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Internet gaming, embodied distress, and psychosocial well-being: A syndemic-syndaimonic continuum

Jeffrey G. Snodgrass^{a,*}, Michael G. Lacy^b, Steven W. Cole^{c,d}

^aDepartment of Anthropology, Colorado State University, Fort Collins, CO, 80523-1787, USA

^bDepartment of Sociology, Colorado State University, Fort Collins, CO, 80523-1784, USA

^cDivision of Hematology-Oncology, Department of Medicine, University of California, Los Angeles School of Medicine, Los Angeles, CA, 90095, USA

^dDepartment of Psychiatry & Biobehavioral Sciences, University of California, Los Angeles School of Medicine, Los Angeles, CA, 90095, USA

Abstract

We examine internet gaming-related suffering as a novel syndemic most prevalent among contemporary emerging adults. Synthetic analysis of our prior research on internet gaming and health affirms how social factors and mental and physical wellness mutually condition each other in this online play context. Employing biocultural anthropological mixed methods, we focus on statistical interactions between intensive gaming and social well-being in relation to genomic markers of immune function. We show that among gamers with low social well-being, intensive game play is associated with compromised immunity markers, but among those with robust social connection, that same play correlates with decreased activation of stress-related immunity activation. The apparently *beneficial* interaction of higher social well-being and intensive game play resonates with an emerging body of research showing how positive practices—in this case, engaged and pleasurable videogame play—can increase resilience to the negative linked psychological and genomic responses to precarity. Based on these findings, we argue, in relation to gaming behaviors, a syndemics analysis could usefully be expanded by attending to both sides of the synergistic interaction between two social conditions: not just exacerbation of dysfunction in relation to their combined effect, but also non-additive *enhancement* of health that may stem from such combinations. We draw on literature emphasizing the relevance to health of “eudaimonic” well-being—psychosocial processes that transcend immediate self-gratification and involve the pursuit of meaningful and pro-social goals. On that basis, we propose the term “syndaimonics” to capture synergies between social context and mental flourishing, which, in this context and presumably others, can illuminate sources of health resilience and overall improved psychosocial wellbeing.

*Corresponding author. jeffrey.snodgrass@colostate.edu (J.G. Snodgrass).

Author contributions

J.G.S., M.G.L., and S.W.C. designed research; J.G.S., M.G.L., and S.W.C. performed research; J.G.S., M.G.L., and S.W.C. contributed new reagents/analytic tools; J.G.S., M.G.L., and S.W.C. analyzed data; and J.G.S., M.G.L., and S.W.C. wrote the paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2019.112728>.

Keywords

Online games; Behavioral addictions; Eudaimonia; Social genomics; Immunity; Stress; Biocultural anthropology; Statistical interactions

1. Introduction

The notion of “syndemics” has been proposed as a more socially critical and sensitive approach to comorbidity (Mendenhall, 2016a; Nichter, 2016; Singer, 1994, 2009). As originally formulated, syndemics is a portmanteau term that fuses “synergy” and “epidemic” to draw attention to synergistic interactions of social, political, and ecological factors with disease states that worsen health outcomes and increase suffering (Singer et al., 2017; Singer and Clair, 2003). Syndemics are said to occur under three conditions: “(1) the clustering of two (or more) diseases exists within a specific population; (2) fundamental contextual and social factors are co-constructed with the cluster of these two diseases insofar as they help create the conditions in which two diseases cluster and contribute to the further emiseration of the afflicted and affected; and (3) the clustering of multiple diseases creates the potential for adverse disease interaction, increasing the burden of impacted populations” (Mendenhall, 2016a, p. 3; see also Mendenhall, 2016b; Singer et al., 2017; Tsai et al., 2017).

In the current context, we examine through a syndemics lens our research on internet gaming, expanding the syndemics concept in ways that make it more appropriate for examining problematic behaviors such as so-called “addictive” gaming (Petry et al., 2014; Snodgrass et al., 2019b). We synthesize in relationship to the syndemics literature research from three studies of ours, each of which built on the prior study. In Study 1, the earliest of the three, we combined participant-observation, semi-structured interviews, and a web survey to develop and assess culturally-sensitive scale measures of online gaming involvement and its positive and negative consequences (Snodgrass et al., 2017a). In Study 2, we used those scales to assess how social context—and particularly experiences of online and offline social support and loneliness—shaped whether videogame play was experienced as pleasurable as opposed to distressful (Snodgrass et al., 2018a). In the final of the three studies, Study 3, we again employed our videogame involvement and consequences scales to explore biocultural linkages between videogame involvement and psychosocial well-being (Snodgrass et al., 2019a). This latter study entailed analyzing in videogame players expression of a stress-induced gene profile known as the “conserved transcriptional response to adversity” (CTRA) (Cole, 2019). The CTRA is induced in immune cells (leukocytes) by activation of fight-or-flight stress responses from the sympathetic nervous system (Powell et al., 2013), and involves up-regulated expression of genes (in RNA) involved in inflammation and down-regulation of genes linked to innate antiviral responses and antibody production (Cole, 2019). Table 1 summarizes each of these three studies’ main findings and relationships to each other.

In the following analysis, our first contribution is to describe problematic internet gaming as a new and distinct contemporary syndemic affecting many emerging adults (Arnett, 2000), one involving a confluence of factors such as social marginality in the form of loneliness,

intensive engagement with new internet technologies like networked online gaming, motivations to achieve and succeed, and feelings of stress and precarity that can have biological impacts at the molecular level in RNA patterns. Second, we affirm in this setting how syndemic suffering is fundamentally shaped by sociocultural context, and thus cannot be fully accounted for through biomedical terminology such as “disease” and “comorbidity” (Mendenhall, 2016a; Singer, 2009, 1994)—or here, by the notion of “addictive” gaming (Petry et al., 2014). Third, resting on the clearly social nature of gaming-related distress, we point to the utility of anthropological methods, including participant-observation in online gaming worlds (Snodgrass, 2016, 2014), cultural psychiatric interviews (Groleau et al., 2006), field surveys (Dressler and Oths, 2014), field-friendly biomarkers such as dried bloodspots (McDade et al., 2007), and specialized analytical methods from cognitive anthropology such as “cultural consensus analysis” (Romney et al., 1986), for assessing culture members’ frames of meaning and experience related to wellness and suffering. Fourth, we emphasize the importance of analyzing statistical interaction effects between suffering and social context, which is often underplayed in syndemic studies that report simply additive risk rather than truly synergistic interactions between diseases and social context (Tomori et al., 2018; Tsai, 2018; Tsai and Burns, 2015).

By examining synergistic relationships between disease states and social context—identified through statistical interactions—we show how certain forms of positive gaming involvement are associated with increased resilience to negative psychosocial and physical suffering. We thus argue that in the case of gaming behaviors the syndemics perspective can be usefully expanded to recognize the continuum along which interaction occurs, paying attention not just to synergistic exacerbation of adverse outcomes, but also to how positive social state and behavior have (in this case) a non-additive relation with healthier immune gene expression. The relevant state of social well-being is “eudaimonic,” defined as psychosocial processes that transcend immediate self-gratification and involve the pursuit of meaningful and pro-social goals, which contrast with more transient “hedonic” experiences of positive emotions such as happiness (Jones et al., 2014; Ryan and Deci, 2001). On this count, we coin the term “syndaimonics” to capture synergies between social context and positive mental flourishing (“eudaimonia”), which are necessary to attend to in this context in order to illuminate sources of health resilience (Norris et al., 2009). Our reading of the syndemics literature suggests that a focus on such positive synergies has not previously appeared in it, and emphasizing that possibility constitutes a fifth and final contribution of the current work.

In what follows, we begin by presenting methods and results from three of our prior studies. We subsequently analyze those studies’ empirical results through each of the syndemics framework’s three main components: (1) The co-occurrence of two (or more) disease states, which, in this case, are so-called “problem” or “addictive” play patterns and stress-induced physical problems such as immune system dysfunction; (2) The intersection of social context with disease; here, the way psychosocial problems such as loneliness are intertwined with problem gaming and related mental and physical suffering; (3) The way the clustering of multiple diseases creates the potential for adverse disease interaction, which here entails analysis of how social well-being’s relationship to the CTRA differs according to individuals’ relative degree of involvement with online gaming. This analysis leads us to a broader culminating discussion of what we call a “syndemic-syndaimonic continuum,” with

one primary aim being to clarify how the psychosocial contexts of gaming can transform potentially problem play into instead engaged positive gaming, with associated mental and physical health benefits. In that final discussion, we also point to potential broader applications of our “syndaimonic” perspective, specifically to syndemic contexts involving substance use and abuse (Rhodes et al., 2005; Singer, 2009; Singer et al., 2017; Singer and Clair, 2003), and also to other “behavioral addictions” (Holden, 2001) beyond the problem gaming case study described here.

2. Research findings

2.1. Study 1: identifying culturally meaningful experiences of intensive online videogame involvement and its positive and negative consequences

Study 1 began in fall 2014 with several months of participant-observation research, documented in field-notes, in the “massively multiplayer online role-playing game” (MMORPG) *Guild Wars 2*. This phase of research included observations and unstructured interviews—typically within in-game associations of like-minded players termed *guilds*—focused on understanding the positive and negative experiences connected with intensive online gaming involvement from the point of view of players themselves.

Later in fall 2014, we conducted 20 interviews with emerging adult (Arnett, 2000) videogame players. Modifying the McGill Illness Narrative Interview format (Groleau et al., 2006), we focused on gamer respondents’ positive and negative videogame experiences rather than “illness” per se, so as to capture cultural insider understandings and frames of reference about such experiences. We sampled interviewees from our ethnographic networks, and we spoke to individuals playing both the more “hardcore” (i.e., demanding and intensive) game *World of Warcraft* and the typically more “casual” *Guild Wars 2*. Interviews were digitally recorded, transcribed, and subsequently coded and analyzed using the software MAXQDA (Kuckartz, 2007), within a “grounded theory” approach (Glaser and Strauss, 1967).

An iterative coding and analysis process led us to items for videogame *involvement* and the *positive and negative consequences* linked to such *involvement*. The *involvement* items were designed to elicit especially experiences related to core gamer motivations of *achievement*, *social*, and *immersion*, which foundational research had revealed to be key to understanding videogamer psychology (Yee, 2006). The *positive and negative consequences* scales included in each case *achievement* items (such as gaming producing satisfying feelings of accomplishment or feeling more like a dead-end job), *social* ones (like gaming providing satisfying community or instead over-play creating social isolation), *psychosomatic* impacts (related to general gaming-related mental and physical health), and *behavioral* consequences (gaming producing positive structure or by contrast boring and potentially compulsive routine). (See Appendix A: Survey Measures for all items.)

Scale items describing negative consequences were matched with positive counterparts. Thus, for example, an inability to focus on or fully engage with offline activities because one was always thinking about gaming (negative preoccupation) was paired with the satisfying experience of looking forward to gaming (positive anticipation). Further, the negative

consequences scale included classic “addictive” gaming symptoms commonly found in existing “gaming disorder” scales, and thus closely paralleled formulations by the APA (American Psychiatric Association) and WHO (World Health Organization) (Petry et al., 2014). These were: *negative cognitive salience (preoccupation), withdrawal, continue to play despite problems, loss of control/relapse (reduce/stop), loss of interest in other activities, avoidance/mood modification (escape adverse moods), tolerance, and conflict (risk/lose relationships/opportunities)*, with items phrased in ways that matched gamer culture and experience. In addition, the scale contained “problem” play items, which also emerged from our ethnography, but were not typical of “addictive” gaming. These latter experiences related to *social isolation, excessive achievement motivations, playing out of social obligation in ways that compromised gaming pleasure, experiencing gaming as mentally and socially “toxic,” feeling mentally and physically “drained” after long gaming sessions, experiencing gaming more like work than play*, and other themes that emerged in our earlier ethnography and interviews.

Subsequently, in late 2014, we placed the items in an online questionnaire. We asked respondents whether they agreed or disagreed (on a 4-point Likert Scale format) whether each *involvement* item characterized intensively involved online gaming from what they saw as a typical gamer’s point of view. Gamers similarly responded as to whether they agreed or disagreed that the *positive and negative consequences* of such play described in our survey items would be seen by gamers as typical of such experiences. We distributed the survey to our own play networks as well as on online gaming forums, receiving 672 responses. Survey results were analyzed via cultural consensus analysis (CCA) (Romney et al., 1986), in order to assess the extent that each scale item represented socially shared understandings about videogame play—or, in the analytical language of classical CCA, whether the culturally shared “answer key” for each item was “Agree” rather than “Disagree.” (For this analysis, we dichotomized survey items into a simpler “Disagree/Strongly Disagree” vs. “Agree/Strongly Agree.”)

The consensus analysis focused on assessing gamer agreement on the cultural appropriateness of each scale item, including of the more biomedical “addiction” items, with the latter of particular relevance for our syndemics analysis. Averaging the percentages of respondents agreeing to each of the *involvement* items, we found that on average 81.8% of all informants agreed that each *involvement* item described an important and typical highly involved gaming experience. Likewise, the culturally consensual and thus shared response (in CCA terms, the “answer key” response that is “correct” from a gamer community point of view) for all *involvement* items was “Agree” (see Table 2 for these results). Regarding online gaming’s *positive consequences*, the average percentage agreement of each item’s importance was 79.2%, and the answer key again was “Agree” for all items, except for a question about feeling exhilarated by gaming long hours, which was “Disagree” (Table 3). *Negative consequences*, by contrast, showed a quite different pattern. The average percentage of respondents that agreed the item was important was much lower, 45.2%, with the answer key response being “Disagree” on most of the items. Only six out of the 21 *negative consequences* items had as their consensual answer “Agree.” Of particular note, *none* of our *negative consequences* scale’s versions of classic gaming disorder items (Petry et al., 2014) had as their culturally correct answer “Agree” (Table 4), pointing to limitations

of a biomedical “addiction” perspective in this cultural context. (See Snodgrass et al. 2017a for more detail on Study 1’s methods and findings.)

2.2. Study 2: Loneliness, videogame involvement, and problem gaming

Building on Study 1, we conducted a second online survey to assess associations between gamers’ self-reported loneliness, level of online gaming involvement, online social support, perceived societal attitudes toward gaming (social norms), and problem gaming experiences. For *loneliness*, we used a previously validated scale asking about how often our respondents felt that they lacked companionship or felt left out of events and isolated, wording those items to explicitly ask about “offline” contexts in each case (Hughes et al., 2004). For gaming *involvement*, we employed items from the ethnographically validated videogame *involvement* scale, described above in Study 1. For *online social support*, we adapted to online contexts a version of a previously validated Interpersonal Support Evaluation List (ISEL), asking respondents if they had people they could turn to online for help with their problems, for advice, conversation, or with whom they simply enjoyed spending time (Cohen et al., 1985). To these, we added reverse-coded *online loneliness* items, making up an *online social support* scale. Based on earlier phases of ethnography, we also developed questions about whether gamers perceived others, including the media, their family, work colleagues, friends, etc., as generally supportive of their gaming “as a positive and even healthy activity,” which constituted our *social norm support* scale. For problem gaming, we employed the Internet Gaming Disorder scale (IGD-9) developed by Pontes and Griffiths (2015). (For more detail on this second survey’s items, see again Appendix A: Survey Measures.)

Fall 2015, alongside a variety of demographic and control variables, we posted these items in an online questionnaire, again distributing a link to it in our own play networks, as well as to various online gaming fora. We received 3629 responses from gamers around the globe, though mostly from Europe and North America. The core of our survey analysis rested on a path analysis (conducted using Stata; StataCorp, 2015), with us examining how a relationship between loneliness and problem gaming in particular might be mediated by self-reported videogame involvement, online social support, and normative judgments about the value of gaming.

Analysis showed *loneliness* to be positively associated with higher rates of self-reported problem or “disordered” gaming as measured by the IGD-9. A one standard deviation (SD) increase on our *loneliness* measure was associated via a direct pathway with over a *third* of a SD increase on IGD-9. And the relationship between *loneliness* and *disordered gaming* (IGD-9) was further strengthened, when considering mediated pathways between those two variables, such as via *online social support* and *social norm support*. Summing up the total strength of this relationship, considering all pathways, a one SD increase on the *loneliness* scale was associated with about a *half* SD rise in IGD-9, a substantial effect.

However, these associations changed substantially when considering pathways mediated by respondents’ degree of videogame *involvement*, which we represent graphically in Fig. 1.

In this analysis, *loneliness* was positively associated with videogame *involvement* (standardized effect of 0.20), with lonely individuals more heavily involved in online games. Intensive videogame *involvement* was associated positively and more substantially with self-reports of *online social support*, with a one SD increase in videogame involvement associated with about a third of a SD rise in *online social support*. Following the indirect path from *loneliness* through *involvement* showed higher *loneliness* leading to more intensive videogame *involvement*, leading to greater *online social support*. *Online social support* was itself negatively associated with IGD-9, and this *social support* measure was positively associated with our *social norm support* variable, which was itself negatively associated with the IGD-9. This meant that lonely gamers who played videogames intensively in ways that built their social support—as seen in higher reports of *online social support* (one pathway), and the associated accordance with *social norm support* (an additional pathway)—actually showed *decreases* in their self-reports of problem play. (See Snodgrass et al. 2018a for greater detail on Study 2.)

2.3. Study 3: psychosocial well-being, videogame involvement, and the “conserved transcriptional response to adversity” (CTRA)

To explore biocultural aspects of relationships between psychosocial well-being and videogame involvement, we invited between January 2016 and October 2016 videogame players in Colorado and Utah to respond to the same Study 2 questionnaire, this time recruiting respondents from local internet gaming clubs and other networks of ethnographic informants in our two university communities in Colorado and Utah. The questionnaire contained additional screening questions related to local respondents’ interest in meeting with us to collect additional data, including blood for the planned gene expression analysis. Out of the 404 local questionnaire responses received, we contacted individuals who scored in the top and bottom quartiles ($N = 202$) on the previously described (Study 1) videogame *positive and negative consequences* scales (a sum scale of the two), aiming to maximize variability in participants’ gaming experiences. We obtained a sample of 58 persons split between those two quartiles, from whom we further interviewed and drew blood using standard dried blood spot collection procedures (McDade et al., 2007).

In results presented here, we examined (via linear regression) relationships between CTRA (as the primary outcome) and social well-being and videogame involvement (as the main predictors). *Social well-being* was assessed with a 5-item measure—*respondents felt that they contributed to society, that they belonged to a community, that society was becoming a better place, that people were good, and that society made sense*—which was a sub-scale of the 14-item Mental Health Continuum-Short Form (MHC-SF) (Lamers et al., 2011). For videogame play, we categorized individuals as belonging to either a high ($N = 13$) or low ($N = 43$) *positive gaming involvement* group. Triangulating with ethnographic and interview data, we included individuals in the high *positive gaming involvement* group who: 1.) Scored in the top tercile of our gaming *involvement* scale (described in Study 1); 2.) Played at least 10 h per week; 3.) Assessed their play as overall positive (as a balance of self-reported positive compared to negative gaming consequences; again, these two scales were described in Study 1); and 4.) Did not qualify as overly “addicted” to videogames

based on the recognized IGD-9 (also previously described in Study 1) (Pontes and Griffiths, 2015).

We found that high levels of general *social well-being* were associated with *reduced* expression of CTRA indicator genes. Even when considered alongside controls, the *social well-being* measure displayed a strong inverse relationship with CTRA (a standardized coefficient of -0.429). However, the finding most relevant to the syndemic perspective was the additional interactive relation between this *social well-being* scale and *positive gaming involvement* in relation to CTRA. Allowing for a different association between *social well-being* and CTRA, depending on level of *positive gaming involvement* fit the data much better, more than doubling the value of the R^2 (from 0.09 to 0.21). Among persons with low *positive gaming involvement*, standardized regression coefficients indicated a weakly negative association of *social well-being* with CTRA (-0.161), but a substantial negative (i.e., favorable) association in the high *positive gaming involvement* group (-0.95). Conversely, *positive gaming involvement* had little relation to CTRA for persons near the mean of *social well-being*, but at values of *social well-being* that departed from the mean, *positive gaming involvement* did show marked association with CTRA. For example, with *social well-being* at 1.0 SD *below* the mean, persons in the high *positive gaming involvement* group would be predicted to have CTRA *elevated* (worsened) by about 0.7 SD. By contrast, among persons with *social well-being* at 1.0 SD *above* the mean, persons in the high *positive gaming involvement* group were predicted to have a CTRA score *reduced* (improved) by 0.88 SD. We illustrate these patterns graphically in Fig. 2. (See Snodgrass et al. 2019a for more detail on Study 3.)

3. Syndemics in internet gaming

3.1. Syndemics component 1: the clustering of two (or more) disease states

3.1.1. 1st disease state: problem or “addictive” gaming—Research indicates that some individuals become so involved in videogames as to play them problematically, that is, in ways that compromise their ability to function in day-to-day life (Caplan et al., 2009). One global study (Pontes et al., 2014) of this problem estimates the prevalence of problem play at 5% of all internet gamers. Some researchers consider distressful internet gaming a behavioral addiction, sharing with alcohol and substance use disorders characteristic symptoms of cognitive salience, tolerance, withdrawal, conflict, and relapse (Petry et al., 2014). Concerns about dysfunctional aspects of gaming are reflected in proposals from both the American Psychiatric Association (APA) and the World Health Organization (WHO) to include variations of “gaming disorder” as formal psychiatric diagnoses (American Psychiatric Association, 2013; World Health Organization, n.d.). Others, though, have questioned the logic of assessing problem gaming via standards established in relation to substance use and gambling (Griffiths et al., 2016). This second group of researchers thus argue that new approaches to assess problem gaming, resting on research into the actual experiences of gamers, are needed to properly measure such problems and distinguish them from highly engaged but pleasurable play (Billieux et al., 2015; Charlton and Danforth, 2007; Snodgrass et al., 2017a, 2019).

What is important here for our “syndemics” argument is that some internet gamers experience distress and suffering connected to their play experiences, and, as we next show, that distress is associated with measurable alterations of immune system biology. In fact, such problems were highlighted in all three of the studies presented here. However, as Study 1 results made particularly clear, a biomedical language of “addiction”—and thus also of “disease” and “comorbidity”—did not account for our respondents’ negative play experiences. In contrast to the gaming *involvement* and *positive consequences* scales (Tables 2 and 3), there was little cultural agreement on what constituted problem play, with particular rejection of the appropriateness of classic “addiction” symptoms (see Table 4). Following Nichter’s classic “idioms of distress” work (Nichter, 1981), we have argued elsewhere that “addictive” videogaming—a term commonly used by gamers themselves—is a culturally salient linguistic and behavioral idiom for communicating distress to friends and family (Snodgrass et al., 2019c). The idioms of distress approach is concordant with the results presented here, and also with other research of ours that similarly aimed to capture wellness and suffering in culturally meaningful ways (Snodgrass et al., 2017b).

Whether biologically-grounded “disease” or psychosocially experienced “illness” (Kleinman, 1988)—a debate not to be resolved here—“problem gaming” is the first of two disease states discussed here that emerge from social context in ways that form a syndemic. However, in addition to the incompleteness of the medical model in this context, readers should also keep in mind the difficulty of fully separating “problem” online play from healthy “engagement” with gaming as a hobby (Charlton and Danforth, 2007). This was particularly apparent again in Study 1, given the way that the positive and negative consequences were matched—for example, as shown in Tables 3 and 4 (and in Appendix A), positive consequence item 16 is paired with negative item 37, question 17 with 38, and so forth. This is a point to which we’ll return in the context of our concluding discussion of “syndaimonics.”

3.1.2. 2nd disease state: embodied distress: internet gaming and the “conserved transcriptional response to adversity” (CTRA)—Research links life stress to compromised and dysregulated immune function (Ross et al., 2019), including increases in a stress-induced gene profile known as the “conserved transcriptional response to adversity” (CTRA) (Cole, 2019). As may be evident, studies of CTRA phenomena are quite consonant with a key theme of the syndemics perspective, namely how adverse social conditions (stressors) become “embodied” (Csordas, 1990) in biological states (CTRA). The findings of Study 3 are consistent with this claim about adverse biological effects of social conditions, as the genomic analyses in our study showed certain forms of online play to be associated with biological manifestations of chronic threat, uncertainty, and distress, as assessed by CTRA (Cole, 2019). That is, more distressed gamers showed *embodied* differences (at the molecular level in RNA transcription patterns), with problem play thus not fully explained by societal moral panic views about “addiction” and how young adults should be spending their time (Golub and Lingley, 2008; on this point, also see Snodgrass et al., 2018b).

In the framework being developed here, the co-occurrence of gaming-related distress with altered immune cell gene regulation represents a second form of suffering making up a

potential syndemic. But as in the prior discussion of Study 1 results, we once again need to be careful with describing this suffering as “disease.” The CTRA shows a manifestation of distress in molecular physiology, but this biology serves at best as a precondition for the *development* of disease rather than a direct indicator of a current disease state—that is, the CTRA represents a health vulnerability rather than full-blown disease profile (Cole, 2019).

3.2. Syndemics component 2: social factors; loneliness and problem gaming

Some researchers have argued that problem gaming should be understood as a response to life problems rather than as a meaningful psychiatric diagnostic category (Kardefelt-Winther, 2014; Snodgrass et al., 2014b). Thus, as in other syndemics, social factors would be closely tied to disease and illness experiences. As one example of this, research suggests that lonely individuals in particular go online in order to relieve the negative emotions associated with their felt isolation (Caplan et al., 2009). However, life online can displace offline activities and relationships for vulnerable lonely individuals in particular, potentially subverting and compromising offline relationships, thus compounding rather than relieving their felt isolation (Orleans and Laney, 2000; Turkle, 2012). Not surprisingly, felt loneliness is thus associated with problematic internet use including problem gaming (Moody, 2001; Snodgrass et al., 2018a).

In the present context, our Study 2 showed that loneliness was directly associated with *increased* reports of “disordered” or “addictive” gaming (for this discussion, again see Fig. 1). This was concordant with interview data from that same study, where a slight majority of our interviewees suffering from loneliness reported that videogame play *compounded* rather than relieved their felt isolation (Snodgrass et al., 2018a). However, Study 2’s path analysis also showed how loneliness was associated with greater videogame involvement, and how that involvement in turn was associated in some gamers’ lives with reports of greater social support and in turn with *decreased* experiences of “addictive” gaming. Here, some lonely individuals did seem capable of compensating for their felt isolation via more intensive online videogame involvement, but only when their play allowed them to build meaningful social relations. In the same positive vein, other Study 2 interview respondents spoke of videogames as helping to *alleviate* their life problems—including loneliness—rather than producing or compounding them (Snodgrass et al., 2018a). In those conversations, respondents typically spoke of the social connection they developed with gaming friends and communities, which helped them through problems such as divorce and depression. Some claimed that gaming even helped them to overcome suicidal ideation via their social connection to others, which provided them with a vital lifeline when they most needed it.

In the syndemics framework being developed here, we’d highlight how prior research (conducted by others and ourselves) shows that internet gaming-related suffering is associated with players’ felt social needs (e.g., see Kardefelt-Winther, 2014; Snodgrass et al., 2019c). For certain individuals, gaming might at first feel good (i.e., relieves stress, increases happiness, and so forth), but in some contexts can become compulsive and thus distressful, as players compromise their offline existences in favor of online ones (Snodgrass et al., 2014b). And as we argue elsewhere, some players can come to feel themselves pulled between competing commitments to online and offline worlds, with some coming to

feel like they inhabit two lives simultaneously, an infeasible and thus distressing situation (Snodgrass et al., 2014a). But as Study 2's findings made clear this was not *necessarily* the case. Certain lonely individuals, as impassioned and skillful gamers, found in online play communities the social appreciation and support they otherwise lacked, which protected them from “addictive” patterns of game-play. And it was the *social* context of gaming—i.e., whether gamers managed to successfully connect with other players or not—that played a critical role in shaping the positive as opposed to distressful tenor of online experiences in this context.

3.3. Syndemics component 3: interactions between disease and social context; interacting problem gaming, embodied distress, and social context

New research shows how positive practices can instill resilience to the negative psychobiological responses to stress (Mason et al., 2019), including reduced expression of CTRA indicator genes (Kitayama et al., 2016; Kohrt et al., 2016). Related research has shown a link between experiencing life as meaningful and purposeful—*eudaimonia*—and the same *reduced* expression of CTRA (Fredrickson et al., 2015).

In our Study 3 results presented here, we observed a statistical interaction consistent with a synergistic “rich-get-richer” and “poor-get-poorer” (Kraut et al., 1998; Snodgrass et al., 2018a) relation of eudaimonia to CTRA: Higher *positive involvement* in gaming was associated strongly with reduced CTRA among players with a more eudaimonic experience of life. By contrast, among players with lower eudaimonic *social well-being*, those with higher involvement had substantially *higher* levels of CTRA, suggesting more *compromised* psychosomatic well-being (see Fig. 1).

This finding, we believe, fits with Tsai et. al.'s (2018) emphasis on interaction/synergism as a key theme in syndemics. One possible mechanism for this synergy, prompted by our ethnographic work, would be that among poorly functioning individuals time spent in intensive gaming takes away from their ability to improve their lives, by establishing meaningful connections to offline others, for example (Snodgrass et al., 2011). That compromised psychosocial well-being could in turn increase videogamers' CTRA, which had been found in previous research to be responsive to social and other forms of felt stress and insecurity (Cole, 2019). But such mechanistic speculation cannot be confirmed via the current analysis of this statistical interaction in a cross-sectional observational study.

4. Discussion

In our analysis, we have aimed to illuminate, first, a distinct emerging syndemic. In this case, the experience of social isolation and loneliness combine with new media technologies in the form of networked online gaming to produce newly synergistic forms of mental and physical suffering. Other sociocultural factors, such as U.S. and global definitions of success and failure, hinted at in our Study 1 scales' “achievement” items, undoubtedly contribute to this distinct contemporary syndemic. For example, many gamers aimed to compensate for their perceived offline deficiencies via in-game achievement and success, which could push them into problematic patterns of play, the focus of other work of ours (Snodgrass et al., 2014a).

Second, we have affirmed the fundamental importance of *social* factors in shaping this syndemic. Study 1's systematic analysis of interview and survey data pointed to the deeply sociocultural nature of the experience of distress in this context, highlighting the limitations of purely biomedical "addiction" points of view (see Table 4 in particular) (Nichter, 1981; see also Snodgrass et al. 2017a and 2019c). In Study 2, we highlighted the importance of psychosocial factors such as loneliness in shaping this syndemic (Fig. 1), which, as seen in our Study 3, even manifested at the genomic level (Fig. 2). In regard to Study 3, examining the active expression of RNA in response to environmental distress provided us with a "functional genomic" (Cole, 2019) way of operationalizing how social suffering was "embodied" (Csordas, 1990)—here, in molecular-physiological states such as CTRA—a key component of the syndemics "biosocial" perspective (Singer et al., 2017; Singer and Clair, 2003).

Third, we have emphasized the importance of anthropological mixed methods for understanding syndemics such as the gaming-related one presented in these pages. This included: collaborative ethnography in online and offline contexts (Snodgrass, 2016, 2014); systematic interview analysis to construct culturally sensitive experience measures, which, in the case of gaming, helped clarify how problem play resided along a continuum with more typically pleasurable and engaging gaming experiences (Groleau et al., 2006; Snodgrass, 2018a; Authors, 2019c); field-friendly biomarker techniques such as dried bloodspots (McDade et al., 2007); and molecular markers of stress such as CTRA for assessing immune status, also analyzed along a health continuum (Cole, 2019). We think that similar suites of mixed qualitative-quantitative approaches, founded upon deep ethnography and operationalizations of simpler proxies for complex cultural processes, provide clear roadmaps for assessing syndemic-syndaimonic processes in population-level studies, in ways that remain sensitive to context and community-specific meanings and practices (Singer et al., 2016; Tsai, 2018; Tsai et al., 2017).

Employing methods that better attend to mental and physical health continua has the added benefit of sensitizing syndemics researchers to pre-disease states—including elevated CTRA, a precursor to cardiovascular disease and cancer (Cole, 2019)—rather than thinking only in terms of binary "disease" and "health." That is, by moving the syndemic analysis upstream of diagnosed disease, to encompass the molecular physiological preconditions for disease, researchers and clinicians are better positioned to understand how to avert diseases before they manifest. Thus, in the current case, our methods show how analysis of a syndemic might be integrated with a preventive approach, which could have higher impact than efforts to reverse disease after onset.

Fourth, among videogamers featuring in our Study 3, highly involved individuals with compromised social well-being possessed the most compromised molecular well-being (elevated CTRA) (again, see Fig. 2). That pattern of statistical interaction provided a more nuanced understanding of relationships between problem gaming, embodied distress, and social context. It also gave more evidence for the internet gaming situation described here forming a syndemic, which, as Tsai and his collaborators point out, depends on identifying true synergistic interactions between disease states and social context, an often

underestimated process in syndemics research (Tomori et al., 2018; Tsai, 2018; Tsai and Burns, 2015).

Finally, and fifth, our analysis revealed what we name here “syndaimonics”: interactions between positive states of well-being (engaged gaming, favorable immune profiles) with social context (positive social connection) that can synergistically amplify health and well-being. In our case, this shift in frame to analyzing a syndemic-syndaimonic continuum included thinking about both problematic and positively engaged videogaming, compromised and enhanced immune function, and low to high psychosocial well-being. But beyond the specific context of internet gaming, we can imagine broader applications for the syndemic-syndaimonic continuum we describe. For example, syndemics analyses have shown how drug use, disease, and social context can interact in ways that magnify suffering and health inequities, e.g., when the relationship between intravenous drug use and HIV infection is further strengthened in contexts of economic inequity and social marginality (Rhodes et al., 2005; Singer, 2009; Singer et al., 2017; Singer and Clair, 2003). However, anthropological research shows that alcohol and other substance use, despite the health risks, can be part of a complex of social rituals that promote feelings of intimacy, trust, and belonging in friendship and other social circles (Douglas, 2013; Lende, 2005), and thereby contribute to improved emotional and physical health. In line with our current findings, such salubrious effects would be more likely among persons already enjoying better health, while at the same time having no effect (or even a negative one) among less advantaged persons.

Consider, for example, socially marginalized young people, who resemble individuals and communities featured in foundational syndemics analyses (Singer, 2000; Singer et al., 2006), and who often consume alcohol and drugs in ways and contexts that (whatever their other effects might be) can strengthen positive peer relations among some users (Foster and Spencer, 2013). A *syndaimonics* analysis such as we propose would encourage researchers to examine, for example, how substance use, health, and social context might interact in ways that *reduce* suffering among some of these young people, while *magnifying* it among others. For example, based on findings from the current study, in a homeless or otherwise socioeconomically marginalized population, we would anticipate that more mentally healthy young people—i.e., those already less subject to depression, trauma, and abuse—would be more likely to consume substances in ways that promoted supportive social relations, which could provide protection from stress-related conditions such as high CTRA. At the same time, substance use among the more distressed peers in this population might have destructive effects on them and their relationships. Thus, though having potentially positive benefits for certain users, syndaimonic substance use might nevertheless actually *increase* health inequalities within this marginalized population, just as syndemic forces do, as in the drug use and HIV example referenced above. Again, the statistical interaction we describe is consistent with a synergistic “rich-get-richer” and “poor-get-poorer” health perspective, which has broader significance beyond the internet gaming example that is the focus of the current work (Kraut et al., 1998; Snodgrass et al., 2018a).

This point—the importance of recognizing simultaneous positive and negative synergies—resonates with the concept of *countersyndemics*, i.e., that a social situation or disease state can help protect against other disease (Singer et al., 2017). In our finding here, however,

what prevailed was even stronger than the merely *protective* effects typically glossed by countersyndemics: A eudaimonic state of social well-being was associated not just with high gaming involvement protecting against *adverse* CTRA expression, but actually was connected to involvement having a positive association with *healthy* CTRA expression for some individuals. Again, thinking more generally, attending to such syndaimonic processes would make it more likely that syndemics researchers recognized the positive well-being potential in gaming and substance use among some persons—and, by extension, the positive potential in other common activities that are open to abuse, such as gambling, eating, sex, shopping, and running (Holden, 2001)—rather than *necessarily* treating such activities as invariably problematic health risks and sources of addiction.

5. Conclusion

As social scientists, we applaud any perspective, like syndemics, that frames social processes as inherent—rather than incidental—to health and wellness. Our analysis confirms key themes of prior syndemics work, especially its emphasis on how social context and disease states mutually condition each other, and thus on the limitations of biomedicine's language of disease and comorbidity to fully account for syndemic forms of suffering. We have also described a new syndemic involving experiences of loneliness, internet gaming, and compromised immune function. Throughout, we have emphasized the utility of anthropological mixed methods for understanding emerging health syndemics, alongside the importance of identifying truly *synergistic* interactions between disease and social context. Finally, we have emphasized the importance of attending to *positive* states of improved health and well-being alongside the suffering, perhaps the most novel contribution of the current research, with potential applications beyond the internet gaming activities described here.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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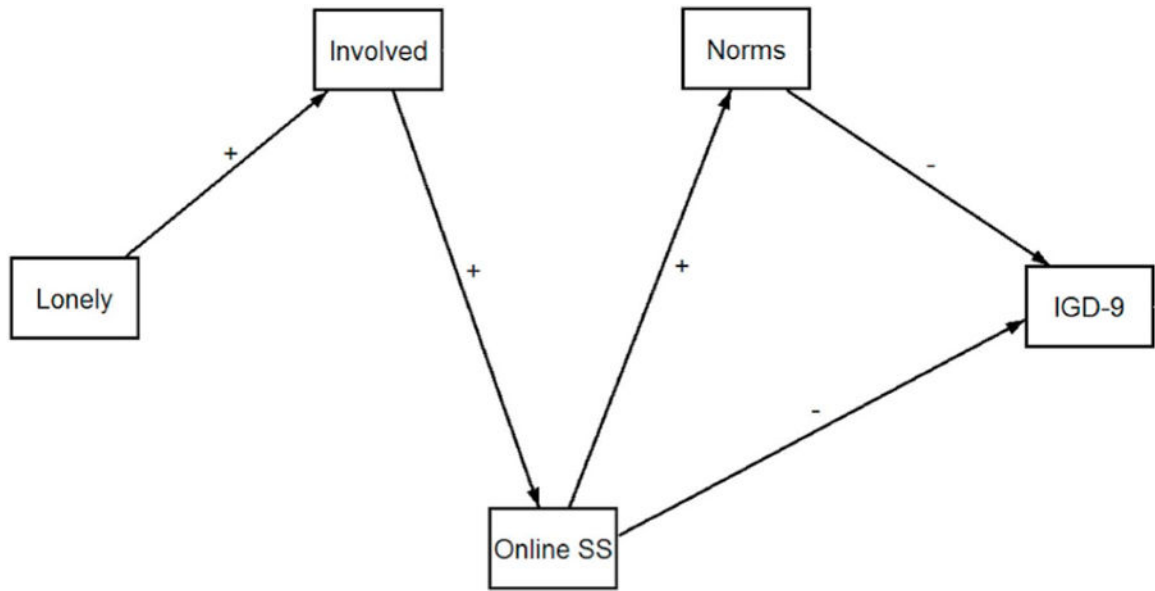


Fig. 1. (Study 2) Lonely gamers’ more highly involved play produces positive social and experiential outcomes and decreased disordered gaming. Adapted from Fig. 1 in Snodgrass et al. 2018a.

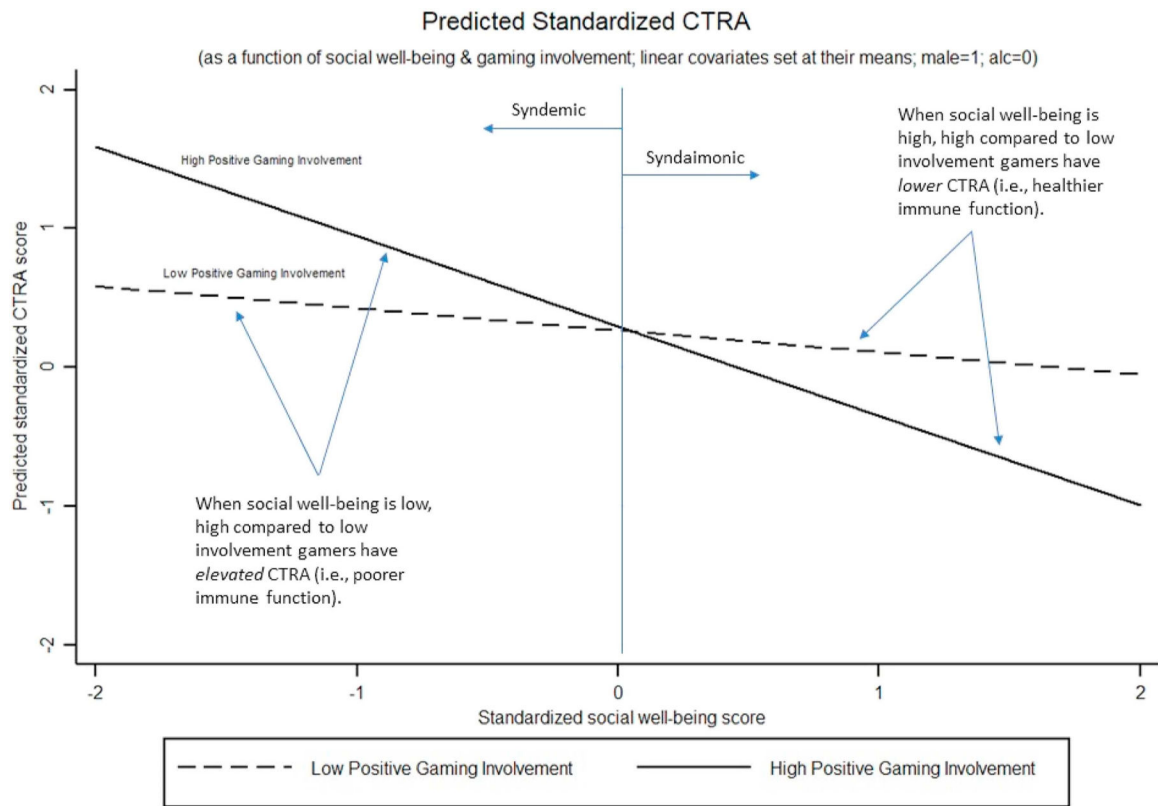


Fig. 2. (Study 3) A syndemic-syndaimonic continuum: Predicted value of CTRA (adversity) as a function of social well-being and positively involved gaming in interaction with each other.

Table 1

Research considered in the current analysis.

Study #	Support	Methods	Findings	References
Study 1	Tables 2–4	Participant-observation; cultural psychiatric interviews; online survey; cultural consensus analysis	Construction of culturally-meaningful scales for assessing online gaming involvement and its positive and negative consequences	Snodgrass et al. (2017a)
Study 2	Fig. 1	Path analysis of online survey data; further support from ethnographic interviews	Trace relationships between loneliness, videogame involvement, and problem gaming	Snodgrass et al. (2018a)
Study 3	Fig. 2	Regression analysis; gene expression “transcriptome” (RNA) analysis	Identify relationships between psychosocial well-being, videogame involvement, and the “conserved transcriptional response to adversity” (CTRA)	Snodgrass et al. (2019a)

Table 2

(Study 1) Descriptive statistics for online gaming involvement survey items. Adapted from Table 1 in Snodgrass et al. 2017a.

Item	Descriptor	% Responding "Agree"	Answer Key
1	Time and energy	97.3	Agree
2	Way of life	69.2	Agree
3	Gaming like work	77.7	Agree
4	Play when tired	79.5	Agree
5	Preoccupation	87.8	Agree
6	Prefer gaming	89.6	Agree
7	In-game focus	51.2	Agree
8	Lose track of time	81.3	Agree
9	Escape	85.6	Agree
10	Improvement	93.3	Agree
11	Research	95.2	Agree
12	Need to succeed	63.2	Agree
13	Team/community	89.7	Agree
14	Help online friends	88.5	Agree
15	Connection	78	Agree
Average	Items 1–15	81.8	Agree

Table 3

(Study 1) Descriptive statistics for online gaming positive consequences survey items.
Adapted from Table 2 in Snodgrass et al. 2017a.

Item	Descriptor	% Responding "Agree"	Answer Key
16	Positive anticipation	93.3	Agree
17	Mood improvement	84.8	Agree
18	Life focus and purpose	66.5	Agree
19	Adrenaline and energy rushes	95.8	Agree
20	Positive testing of limits	34	Disagree
21	Calm and controlled	94.9	Agree
22	Positive routine	57.7	Agree
23	Testing limits	94.5	Agree
24	Enjoyable repetition	76.8	Agree
25	Preferred hobby	89.7	Agree
26	Positive distraction	82	Agree
27	Growth and evolution	96.6	Agree
28	Social connection	78	Agree
29	Expanded POV	82.1	Agree
30	Social belonging	86.8	Agree
31	Positive anonymity	49.4	Agree
32	Strengthened relationships	78	Agree
33	Positive social obligation	85.1	Agree
34	Satisfying labor	95.7	Agree
35	Increased confidence	66.8	Agree
36	Career and life advancement	73.7	Agree
Average	Items 16–36	79.2	Agree

Table 4

(Study 1) Descriptive statistics for online gaming negative consequences survey items.
Adapted from Table 3 in Snodgrass et al. 2017a.

Item	Descriptor	% Responding "Agree"	Answer Key
37 ^a	Negative cognitive salience	47	Disagree
38	Mood deterioration	74.7	Agree
39 ^a	Regret	43	Disagree
40	Draining	59.4	Agree
41	Push selves too far	46.9	Disagree
42 ^a	Withdrawal	36.6	Disagree
43 ^a	Bad habit/play despite problems	36.6	Disagree
44 ^a	Loss of control/relapse	48.5	Disagree
45	Boring routine	55.1	Agree
46 ^a	Loss of interest in other activities	33.6	Disagree
47 ^a	Avoidance/mood modification	48.9	Disagree
48 ^a	Tolerance	24.1	Disagree
49	Social isolation	37.5	Disagree
50	Need for social approval	35.9	Disagree
51	Toxic community	59	Agree
52	Negative anonymity	65.3	Agree
53 ^a	Conflict	31	Disagree
54	Negative social obligation	36.6	Disagree
55	Draining job	16.7	Disagree
56	Loss of confidence	63.4	Agree
57	Perceived failure	48.4	Disagree
Average	Items 37–57	45.2	Disagree

^aVersions of commonly used internet gaming disorder items.