. Coincidence or not, in this game the players seek together the cure for 4 viral diseases that have spread around the world.

## 3 Game development

### 3.1 Distancing and solidarity

For the development of our serious game, we chose to work on different prevention concepts for SARS-CoV-2. We chose not to include the name of the virus or disease so that the game would not be restricted to the COVID-19 pandemic, but could be used in more varied contexts, for any other respiratory virus, since the preventive measures are basically the same. Based on our impressions after researching the games, we chose to focus on the importance of avoiding crowds and maintaining physical distance between people in the same environment. Among the games that contained concepts of distancing or social isolation, physical distancing was the notion that least appeared in our research.

**Table 2.** Structure and mechanics in COVID-19-themed games

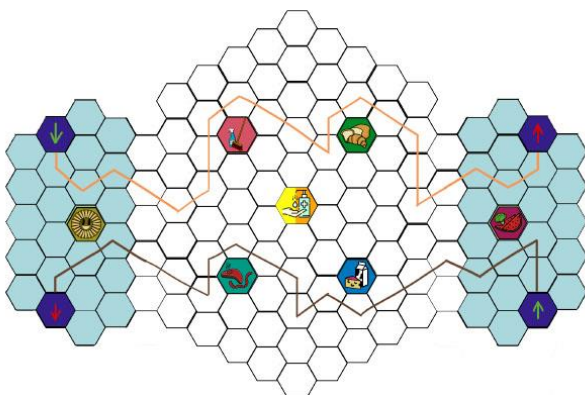
Game	Format	Structure	Main mechanics	Game summary
3 <sup>rd</sup> world labour: pandemic edition	Boardgame	Competitive	Push your luck, dice rolling, action drafting	Each round players choose between going to work and get paid, risking of getting sick or stay safe at home with no income. At the end of the game the richest player wins.
Against COVID-19	Print and play	Solo	Action points, area movement	The player fight the pandemic by managing the economy, medical personnel, health supplies and treating patients
American pandemic: the party	Not informed	Competitive	Bribery, action/events, negotiation	Players are neighbors who compete for resources like toilet paper, which they can steal from each other.
Ay, Corona!	Card game	Competitive	Action/Events, hot potato, take that, player elimination	Card game in which players exchange cards trying to get rid of viruses and survive the infection
Bandido COVID 19	Print and play, card game	Cooperative	Network and route building, tile placement	New version for Bandido game. Players must avoid a pandemic by preventing the virus to escape
Can you survive 2020?	Card Game	Semi-cooperative	Grid movement, point movement, command cards, rock-paper-scissors	Players race around the board buying and stocking resources and avoiding virus spread. When someone dies from infection the player with the more resources wins.
Cats with Covid	Card game	Competitive	Player elimination	Players must protect their cats with face masks and vaccination so they can go to social events. The player with the last cat standing wins
Clinic: Deluxe ed. COVID 19	Boardgame	Cooperative/Solo	Work placement, tile placement	Expansion for Clinic game Players must manage a hospital and cure patients, not letting them die.
Combate ao Corona	Print and play	Cooperative	Hand management, dice rolling, card selection,	Together players try to stop viruses that "fight back" by removing hospital beds.
Corona chase	Boardgame	Competitive	Point to point movement	Trail game where players must arrive with their characters upon arrival but must follow prevention rules
Corona nervt	Card game	Competitive	Hand management	Children's game in which players must get rid of "corona" cards without losing all "nerve" cards
Corona vírus- o jogo	Print and play	Cooperative/Solo	Deck building, hand management, card selection	Players must produce a vaccine against the virus and prevent its spread with preventive measures
Corona wars: survivor	Card game	With traitor	Negotiation, player elimination, bribery	The game takes place in the future, post-Corona, and players try to escape the Earth that is infested with mutants. Excluded from analysis for lack of health concepts
Corona Yuga	Boardgame	Competitive	Dice rolling	The game shows the perception of a 9 years old boy based on the information he obtained from the media
Corona: mit eifer ins geschäft	Card game	Competitive	Not informed	Created by teenagers in lockdown. Players compete to shop for their elderly neighbor.
CoronaLine	Print and play	Competitive	Paper and pen	Game created to pass the time in isolation. The player must connect dots forming patterns. Excluded from analysis for lack of health concepts
Coronavírus card game	Print and play, Card game	Competitive	Not informed	Players must avoid COVID-19 and stock up on supplies
Coronavírus: le jeu	Card game	Competitive	Card selection, hand management, player elimination	Players compete to acquire immunity to the virus or be the last one standing
Coronials	Boardgame	Not informed	Set collection, acting	The game brings diverse pandemic situation to stimulate children and young people to talk about their feelings.
COVID	Card game	Competitive	Hand management, player elimination, set collection, take that	Players must protect themselves, get vaccine tokens or attack others to become the last survivor.
COVID 19	Print and play	Solo	Actions/events, dice rolling, paper and pen, negotiation	For 40 days, player manage money, food, alcohol gel and facemasks to survive and not become contaminated.
COVID deniers	Card game	With traitor	Deduction	Based on Werewolf game, players try to find out who the denialists are before they destroy them.
COVID Survivor	Card game	Competitive	Hand management, player elimination, set collection, take that	Players must stock up on supplies, wear protective gear, and attack others to become the last man standing.
CovidParty!	Card game	Competitive	Dice rolling, player elimination, take that, different character abilities	Card game in which each player represents a country that must control the transmission of the virus in its territory.
Destroy COVID	Escape room	Cooperative	Puzzle	Escape room designed for each player to play from home, without contact
Dockter Li	Card game	Competitive	Trick-taking	Players collect card of items, hospital capacity and leadership, preparing to new virus wave.
État d'urgence	Card game	Competitive/solo	Deck building, player elimination, take that	Players need to maintain people's trust in the government during pandemics.
HERO: the pandemic	Expansion to HERO	Competitive/cooperative	Dice rolling, work placement	Players are doctors who need to isolate and treat patients to prevent the virus from spreading.
Hey, Corona! 2020	Card game	Competitive	Hand management, set collection	Players should stock up as much toilet paper as possible
Infection	Roll and write	Competitive	Dice rolling, roll and write	Players choose dice and assign them to treat patients, stock remedies, research, among others. They lose points if there is a shortage of hospital beds.
Lockdown! A card game	Card game	Competitive	Open draft, take that	Players are governors that try to contain the disease in their country while disrupting other players management measures.
Lockdown! The game	Card game	Competitive	Set collection, trading	Players try to collect sets of cards from different resources before the COVID-19 pandemic ends the game.
Maradj-otthon!	Boardgame	Semi cooperative	Roll and move, set collection	Players have to collect point in the boardgame that can change due to the pandemic's situation. Players may give up of some points to prevent the virus spread or all loose.

Regarding the structure, we opted for a cooperative game be-

**Table 2.** Structure and mechanics in COVID-19-themed games (continued)

Game	Format	Structure	Main mechanics	Game summary
Monopoly: at home reality	Boardgame	Competitive	Set collection, player elimination, auction/biding, roll and move	New version of the monopoly game where the board features places in a house where people are in social isolation.
Oltakozz okosan!	Boardgame	Competitive	Roll and move	People must try to get 2 vaccine shots and escape the virus to win the game.
Operations re-search for COVID 19	Not informed	Solo	Simulation	The player must make management decisions in the face of deaths from COVID-19 and the shutdown of the economy
Pandemia	Boardgame	Competitive	Dice rolling, area movement, hexagon grid, open drafting, action/event	Players will manage different resources in order to protect an area from a contagious virus
Pandemiepoker	Card game	Competitive	Hand management, player elimination	Based on the game Uno where cards with adjacent numbers cannot be played one after the other. There are also new special cards including a COVID19 card which eliminates the player who gets 3 of them
Pandora's box card game: Covid19 exp.	Card game	Competitive	Set collection, race, end game bonuses	Expansion cards for the game Pandora's box where Greek gods represent COVID-19 situations
People vs pandemic	Print and play	Cooperative	Dice rolling, command cards	Players must gather all humans in the center of the board before the virus catches them.
The big lockdown	Card Game	Competitive	Hand management, push your luck, take that, trading	Players should manage their stocks of food, toilet paper and medical supplies and decide whether to stay home safely and use their stock or go out and buy more, risking get infected.
The COVID containment	Print and play	Solo	Dice rolling, paper and pen, pattern building, role playing	The player is a doctor and must stock and administer testing kits for COVID-19 and other means to contain the pandemic
We care: a grizzled game	Card game	Cooperative	Hand management, push your luck, variable player powers, communication limits	New version for the game The Grizzled, players are healthcare professionals in the trench line which should take care of patients with limited resources.
What a wonderful Covid vaccine	Card game	Competitive/cooperative	Set Collection	Players play vaccine ingredients to advance in tracks and win points
Xô Corona	Card game	Competitive	Hand management, push your luck, player elimination, take that, set collection	Based on the game Exploding kittens. Players fight to be the last survivor, amidst the possibility of infection

To work on this concept, we chose to place our game in a marked which is represented by a hexagonal grid, so that players would have freedom of movement and it would be easy to determine when two characters are in adjacent locations, that is, when they are close, without maintaining the recommended distance. **Figure 1.** We named the game as “Sai pra lá” or “Keep your distancing”, in English.



**Figure 1.** Hexagonal grid used for the “Keep your distancing” board allows for free player movement. The different sections of the market (gardening, fruits and vegetables, bakery, butchery, dairy products, and cleaning) and a totem for hand hygiene with alcohol gel are represented. The blue hexes are in balcony areas, with free air circulation, while the white hexagons are indoors. The traces show the predetermined path of the “passerby” who also make their shopping.

cause we believe that the spirit of the pandemic is one of collaboration and not competition. Cooperative play is defined as a game in which players must coordinate their actions to achieve certain victory conditions, winning or losing together (Engelstein et al., 2019). This is precisely the feeling we would like to pass on, because only together can we beat the virus. Furthermore, according to Terry Orlick, cooperative games develop positive social interaction skills, raise players' self-esteem and stimulate people's commitment (Spiegel, 2022); all desirable features for a serious game.

Thus, in “Keep your distancing” players must enter a market, buy items from their shopping list, which is decided at the beginning of the game, and leave without being infected. For the game to be won, everyone must be able to complete their list and leave the market in a maximum of 12 rounds. Each player has an individual list of three products, but they can help each other by discussing moves, creating joint strategies, leaving products for others to pick up, or even moving people around the market to leave an empty section so that another player can do their shopping in safety. To give players freedom, we used the action point mechanic. In their turn, each player receives a determined quantity of points, which can be spent to move around the market, pick up or return products in sections or use action cards, according to each player's strategy.

To represent the risk of infection we created a sneezing dynamic. Throughout the game, people in the market may



sneeze, endangering others nearby. To create this dynamic, we chose to work with a rondel of events that defines who will sneeze and when. These events are random because in life, we never know who is infected or who might sneeze next to you. Hence the importance of keeping your distancing. This dynamic also creates an aesthetic of uncertainty and insecurity, a feeling experienced by many during the pandemics.

In addition to players, the market is also visited by other people, whom we call “passersby”. These characters slowly enter the game and advance along a predetermined path, although the speed of advancement has a random component. This dynamic allows players to plan, to some extent, their positioning in relation to passersby while remaining safe.

Whenever someone sneezes in the game, it potentially hits anyone around them. Thus, if a player is positioned adjacent to a character who sneezed, he loses a “health marker”, which represents that he could potentially be infected. If, at any point in the game, a player is hit by a sneeze and has no more markers to lose, the game is over, and everyone is defeated. Likewise, if the total number of markers lost by the group reaches a certain threshold, the risk of infection for the group is too high and the game also ends in defeat. These two defeat conditions are intended to reinforce the idea of solidarity and cooperation. So, if one doesn't take care of the other, all players lose. To reinforce the idea of caring for others, players also lose markers when they sneeze on other players or passersby.

### 3.2 Other concepts of prevention

Face masks have been used during the SARS-CoV-2 pandemic both as a public and as an individual protective measure. Studies show that the greater the filtering quality of the mask and people's adherence to this practice, the lower the circulation of the virus, with pff2 being more effective due to its greater filtration capacity and adjustment to the face (Howard et al., 2021; Schoberer et al., 2022). Thus, in the game, all characters enter the market with cloth masks, as suggested at the beginning of the pandemic, when mask availability was an issue. **Figure 2.** Throughout the game they can get action cards that allow them to exchange their cloth mask or that of another player for a pff2, which will give them greater protection, allowing them to approach safely.

Although in 2020 a technical note from the Brazilian National Health Surveillance Agency (Anvisa) (Anvisa, 2020) predicted the use of pff2 masks only for health professionals in direct contact with patients, the Brazilian National Health Council (CNS) in January 2022 issued a note recognizing the greater effectiveness of this type of mask and recommending its distribution for the population (Conselho Nacional de Saúde, 2022). Nevertheless, in the game, the pff2 mask will only protect you from one sneeze, and must then be removed, assuming that it has become filthy. While this doesn't match reality, this rule had to be included to maintain gameplay. On the other hand, pff2 masks are expensive and it is unrealistic to expect that everyone would wear one, especially in low-income countries. Therefore, in the game, pff2 masks are rare resources, not available for everyone. We expect players to

use this resource carefully, protecting characters with higher risk of infection.



**Figure 2.** Artwork for the player characters. The art shows the characters without a face mask (left column), with a cloth mask (central column) and with a pff2 mask (right column).

To draw attention to the correct use of the face mask, which must cover the mouth and nose, we have included a “passerby” with the mask on the chin. **Figure 3.** When he sneezes, the formed droplets are projected further away, potentially reaching other characters further away, i.e. those not immediately adjacent.



**Figure 3.** Artwork for the different “passersby” that circulate through the market, increasing the risk of infection for players. The green-haired “passerby” (on the left) has a lower risk of infection because she has been vaccinated and uses her face mask correctly; the one with red hair (in the center) has not been vaccinated and therefore is more likely to have a high viral load if infected and the passerby on the right does not use his face mask correctly and therefore his sneeze has greater reach.

Along with wearing face masks, hand hygiene is one of the most cost-effective COVID-19 prevention measures (Juneau et al., 2022). In the game, we inserted an alcohol gel totem that allows players to wash their hands and earn hygiene cards. **Figure 1** These action cards generate benefits that include, face pff2 masks for greater protection, extra movement on the grid, picking up more products from the shelves or



dislocating “passersby” out of the way. The totem can be used at any time, providing an action card whenever a player walks by it. A second totem at the market entrance provides an action card to all players at the beginning of the game, showing that they have sanitized their hands when entering the market.

Works on the dispersion and accumulation of droplets in environments shows that physical distancing is not enough to prevent infection by SARS-CoV-2, if the ventilation of the environment is not correct. In this case, viral particles expelled when speaking or respiratory discharges can accumulate in the environment, reaching individuals who share the same environment, especially when there is no use of a face masks (de Oliveira et al., 2021). In the game, we created two balcony areas on the sides of the market. These areas appear in blue on the board and represent places with increased air circulation. **Figure 1.** They are considered safe areas, except for those without a face mask. In this case, only the sneeze of the passerby with the mask on his chin can reach the players, but only if they are immediately adjacent to him.

Finally, we cannot fail to emphasize the importance of vaccination as a measure to reduce the severity and mortality of COVID-19. A study carried out with people infected by the Delta variant of SARS-CoV-2 showed that unvaccinated individuals had higher viral load than those with a complete vaccination schedule (Puhach et al., 2022). To recreate this dynamic, we created a “passerby” who has not been vaccinated. **Figure 3.** When a player is hit by a sneeze from this “passerby” he/she loses two health markers instead of one, showing the higher potential risk. **Table 3** brings together all the concepts addressed in the game, specifying the mechanics and dynamics, as well as the type of feeling or aesthetics related to them.

**Table 1.** How health concepts were transposed to “Keep your distancing”

Health concept	Mechanics/dynamics	Feelings/aesthetics
Risk of infection	Rondel with random events (sneezes)	Uncertainty/apprehension
Social distancing	Gameboard with hexagonal grid	Freedom of movement and choice
Facemask quality	Action card with pff2 mask	Lower risk of infection, safety
Correct use of face-mask	Passerby with mask on the chin	Higher risk of infection, unsafety, indignation
Hands hygiene	Alcohol gel totem that gives away action cards	Lower risk of infection, safety
Room ventilation	Balcony area	Lower risk of infection, safety
Vaccination	Non-vaccinated passerby	Higher risk of infection, unsafety, indignation
Solidarity	Cooperation Loss of health marker when sneezes at another person	Care for each other

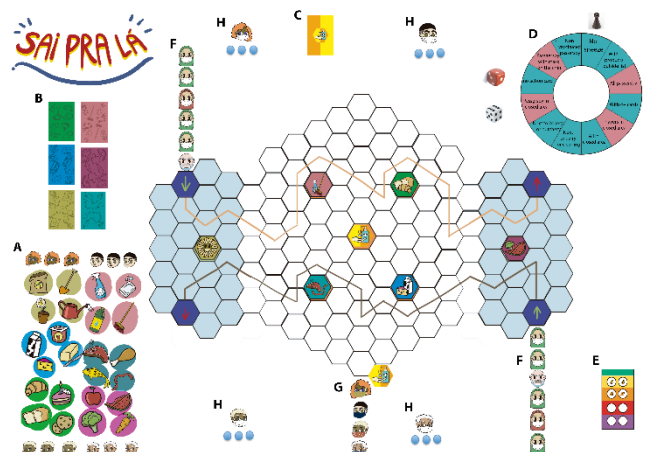
## 4 Development, tests, and game balancing

We use the game development process called “Iterative Design” (Salen et al., 2012) in which design decisions are made based on the playing experience. The process emphasizes the

importance of prototyping and playtesting early in game development. The first prototypes are not graphically concerned but begin to define the fundamental rules and core mechanisms of the game. Each prototype is played, evaluated, adjusted, and played again, in a cyclical process that alternates between prototyping, testing, evaluation and refinement.

Due to the difficulty of testing games in person during the pandemic, the game prototype was developed on Tabletopia (<http://www.tabletopia.com>), an online platform that allows games to be tested remotely, simulating a table where players virtually manipulate game components. All pieces were developed and published on the platform according to demands and needs.

After each playtest, we noted the result and playing time and discussed any doubts or observations pointed out by the participants, adjusting the prototype before the next test. Once the mechanics were established, we carried out balancing tests, including “negative” tests where we asked participants to play with no regard for physical distancing. In these tests, we sought to ensure that, in most games in which players were careful with preventive measures, they emerged victorious from the market, while the careless ones lost due to excessive risk of infection (excessive loss of health markers) to one or all players. The idea of this balance was to encourage and reinforce ideas and behaviors related to prevention, without necessarily making the game difficult to win.



**Figure 4.** “Keep your distancing” (Sai pra lá) setup. On the left bottom corner is the shopping list (A) where each player selects three products he/she wants to buy in the market. Just above, the cards from each section of the market (B), and centered at the top the action cards (C) that we receive in the alcohol gel totem. On the right top corner is the rondel (D) where the sneeze events are drawn. Below, we find the “risk of infection” board (E) that determines the end of the game. Its colors display the flag code used in Brazil to represent risk of infection, being green a very low risk and purple an extremely high risk of infection. At each side of the main board, 6 passersby (F) await to enter the market by its side doors. Their entry counts the 12 turns of the game. At the bottom entrance players (G) also line up to enter. Finally, we can see the player markers with pff2 masks (H) that may be used during play and the blue health markers, three for each player.

In respect to the artwork, authorial illustrations were developed, avoiding database images. As the main visual reference, the arts of Kyle Ferrin (BoardGameGeek, n.d.-a) and rubber hose (Garofalo, 2001), popular animation style in the

1930s, were used. The simplification of those forms was essential for this “print and play” format of the game since the objective is the democratization of the game. As we have no control over the equipment of who will print, something simpler makes the experience better for everyone. Main game components are shown on **figure 4**.

## Conclusions

Keep your distancing is a serious board game, fully developed to highlight the main preventive measures for respiratory viruses’ infection, including SARS-CoV-2. It is intended to provide the player with a light and fun playful experience, but capable of awakening him/her to the importance of caring for his/her health and that of others around him/her. The game was balanced so that attention to preventive measures and care for others could be the difference between victory or defeat for the group.

## Acknowledgements

The authors wish to thank all people that gave us some of their time to help us playtest this game, especially Oficina das Ligadas and Oficina do Playteste. At that time of game development, no ethical committee has been contact, as game validation has not yet started.

The authors declare no conflict of interest.

All figures were developed by the authors.

## Authors contribution

Conceptualization: LLN, TZV; Investigation: PHGNM, LLN, TZV, Methodology: PHGNM, LLN, TZV, Supervision: TZV, Visualization: PHGNM, Writing original draft: TZV

## References

- Adil, M. T., Rahman, R., Whitelaw, D., Jain, V., Al-Taani, O., Rashid, F., Munasinghe, A., & Jambulingam, P. (2021). SARS-CoV-2 and the pandemic of COVID-19. *Postgraduate Medical Journal*, *97*(1144), 110–116. doi: 10.1136/postgradmedj-2020-138386
- Anvisa. (2020). *Nota Técnica GVIMS/GGTES/ANVISA Nº 04/2020*.
- Asselah, T., Durantel, D., Pasmant, E., Lau, G., & Schinazi, R. F. (2021). COVID-19: Discovery, diagnostics and drug development. *Journal of Hepatology*, *74*(1), 168–184. doi: 10.1016/j.jhep.2020.09.031
- BoardGameGeek. *Kyle Ferrin profile*. Retrieved from <https://boardgamegeek.com/boardgameartist/65224/kyle-ferrin>
- BoardGameGeek. *Take That mechanic*. Retrieved from <https://boardgamegeek.com/boardgamemechanic/2686/take>
- Bogost, I. (2007). *Persuasive games: the expressive power of videogames*. Cambridge, MA, US: Boston Review. 450pp. doi: 10.7551/mitpress/5334.001.0001.
- Callaway, E. (2022). Are COVID surges becoming more predictable? New Omicron variants offer a hint. *Nature*, *605*(7909), 204–206. doi: 10.1038/d41586-022-01240-x
- Conselho Nacional de Saúde. (2022). *Recomendação no 001 de 27 de janeiro de 2022*.
- Conti, A. A. (2008). Quarantine Through History. In *International Encyclopedia of Public Health* (pp. 454–462). Elsevier. doi: 10.1016/B978-012373960-5.00380-4
- de Oliveira, P. M., Mesquita, L. C. C., Gkantonas, S., Giusti, A., & Mastorakos, E. (2021). Evolution of spray and aerosol from respiratory releases: theoretical estimates for insight on viral transmission. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *477*(2245). doi: 10.1098/rspa.2020.0584
- Engelstein, G., & Shalev, I. (2019). *Building blocks of tabletop game design. An encyclopedia of mechanisms* (1st ed.). CRC Press. 492pp. doi: 10.1201/9780429430701
- Ferreira Caceres, M. M., Sosa, J. P., Lawrence, J. A., Sestacovschi, C., Tidd-Johnson, A., Rasool, M. H. U., Gadamidi, V. K., Ozair, S., Pandav, K., Cuevas-Lou, C., Parrish, M., Rodriguez, I., & Fernandez, J. P. (2022). The impact of misinformation on the COVID-19 pandemic. *AIMS Public Health*, *9*(2), 262–277. doi: 10.3934/publichealth.2022018
- Fong, M. W., Gao, H., Wong, J. Y., Xiao, J., Shiu, E. Y. C., Ryu, S., & Cowling, B. J. (2020). Nonpharmaceutical Measures for Pandemic Influenza in Nonhealthcare Settings—Social Distancing Measures. *Emerging Infectious Diseases*, *26*(5), 976–984. doi: 10.3201/eid2605.190995
- Garofalo, E. (2001). *What Is Rubber Hose Animation? How to Achieve This Classic Look*. Retrieved from <https://www.makeuseof.com/what-is-rubber-hose-animation>
- Howard, J., Huang, A., Li, Z., Tufekci, Z., Zdimal, V., van der Westhuizen, H.-M., von Delft, A., Price, A., Fridman, L., Tang, L.-H., Tang, V., Watson, G. L., Bax, C. E., Shaikh, R., Questier, F., Hernandez, D., Chu, L. F., Ramirez, C. M., & Rimoin, A. W. (2021). An evidence review of face masks against COVID-19. *Proceedings of the National Academy of Sciences*, *118*(4). doi: 10.1073/pnas.2014564118
- Huremovic, D. (2019). Social distancing, quarantine, and isolation. In D. Huremovic (Ed.), *Psychiatry of pandemics. A mental health response to infection outbreak* (pp. 85–94). Springer International Publishing. doi: 10.1007/978-3-030-15346-5\_8
- Jess, C. (2021). *The rise of solo play games*. In <https://Play.Nobleknight.Com/the-Rise-of-Solo-Games>.
- Juneau, C.-E., Pueyo, T., Bell, M., Gee, G., Collazzo, P., & Potvin, L. (2022). Lessons from past pandemics: a systematic review of evidence-based, cost-effective interventions to suppress COVID-19. *Systematic Reviews*, *11*(1), 90. doi: 10.1186/s13643-022-01958-9
- Kritz, J., Costa, L., Classe, T., & Xexéo, G. (2020). Xô

- Corona: Aprendendo Medidas Preventivas da COVID-19 Através de Um Jogo. *Proceedings of SBGame*, 1047–1056.
- Li, L., Tæihagh, A., & Tan, S. Y. (2023). A scoping review of the impacts of COVID-19 physical distancing measures on vulnerable population groups. *Nature Communications*, *14*(1), 599. doi: 10.1038/s41467-023-36267-9
- Nham, E., Song, J. Y., Noh, J. Y., Cheong, H. J., & Kim, W. J. (2022). COVID-19 Vaccination in Korea: Past, Present, and the Way Forward. *Journal of Korean Medical Science*, *37*(47). doi: 10.3346/jkms.2022.37.e351
- Puhach, O., Adea, K., Hulo, N., Sattonnet, P., Genecand, C., Iten, A., Jacquéroz, F., Kaiser, L., Vetter, P., Eckerle, I., & Meyer, B. (2022). Infectious viral load in unvaccinated and vaccinated individuals infected with ancestral, Delta or Omicron SARS-CoV-2. *Nature Medicine*, *28*(7), 1491–1500. doi: 10.1038/s41591-022-01816-0
- Salen, K., & Zimmerman, E. (2012). *Regras do Jogo. Fundamentos do design de jogos* (Vol. 1). São Paulo: Editora Blucher. 168pp. ISBN: 9788521206262
- Schoberer, D., Osmancevic, S., Reiter, L., Thonhofer, N., & Hoedl, M. (2022). Rapid review and meta-analysis of the effectiveness of personal protective equipment for healthcare workers during the COVID-19 pandemic. *Public Health in Practice*, *4*, 100280. doi: 10.1016/j.puhip.2022.100280
- Sousa, M., & Bernardo, E. (2019). Back in the Game. In *Videogame Sciences and Arts. Communications in Computer and Information Science* (pp. 72–85). doi: 10.1007/978-3-030-37983-4\_6
- Spiegel, C. (2022). Jogos cooperativos em sala de aula. In L. Lima, F. Neri, P. Piccolo, & A. V. Carvalho (Eds.), *Jogos de tabuleiro na educação*. São Paulo: Devir Livraria (pp. 66-80). ISBN: 978-65-5514-102-3
- Spiele-Autoren-Zunft. (2021). *Code of Respect and responsibility*. Code of Respect and Responsibility. Retrieved from <https://www.spieleautorenzunft.de/code-of-respect-and-responsibility.html>
- Sweney, M. (2021). Digital detox and post-pandemic catch-ups fuel board game boom. *The Guardian*. Retrieved from <https://www.theguardian.com/lifeandstyle/2021/nov/15/digital-detox-and-post-pandemic-catch-ups-fuel-board-game-boom>
- Tolloti, R. (2022, December 3). Mais que brincadeira de criança: vendas de jogos de tabuleiro disparam no Brasil, mas mercado tem grandes desafios. *InfoMoney*. Retrieved from <https://www.infomoney.com.br/negocios/mais-que-brincadeira-de-crianca-vendas-de-jogos-de-tabuleiro-disparam-no-brasil-mas-mercado-tem-grandes-desafios/>
- Valentim-Silva, joao rafael, OLIVEIRA, L., OLIVEIRA, W., Carvalho Filho, J., Borges, C., Oliveira, G., Oliveira, T., & Silva, V. (2017). Cooperative games as a pedagogical strategy to decrease bullying in physical education: notable changes in behavior. *Journal of Physical Education and Sport*, *17*, 1054–1060. doi: 10.7752/jpes.2017.03162
- Verheijen, G. P., Stoltz, S. E. M. J., van den Berg, Y. H. M., & Cillessen, A. H. N. (2019). The influence of competitive and cooperative video games on behavior during play and friendship quality in adolescence. *Computers in Human Behavior*, *91*, 297–304. doi: 10.1016/j.chb.2018.10.023
- WHO. (2020). *WHO Director-General's opening remarks at the media briefing on COVID19*. Retrieved from <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
- WHO. (2023). *WHO Coronavirus (COVID-19) Dashboard*. Retrieved from <https://covid19.who.int>
- Wilder-Smith, A., & Freedman, D. O. (2020). Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. *Journal of Travel Medicine*, *27*(2). doi: 10.1093/jtm/taaa020
- Williams, L. J. (2022). *How the pandemic has brutally reshaped the board games industry*. Games Hub. Retrieved from <https://www.gameshub.com/news/features/coronavirus-board-games-cost-shipping-manufacturing-production-36512/>

## Game references

- 3rd world labour: pandemic edition, 2022. Phumiphan, P. <https://boardgamegeek.com/boardgame/375090/3rd-world-labour-pandemic-edition>
- Against COVID-19. Xu Wentao, 2020. [www.boardgamegeek.com/boardgame/314013/against-covid-19](http://www.boardgamegeek.com/boardgame/314013/against-covid-19).
- American pandemic: the party game. 2020. <https://www.boardgamegeek.com/boardgame/329712/american-pandemic-party-card-game>
- Ay Corona!. Isenmann M 2020. <https://www.boardgamegeek.com/boardgame/343226/ay-corona>
- Bandido COVID-19. Andersen MN 2020. [www.ludopedia.com.br/jogo/bandido-covid-19](http://www.ludopedia.com.br/jogo/bandido-covid-19)
- Bandido. Andersen MN 2016. <https://www.boardgamegeek.com/boardgame/191925/bandido>
- Can you survive 2020?. 2020. <https://boardgamegeek.com/boardgame/324944/can-you-survive-2020>
- Cats with Covid, 2021. Simon, J. <https://boardgamegeek.com/boardgame/377502/cats-covid>
- Clinic: Deluxe edition - COVID 19. Viard A. 2020. <https://www.boardgamegeek.com/boardgameexpansion/307384/clinic-deluxe-edition-covid-19>
- Combate ao Corona. Balbinot F. 2020. <https://www.ludopedia.com.br/jogo/combate-ao-corona-a-invasao-dos-monstros-sem-nome-que-comem-tijolos>

- Corona Chase: The Social Distancing Education Game 2021.  
<https://www.boardgamegeek.com/boardgame/344599/corona-chase-social-distancing-education-game>
- Corona nervt. Martin J. 2021.  
<https://www.boardgamegeek.com/boardgame/335012/corona-nervt>
- Corona vírus – o jogo. Sbrighi C. 2020.  
<https://www.ludopedia.com.br/jogo/corona-virus-o-jogo>
- Corona wars: survivor. 2020.  
<https://www.boardgamegeek.com/boardgame/310365/corona-wars-survival>
- Corona Yuga. Kashyap V. 2020.  
<https://www.boardgamegeek.com/boardgame/314732/corona-yuga>
- Corona: mit eifer ins geschäft. Schwaderlapp L, Schwaderlapp P, Schwaderlapp R, Schwaderlapp S. 2020.  
<https://www.boardgamegeek.com/boardgame/327417/corona-mit-eifer-ins-geschaft>
- CoronaLine. Gracar B. 2020.  
<https://www.boardgamegeek.com/boardgame/307430/coronaline>
- Coronavírus card game. Skobelev D. 2020.  
<https://www.boardgamegeek.com/boardgame/307150/coronavirus-card-game>
- Coronavírus: le jeu. DefrŽmont S 2021.  
<https://www.boardgamegeek.com/boardgame/331031/coronavirus-le-jeu>
- Coronials, 2020.  
<https://boardgamegeek.com/boardgame/330652/coronials>
- Covid deniers: a truly viral party game. 2021.  
<https://www.boardgamegeek.com/boardgame/341288/covid-deniers-truly-viral-party-game>
- COVID Survivor. Very Viral Games. 2020.  
<https://www.boardgamegeek.com/boardgame/313405/covid-survivor>
- COVID. Nicolle P, Nicolle S. 2020.  
<https://www.boardgamegeek.com/boardgame/319799/covid>
- COVID-19. Petersen, P. 2020.  
<https://www.boardgamegeek.com/boardgame/307455/covid-19>
- CovidParty, Bombezín-Domino, A, Haroune, C 2020.  
<https://boardgamegeek.com/boardgame/351866/covidparty>
- Destroy COVID. Horváth K, Geda M 2021.  
<https://www.boardgamegeek.com/boardgame/343854/destroy-covid>
- Dokter Li, 2020. Cooreman, L; Cooreman, D.  
<https://boardgamegeek.com/boardgame/327263/dokter-li>
- État d'urgence, 2021. Dion, M; Ferrari, J.  
<https://boardgamegeek.com/boardgame/358622/etat-urgence>
- Exploding kittens. Inman N, Lee E, Small S. 2015.  
<https://www.boardgamegeek.com/boardgame/172225/exploding-kittens>
- HERO: The pandemic, 2023. Schappacher, R.  
<https://boardgamegeek.com/boardgameexpansion/374540/hero-pandemic>
- Hey, Corona! 2020. Cardwell D, Griggs M. 2020.  
<https://www.boardgamegeek.com/boardgame/331182/hey-corona-2020>
- Infection, 2020. Jin, HY, Cheol, JJ.  
<https://boardgamegeek.com/boardgame/347337/infection>
- Lockdown! A card game, 2022.  
<https://boardgamegeek.com/boardgame/359517/lockdown-card-game/credits>
- Lockdown! The game, 2020. Veitch, J.  
<https://boardgamegeek.com/boardgame/328679/lockdown-game>
- Maradj-otthon! 2020. Fatime, LK.  
<https://boardgamegeek.com/boardgame/329951/maradj-otthon>
- Monopoly: at home reality. 2021.  
<https://boardgamegeek.com/boardgame/353283/monopoly-home-reality>
- Oltakoz okosan!.2021. Balázs, L; Szauer. I.  
<https://boardgamegeek.com/boardgame/365358/oltakoz-okosan>
- Operations research for COVID 19. Nagahama K. 2020.  
<https://www.boardgamegeek.com/boardgame/333163/operations-research-covid-19>
- Pandemia, 2022. Toribio, JM.  
<https://boardgamegeek.com/boardgame/354787/pandemia>
- Pandemic. Leacock M. 2008.  
<https://www.boardgamegeek.com/boardgame/30549/pandemic>
- Pandemipoker. Fiore GmbH, 2021.  
<https://www.boardgamegeek.com/boardgame/345263/pandemipoker>
- Pandora's box card game: COVID 19 expansion. 2021  
<https://boardgamegeek.com/boardgameexpansion/350867/pandoras-box-card-game-covid-19-expansion>
- People vs pandemic. Thurber D. 2020.  
<https://www.boardgamegeek.com/boardgame/324628/people-vs-pandemic>
- The big lockdown, 2020. Cooper, D; Frank, M  
<https://boardgamegeek.com/boardgame/321843/big-lockdown>
- The COVID Containment. Dias F 2020.  
<https://www.boardgamegeek.com/boardgame/306935/covid-containment>
- We care: a grizzled game. 2021. Riffaud, F.; Rodriguez, J.  
<https://boardgamegeek.com/boardgame/335541/we-care-grizzled-game>
- Werewolf. Davidoff D, Plotkin A. 1986.  
<https://www.boardgamegeek.com/boardgame/925/werewolf>
- What a wonderful Covid vaccine, 2022. Suzuki, K.  
<https://boardgamegeek.com/boardgame/378687/what-wonderful-covid-19-vaccine>
- Xô Corona. Kritz JS, Costa LM, Classe TM, Xexéo GB. Xô Corona: aprendendo medidas preventivas da COVID-19 através de um jogo. Proceedings of SBGames 2020.