

The Effect of Game-Centered Socialization on Mental Health

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John E. Berberian, Jr.

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Richard D. Jacques, Ph.D., Department of Engineering and Society

Introduction

The pandemic was a dark time for our society's mental health — the lowest point that most of us can remember. In hindsight, it should come as no surprise that the unique combination of social isolation, constant fear of disease, and reduced physical activity was taxing on the public psyche. Faced with a situation that was unprecedented in our lifetimes, our society chose the only effective solution available to us: quarantine on an enormous scale. The effects on our mental health were devastating, bringing the issue into sudden focus on a societal scale.

It seems easy to blame COVID for all our recent mental health struggles, but these problems have been worsening for a decade at least. Researchers identify a wide range of potential causes: opioid use, sleep, the economy, and changes in willingness to admit problems, but the most common one is increased use of electronic devices (Twenge et al., 2019). Social media is frequently mentioned when analyzing causes of mental health degradation (Gardner et al., 2019), especially among teenage girls, who tend to be the heaviest users (Anderson et al., 2023). While COVID did substantially aggravate the existing mental health epidemic, it is critical to view those increases in the broader context of the previous decades.

I think that the most important through-line connecting these threads is face-to-face social interaction. For reasons that are not entirely understood, it seems that face-to-face interaction is more beneficial for building healthy relationships and increasing life satisfaction than digital interaction, including texting, calling, and video calling (Simone et al., 2019). Nowhere was this more evident than the pandemic: when access to face-to-face interaction was substantially restricted, its value became much more visible, far outpacing other factors like physical activity, which was commonly thought to be quite important (Stieger et al., 2023).

One common mode of social interaction is through games. Games can, broadly, be split into two categories: in-person and online. Note that these categories for games are not quite identical

to physical and computer-based: for example, Mario Kart is computer-based but often played in person. Based on my theory that face-to-face interaction is a critical component of mental health, I will attempt to support the claim that in-person games' natural facilitation of face-to-face interaction makes them more beneficial to mental health than online games. To substantiate this, I will conduct a review of the available literature on the effects of online games and in-person games on mental health.

Based on my findings, I will analyze the question of whether it is worthwhile constructing a physical chessboard with features similar to those of chess websites, or if the online versions have equivalent or superior benefits to society. This example is not chosen arbitrarily: my capstone project was an electronic chessboard with features designed toward the goal of teaching the users how to play, and how to improve their skills.

Problem Definition

Even before the pandemic, mental health was worsening across America: Twenge et al. (2019) found increases in major depressive episodes for most age groups between 2009 and 2017, especially affecting young cohorts. And these were not minor changes, either: the increase ranged from +27% to +122% — enormous swings at a societal scale. Researchers can only guess at the cause, but the integration of technology into everyday life (and especially social communication) is often proposed as the culprit — Twenge et al. (2019) notes that the older generations are less likely to use technology with the same regularity or intensity: “the rise of electronic communication and digital media would be expected to have a greater impact on young people, and thus could be a plausible driver of the study findings.”

As an aside, a skeptical analysis would correctly note that this may not indicate an actual differ-

ence in the number of depressive episodes: this could instead demonstrate a difference in reporting frequency. If a shift in societal attitudes over that time interval made depressive episodes more likely to be recorded, that could also explain the increase in the data. But even a skeptic would be forced to concede that this vulnerability to reporting fluctuations is not shared by the other metrics analyzed by the paper: suicide rates, in a macabre way, provide a more robust measurement of mental health, albeit only of the prevalence of severe cases. Twenge et al. (2019) also measured large increases in the suicide rate: between +32% and +56% for the younger cohorts identified earlier (34 and younger). This is much higher than the expected baseline fluctuations. Gardner et al. (2019) provides another robust metric for mental health: the frequency of emergency room visits for self-harm or mental health reasons. They found a steady increase in ER admissions with self-harm codes from 2009-2017 among youths in Ontario (Fig. 1). This effect was particularly pronounced among teenage girls, a population that tends to use social media more heavily (Anderson et al., 2023). They also found increases in mental health-related emergency room visits, with the rate of increase doubling around 2009. The frequency of emergency room visits is not likely to change substantially when societal attitudes shift: unlike self-reported statistics, they tend to be necessary no matter what the societal expectations are.

The data from Gardner et al. (2019) has a surprising property: there is a noticeably clear turning point, around 2009 (see Fig. 1). The authors advanced several theories for this, identifying two major social factors which changed near that time: the 2008 financial crisis and the widespread adoption of smartphones. The financial crisis could have led to increased family-related stress, and “engagement with social media could lead to increased rates of self-harm, at least for vulnerable adolescents, in several ways: by normalizing it, by triggering it, by eliciting emulation of self-harming behaviors, or by exposing youths to cyber bullying” (Gardner et al., 2019). The economic angle is an important possibility to consider: perhaps the financial stresses imposed on families are

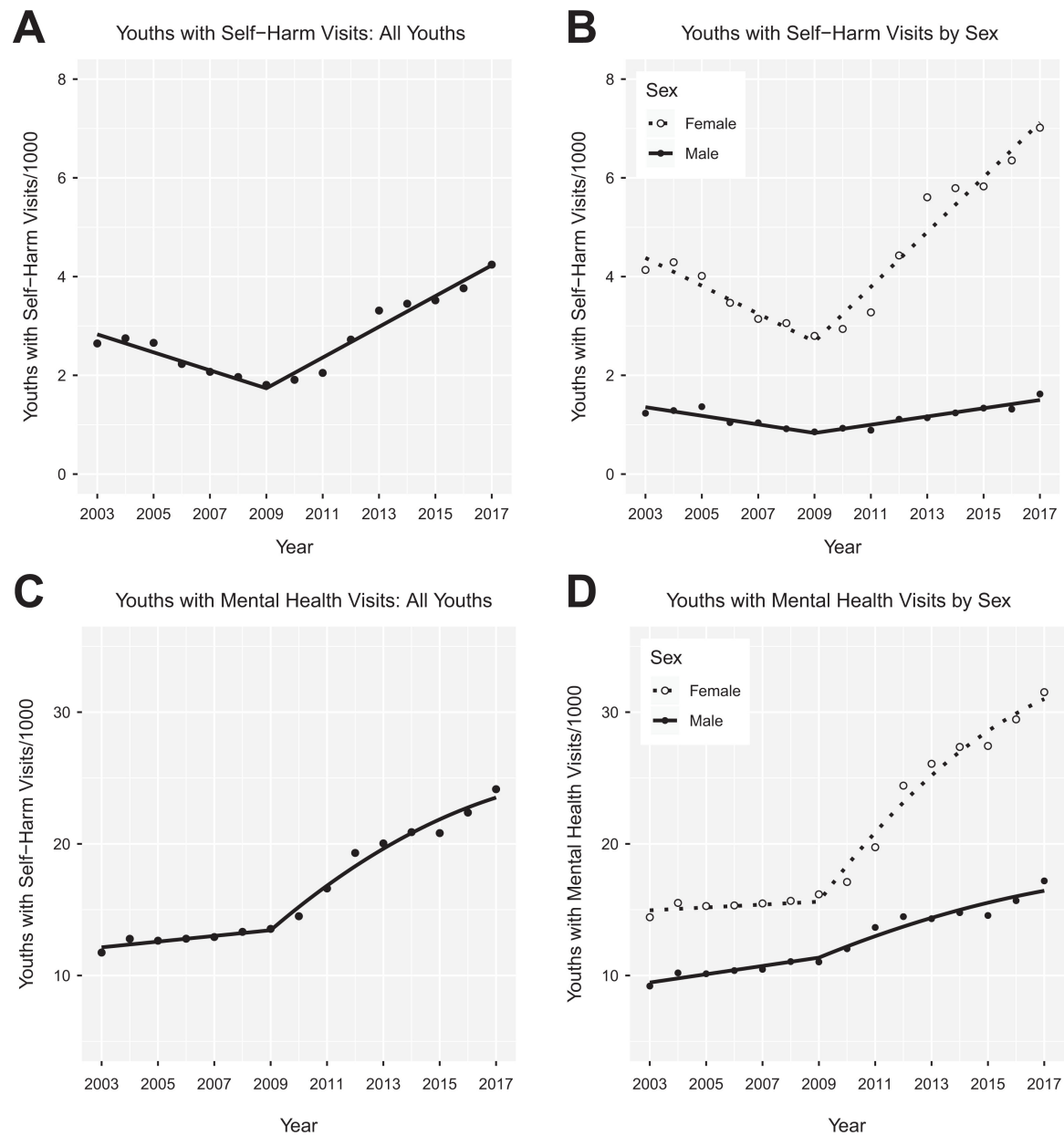


Figure 1: Rates of adolescents with self-harm and mental health emergency department (ED) visits: 2003 to 2017. Figure 1 from Gardner et al. (2019).

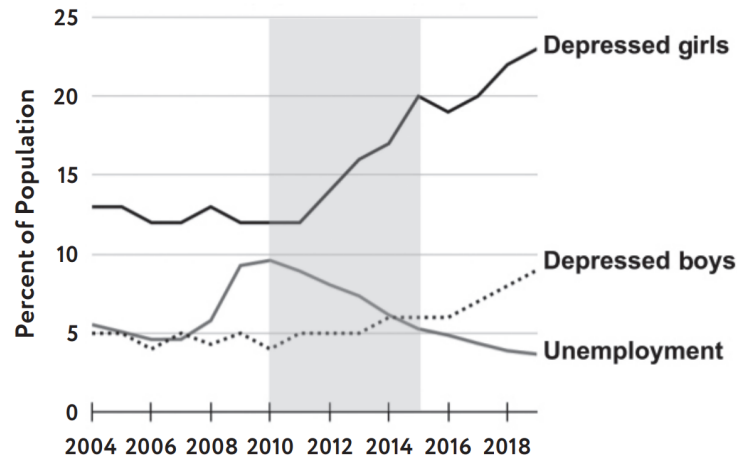


Figure 2: The U.S. unemployment rate (percent of adults in the labor market who are unemployed) fell continuously as the adolescent mental health crisis got worse. Figure 1.7 from Haidt (2024).

causing teens' mental health to suffer.

However, that story becomes more complicated when taking into account data from after the recession: Haidt (2024) noted teen depression continued to rise after the economic crisis despite falling unemployment (see Fig. 2). There is an important bit of nuance here: the unemployment rate measured by the U.S. government is not the percentage of American adults who are unemployed — rather, it is the percentage of adults *in the labor market* who are unemployed. People are only counted as unemployed in the statistics if they report that they are seeking work. If there were a widespread phenomenon of families' primary breadwinners leaving the workforce permanently following the recession, that could explain increasing familial financial stress and falling unemployment statistics. I will discount this as unlikely — I presume that most families for whom leaving the workforce is a viable option would have a higher socioeconomic status, such that they do not require the stable income of a job for survival and could instead subsist off of the dividends from investments. I doubt that the financial stresses would affect such families (a small minority) heavily enough to cause increases in depression on such a scale. That nuance dealt with; it be-

comes difficult to justify the view that this rise in mental health difficulties was caused by the 2008 recession.

Another key factor in mental health is sleep. Palagini et al. (2022) found that insomnia has strong correlations with mental health, and that these correlations are bidirectional: poor mental health can lead to insomnia, and insomnia can worsen mental health. They identified numerous biological and neurological factors as responsible for this: “[insomnia] may favor a state of allostatic overload impairing brain plasticity, emotional, immune and endocrine pathways and may contribute to mental disturbances” (Palagini et al., 2022). Essentially, insomnia is a stressful and abnormal condition for the brain, which they believe leads to the mood disorders they were studying. The bidirectional nature of the relationship raises the frightening possibility of a feedback loop: one’s mental health struggles could cause insomnia, which could in turn worsen one’s mental state. The complexity of the systems involved makes recognition of such effects difficult: generally, those are not the only factors involved. For example, it is possible that decreases in sleep are associated with increased use of cell phones and social media. Twenge et al. (2019) wrote that “recent studies have found that problematic Internet and social media use and sleep disturbance among youth are linked, and that these associations contribute to depressive symptoms in this group.” Perhaps increased insomnia is not the root cause of the recent increases in mental health problems — rather, it may be a secondary cause, brought about by the increases in use of electronic devices.

The global pandemic deserves mention as a contributing factor as well: depression rates went up by 25% (World Health Organization, 2022), severe loneliness increased by an enormous 350% (O’Sullivan et al., 2021), and deaths of despair by 29% (Angus et al., 2023). The last of these is the most telling, as it would be robust to the changes in societal awareness and acceptance of mental health that occurred over the period of isolation. While the pandemic was the single worst

event for mental health in the last decade, the causes of increased difficulty during this time were not fundamentally novel: physical activity dropped off, social isolation was imposed by law, and in-person interaction was impossible. Physical activity has long been believed to be important for mental health: studies have shown that the release of endorphins caused by exercise can help to regulate mood and that regular exercise can improve sleep routine (Mahindru et al., 2023). As Khosravi (2021) explained, physical activity and mental health have a bidirectional relationship, and both were worsened by the effects of the pandemic.

But closer study reveals that there is more at play here. Data collected by Stieger et al. (2023) showed that “both face-to-face and digital text communication were more predictive of mental health than either physical or outdoor activity” during the pandemic. Their data suggested that social interaction was substantially more important than physical activity, and that in-person interaction was much more helpful than digital communication (e.g. texting or video calls). This would accord with the study by Simone et al. (2019), which demonstrated the importance of strong, reciprocal, multi-contextual, in-person relationships in preventing depression. But in fact the data collected by Stieger et al. (2023) is more convincing, as it is able to eliminate some of the selection effects usually associated with these sorts of studies: because of the legal restrictions present during the pandemic on face-to-face social interaction in the German-speaking countries studied, the data does not implicitly amplify the effect of some people being more sociable than others. Normally, such correlations between in-person interaction and mental health could have two direct-cause explanations: those who interact more are more mentally healthy, or the reverse — those who are more mentally healthy tend to interact more. In this case, the reverse option is restricted: those who were more mentally healthy were prevented from socializing in-person by law, and yet the correlation between the two groups remained. While there are undoubtedly external causes that affect both, the unique circumstances of this study make it more useful in supporting the theory

that face-to-face social interaction is foundational to mental health.

In short, the current condition of mental health has been brewing since around 2009. The apparent worsening is not merely a reporting difference: metrics based on suicide and ER visits suggest that the health of our society truly has degraded. Economic stress following the 2008 recession seemed a likely hypothesis, but is implausible in light of the following years' trends. Insomnia, lower physical activity, increased technology use, and reduced face-to-face interaction remain likely candidates for the cause. While these are all interrelated, unique evidence from the pandemic suggests that the last of them is the most significant. It seems that face-to-face interaction is key to mental health.

Research Question and Methods

In order to test the validity of this theory as a general principle, I will study its applicability to social interaction over games. If face-to-face interaction is a critical component of mental health, I would expect to see that games involving more face-to-face interaction lead to improved mental health outcomes compared to online games.

To that end, I have read the studies that I can find online relating to mental health and games and summarized the results sections. I chose to exclude most instances of the therapeutic use of games, as the majority of therapeutic games are carefully structured and rather different from the games that most people play. I searched through the papers available on UVA Virgo and APA PsychNet and analyzed the results that I found.

Results

The most interesting papers I encountered are summarized below. It was somewhat challenging to find high-quality research that was directly relevant to my topic — PsychNet is particularly prone to finding irrelevant but similarly-worded results — and much of the relevant research is inherently limited. I am most interested in investigating causal effects; such effects are notoriously difficult to measure in the social sciences. Nevertheless, I believe the evidence I found is sufficient to support (though not to *prove*) my thesis.

In a study in the Netherlands, Lemmens et al. (2011) performed a two-wave longitudinal survey of Dutch students aged 11-17. The survey asked questions related to social competence, self-esteem, time spent on video games, and the symptoms of video game addiction (e.g. withdrawal, relapse, increasing tolerance). Their analysis, because of the wave-based longitudinal approach, was able to discern causal factors more accurately: using an autoregressive model, they found that “lower psychosocial well-being is more likely to be a cause than a consequence of pathological gaming,” (Lemmens et al., 2011) though there are effects in both directions. Though the authors state their case quite strongly, I have doubts about how much information can be accurately discerned from only two waves, though the close spacing (six months) does lend their conclusions more credibility.

Egami et al. (2024) exploited a unique opportunity involving a PlayStation lottery to show a positive causal link between console ownership along with increased gameplay and mental well-being. The study notes that much of the previous literature has focused on correlations between video game use and depression, which could be causal in either direction or both caused by some independent factor; in contrast, this study was able to control for many of the effects that would prove confounding for their colleagues. The study noted, however, that the positive effect of video games plateaued after daily play time exceeded a few hours.

Most other studies I read that related to video games were unable to measure causality and had no clear consensus between them. Some noted positive effects from gaming (Carissoli & Villani, 2024) (Leslie, 2024) (Hazel et al., 2022), others noted strong negative effects (Chamarro et al., 2020) (Abdel Raouf et al., 2022) (Nagata et al., 2024) (Männikkö et al., 2020). In general, it seemed that the positive effects tended to occur for lower daily playtime, and that the negative effects were more prevalent when the behavior became closer to addictive (Byeon et al., 2022). Because these studies did not distinguish between online video games and offline video games, it is difficult to determine from these studies what effect face-to-face interaction had. If my thesis is correct, it would make sense that video games show different effects for different levels of use: heavier users of video games are likely addicted and avoiding in-person interaction, whereas lighter users would have more time to engage in the more valuable face-to-face interaction.

One uniquely interesting study by Kowert et al. (2014) on a large sample of adolescent video game players in Germany focused on the *social displacement hypothesis* — the idea that “through increased online video game involvement, adolescents may begin to exchange their close offline friendships for newly formed online contacts.” They used a survey to measure the size and quality of the adolescents’ social circles and the correlations of these metrics with online video game play. Admittedly, the metrics that they used were somewhat fuzzy: they asked participants to estimate how many “good friends” and “confidants” they had. The ambiguity of the term “good friends” is substantial (in fact, the spoken intonation and emphasis can wildly change the meaning) and the researchers chose to leave the definition unclear so as to avoid limiting whom the participants viewed as friends. To supplement this, they also asked a few questions about how supported the participants felt by their social networks. To characterize the adolescents’ gaming, they asked the participants to estimate their frequency of play and average duration — and critically, they differentiated “social online” (playing with friends over the internet) from “social offline” (playing

with friends in the same room) play. While I have doubts about the precision of self-estimated numbers, I suppose such metrics are as good as such research can get.

The differentiation between offline and online gaming led to a fascinating conclusion: increased online gaming corresponded to “smaller and lower-quality offline social circles” (Kowert et al., 2014) and had a strongly significant correlation with lower perceived emotional support. In contrast, offline gaming seemed to either raise or not affect the quality and scope of social relationships. The authors note that their evidence is insufficient to establish any sort of causal relationship, but that their results are consistent with the social displacement hypothesis. They also acknowledge that their study failed to measure a few relevant factors: the *types* of games being played (perhaps online games with a communal focus have less detrimental effects than shooter games), *when* the games are played (perhaps weekend players have an easier time maintaining strong social relationships), and whether the results are generalizable to other cultures. Nevertheless, this study’s results lend strong support to my thesis: online gamers, socializing in a context without face-to-face interaction, have fewer good friends and weaker social support networks. Again, establishing a causal effect is beyond the scope of this cross-sectional study, but the evidence is consistent with my thesis.

In a similar vein, Prochnow and Patterson (2024) mapped the social networks of online gamers and found that “in-person network characteristics showed the strongest associations with mental health outcomes” compared to online social networks. They found strong correlations between the frequency of confiding in in-person networks and decreased depressive symptoms. Unfortunately, the evidence is insufficient to measure whether the effect is causal or merely correlation, but it is still in line with the predictions of my thesis.

There is comparatively little research on the mental health effects of board and card games. There are a sizable number of studies on specialized therapeutic board games, but they tend to

be specifically designed for training a specific mental or social function, rather than for plain entertainment. I am more interested in entertainment-focused board games, of the sort that are most popular in American society. To that end, I try to focus on non-therapeutic studies that involve common board games. This left me with rather little evidence, but enough that my conclusion is supported.

A few studies focused on gerontology have found substantial benefits for both mental health and mental acuity: Levine (2022) describes how the social engagement associated with playing mahjong is associated with reduced cognitive impairment and better health outcomes in senior living centers. However, because it was not longitudinal, it was unable to show any causal effect. Altschul and Deary (2020) performed a 67-year longitudinal study across four survey waves in Scotland and found that “higher frequency of playing [analog] games was associated with higher cognitive function at age 70, controlling for age 11 cognitive function, and the majority of this association could not be explained by control variables.” Because of uncertainty with regard to the completeness of the control variables, they did not feel that it was possible to claim a causal effect from this data.

Gallardo-Masa et al. (2024) implemented a new program at 25 residential foster care facilities across Europe in which adolescents were invited to play a variety of board games with the youth workers. Following the board games, they were asked to fill out an anonymous survey with a few open-ended questions about their experience. The youth workers also wrote up a weekly report summarizing the session and the group satisfaction. The feedback from the participants was overwhelmingly positive: it provided them with a relaxed space in which to disconnect from technology and enjoy the company of their peers. Some mentioned the positive social atmosphere and closeness it precipitated, though others commented on the negative aspects of noisy and competitive games. The authors viewed the participants’ struggles with a competitive environment

positively: in their view, this provided a safe space in which to learn how to win and lose well. They conclude with praise for board games as “an excellent educational resource within the field of residential care.”

It is important to note, however, that their data is prone to selection bias: the adolescents who filled out their surveys were a self-selecting subset of those in foster care. It is quite possible that only those who enjoyed board games continued attending the sessions. A closer look at the results challenges this objection: a general dislike of board games was the most common cause for hesitation among the participants, yet they nevertheless chose to participate. Still, the results of this study are difficult to generalize. It studied a very specific population, which is known to have higher rates of mental and developmental difficulties than the general public. It is possible that they are also uniquely in need of such a social space, and thus the benefits were more pronounced. At a minimum, this study’s results support the theory that face-to-face social interaction around board games is beneficial among vulnerable youth. I would feel inclined to guess that this benefit extends to others.

The next study supports that theory: Chun (2024), in his dissertation, studied the effect of tabletop role-playing games (TTRPGs, e.g. Dungeons & Dragons) on groups of college students at the BYU counseling center. Tabletop role-playing games are uniquely social among board games: their defining feature is the ability for players to take on the roles of characters and act out complex social situations. This has been found to strengthen creative thinking, decrease embarrassment, and stimulate personal development by providing an environment in which participants can safely test out different versions of themselves. The study found that groups playing TTRPGs, when compared to control groups, had highly significant improvements in group cohesion and social network strength, “statistically suggestive improvements in [groups’] psychological functioning,” and various qualitative benefits such as increased compassion and acceptance. The participants

seemed particularly happy with the trust and connection the games created within the group. Chun concluded that “therapeutically applied TTRPG groups are as effective at treating mental health symptoms as unstructured interpersonal process groups.”

Given that this study was voluntary, it is impossible to avoid selection effects. Perhaps only those who were more extroverted or more predisposed to enjoy such games agreed to participate in the study. It is similarly difficult to discount the placebo effect: perhaps the participants’ belief that they were being treated was more beneficial than the treatment (although this is arguably irrelevant to the applicability of the treatment). Unfortunately, nothing short of forcing kidnapped strangers to play games together will ever put such objections to rest. This is, for all practical purposes, as close as any psychological study can get to measuring the effect of an intervention. There is evidence to suggest that selection effects were minimal: Chun found no quantitative differences in psychological characteristics or personality types between the treatment and control groups. He also cites the conclusion by Henrich and Worthington (2023) that there is no recognizable pattern in personality types among players of Dungeons & Dragons. As such, I will feel comfortable generalizing this to the average person. This study shows that one type of game which consists almost entirely of face-to-face socialization is quite effective at improving participants’ mental health and social network strength. These results cannot properly be generalized to all board games, as TTRPGs are a unique niche of board games.

Hegarty et al. (2024) argue for the use of chess as a social and cognitive enhancement to reduce recidivism among prison populations. They compare chess clubs with prison sports programs, noting that the complex blend of social and cultural factors involved in chess make it more effective as a tool to “reduce violence and conflict, develop communication and other skills, and promote positive use of leisure time.” Although the prison population is not representative of the general public, this is a valuable clue that social interaction through board games can be quite beneficial.

It is a pity, then, that not everyone enjoys the social and mental benefits of board games and the associated face-to-face interaction. While many social and economic barriers keep people from board games, I will focus on the one I believe is most solvable: in the study by Gallardo-Masa et al. (2024), the second most common cause for adolescents disliking board game sessions was difficulty in learning the rules of the games. My capstone project dealt specifically with chess: we built an electronic chessboard that teaches beginners how to play. Currently, most of the tools available for learning chess are computer-based and online. This is primarily for practical reasons: the intuitive user interfaces enabled by the web-based rendering format are challenging to replicate in a physical prototype. Fortunately, my capstone team was up to the challenge.

Our chessboard used a complex system of magnetic sensors and precisely-engineered pieces to measure the state of the board 50 times per second, while a network of color LEDs communicated information to the players. It also included a chess clock with buttons for switching turns and configuring elements of the game (clock timing, requesting hints, etc.). The LEDs were primarily used for showing the players which moves were legal on a given turn. Whenever a piece was lifted, the system would illuminate the squares corresponding to the legal moves for that piece.

I believe that building this project was worthwhile. Chess can be intimidating for beginners; our chessboard creates an inclusive and welcoming environment in which players of all skill levels are enabled to play and grow. In contrast with the computer-based tools, our project enables gameplay in a face-to-face context where healthy and beneficial social interaction can occur.

Conclusion

The last decades have seen a steady decline in mental health across the world, exacerbated by a global pandemic. A careful study of the evidence demonstrates that these declines are strongly

correlated with decreases in face-to-face interaction, with a variety of causes: technology, social media, video games, and more. While the complexity of human interactions makes it exceedingly difficult to conclusively prove a causal effect, the unique social circumstances encountered during the pandemic provided researchers with a remarkably clear answer: face-to-face interaction is one of the most important factors for mental health.

In this paper, I studied the differences between online and in-person games' effects on the mental health of the players. The studies I reviewed suggested that computer-based games can be helpful for mental health and socialization if they are played with offline players, but that online games tend to have minimal positive effects on casual players and outright detrimental effects for heavier players. In contrast, analog games, while substantially less studied, seem to have overwhelmingly positive effects on their players. This is consistent with what my thesis predicts. As always, social sciences have great difficulty in proving any sort of causation; in this case, plausible causal mechanisms are sufficiently clear that I believe causation is highly likely. This is, alas, impossible to quantify.

Given the evidence I have reviewed in this paper, I conclude that my capstone project was a worthwhile investment of time: it lowered the barrier to the positive face-to-face social interaction possible through chess games. I recommend that community leaders seeking to improve general mental health should encourage in-person social events. I further recommend that engineers in social media investigate ways to encourage face-to-face interaction between their users.

References

- Abdel Raouf, S. Y., Gabr, H. M., Al-Wutayd, O., & Al-Batanony, M. A. (2022). Video game disorder and mental wellbeing among university students: A cross-sectional study. *Pan African Medical Journal*, 41. <https://doi.org/10.11604/pamj.2022.41.89.31322>
- Altschul, D. M., & Deary, I. J. (2020). Playing Analog Games Is Associated With Reduced Declines in Cognitive Function: A 68-Year Longitudinal Cohort Study. *The Journals of Gerontology: Series B*, 75(3), 474–482. <https://doi.org/10.1093/geronb/gbz149>
- Anderson, M., Faverio, M., & Gottfried, J. (2023, December). *Teens, social media and technology 2023* (tech. rep.). Pew Research Center. Washington, D.C. <https://www.pewresearch.org/internet/2023/12/11/teens-social-media-and-technology-2023/>
- Angus, C., Buckley, C., Tilstra, A. M., & Dowd, J. B. (2023). Increases in ‘deaths of despair’ during the covid-19 pandemic in the united states and the united kingdom. *Public Health*, 218, 92–96. <https://doi.org/j.puhe.2023.02.019>
- Byeon, G., Park, J. E., Jeon, H. J., Seong, S. J., Lee, D.-W., Cho, S.-J., Chang, S. M., Kim, B.-S., Hahm, B.-J., Hong, J. P., & Park, J.-I. (2022). Associations between game use and mental health in early adulthood: A nationwide study in Korea. *Journal of Affective Disorders*, 297, 579–585. <https://doi.org/10.1016/j.jad.2021.10.064>
- Carissoli, C., & Villani, D. (2024). Video gaming for your well-being: What we know from 20 years of research. In *Digital developments: Perspectives in psychology* (pp. 53–70). IAP Information Age Publishing.
- Chamarro, A., Oberst, U., Cladellas, R., & Fuster, H. (2020). Effect of the Frustration of Psychological Needs on Addictive Behaviors in Mobile Videogamers—The Mediating Role of Use Expectancies and Time Spent Gaming. *International Journal of Environmental Research and Public Health*, 17(17), 6429. <https://doi.org/10.3390/ijerph17176429>
- Chun, S. (2024). Dungeons & Dragons & Dissertations: A Study of Therapeutically Applied Tabletop Roleplaying Game Groups at a University Counseling Center. *Theses and Dissertations*. <https://scholarsarchive.byu.edu/etd/10571>
- Egami, H., Rahman, M. S., Yamamoto, T., Egami, C., & Wakabayashi, T. (2024). Causal effect of video gaming on mental well-being in Japan 2020–2022. *Nature Human Behaviour*, 8(10), 1943–1956. <https://doi.org/10.1038/s41562-024-01948-y>

- Gallardo-Masa, C., Sitjes-Figueras, R., Iglesias, E., & Montserrat, C. (2024). 'Great times with board games'. Promoting the right to play for adolescents in residential care. *Children and Youth Services Review*, 167, 108025. <https://doi.org/10.1016/j.chidyouth.2024.108025>
- Gardner, W., Pajer, K., Cloutier, P., Zemek, R., Currie, L., Hatcher, S., Colman, I., Bell, D., Gray, C., Cappelli, M., Duque, D. R., & Lima, I. (2019). Changing rates of self-harm and mental disorders by sex in youths presenting to ontario emergency departments: Repeated cross-sectional study [PMID: 31184929]. *The Canadian Journal of Psychiatry*, 64(11), 789–797. <https://doi.org/10.1177/0706743719854070>
- Haidt, J. (2024). *The anxious generation: How the great rewiring of childhood is causing an epidemic of mental illness*. Penguin Publishing Group. <https://books.google.com/books?id=I03HEAAQBAJ>
- Hazel, J., Kim, H. M., & Every-Palmer, S. (2022). Exploring the possible mental health and well-being benefits of video games for adult players: A cross-sectional study [PMID: 35603464]. *Australasian Psychiatry*, 30(4), 541–546. <https://doi.org/10.1177/10398562221103081>
- Hegarty, P., Widdicombe, B., Sullivan, P., & Wicks, B. (2024). Going straight with chess. *Psychologist*. Retrieved November 4, 2024, from <https://proxy1.library.virginia.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&site=eds-live&db=a9h&AN=179779016>
- Henrich, S., & and Worthington, R. (2023). Let Your Clients Fight Dragons: A Rapid Evidence Assessment regarding the Therapeutic Utility of 'Dungeons & Dragons'. *Journal of Creativity in Mental Health*, 18(3), 383–401. <https://doi.org/10.1080/15401383.2021.1987367>
- Khosravi, M. (2021). COVID-19 quarantine: Two-way interaction between physical activity and mental health. *European Journal of Translational Myology*, 30(4), 9509. <https://doi.org/10.4081/ejtm.2020.9509>
- Kowert, R., Domahidi, E., Festl, R., & Quandt, T. (2014). Social gaming, lonely life? The impact of digital game play on adolescents' social circles. *Computers in Human Behavior*, 36, 385–390. <https://doi.org/10.1016/j.chb.2014.04.003>
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2011). Psychosocial causes and consequences of pathological gaming. *Computers in Human Behavior*, 27(1), 144–152. <https://doi.org/10.1016/j.chb.2010.07.015>
- Leslie, T. (2024). Video games are actually good for mental health. *New Scientist*, 263(3505). [https://doi.org/10.1016/s0262-4079\(24\)01513-6](https://doi.org/10.1016/s0262-4079(24)01513-6)
- Levine, J. M. (2022). Mahjong and the benefits of social engagement. *Journal of the American Geriatrics Society*, 70(10), 3047–3048. <https://doi.org/10.1111/jgs.17898>

- Mahindru, A., Patil, P., & Agrawal, V. (2023). Role of Physical Activity on Mental Health and Well-Being: A Review. *Cureus*, 15(1), e33475. <https://doi.org/10.7759/cureus.33475>
- Männikkö, N., Ruotsalainen, H., Miettunen, J., Pontes, H. M., & Kääriäinen, M. (2020). Problematic gaming behaviour and health-related outcomes: A systematic review and meta-analysis. *Journal of Health Psychology*, 25(1), 67–81. <https://doi.org/10.1177/1359105317740414>
- Nagata, J. M., Al-Shoaibi, A. A., Leong, A. W., Zamora, G., Testa, A., Ganson, K. T., & Baker, F. C. (2024). Screen time and mental health: A prospective analysis of the Adolescent Brain Cognitive Development (ABCD) Study. *BMC Public Health*, 24(1). <https://doi.org/10.1186/s12889-024-20102-x>
- O’Sullivan, R., Burns, A., Leavey, G., Leroi, I., Burholt, V., Lubben, J., Holt-Lunstad, J., Victor, C., Lawlor, B., Vilar-Compte, M., Perissinotto, C. M., Tully, M. A., Sullivan, M. P., Rosato, M., M., P. J., Tiilikainen, E., & Prohaska, T. R. (2021). Impact of the covid-19 pandemic on loneliness and social isolation: A multi-country study. *International journal of environmental research and public health*, 18(19), 9982. <https://doi.org/10.3390/ijerph18199982>
- Palagini, L., Hertenstein, E., Riemann, D., & Nissen, C. (2022). Sleep, insomnia and mental health. *Journal of Sleep Research*, 31(4), e13628. <https://doi.org/10.1111/jsr.13628>
- Prochnow, T., & Patterson, M. S. (2024). It’s not just a game: Social networks, isolation and mental health in online gamers. *Journal of Public Mental Health*, 23(2), 140–153. <https://doi.org/10.1108/JPMH-11-2023-0099>
- Simone, M., Geiser, C., & Lockhart, G. (2019). The Importance of Face-to-Face Contact and Reciprocal Relationships and their Associations with Depressive Symptoms and Life Satisfaction. *Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation*, 28(11), 2909–2917. <https://doi.org/10.1007/s11136-019-02232-7>
- Stieger, S., Lewetz, D., & Willinger, D. (2023). Face-to-face more important than digital communication for mental health during the pandemic. *Scientific Reports*, 13, 8022. <https://doi.org/10.1038/s41598-023-34957-4>
- Twenge, J. M., Cooper, A. B., Joiner, T. E., Duffy, M. E., & Binau, S. G. (2019). Age, period, and cohort trends in mood disorder indicators and suicide-related outcomes in a nationally representative dataset, 2005–2017. *Journal of Abnormal Psychology*, 128(3), 185–199. <https://doi.org/10.1037/abn0000410>
- World Health Organization. (2022, March 2). *Covid-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide*. Retrieved October 3, 2024, from <https://www.who.int/news/item/2-03-2022/covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide>

[who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide](https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide)