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Technology-enabled subcultures among Chinese youths: smartphone addiction, virtual social capital, and ACGN addiction

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Abstract: The anime, comics, video games, and novels (ACGN) subculture is the most popular subculture among Chinese youths. Also known as *Erciyuan* culture in China, youths use technology to participate in this subculture, primarily consuming ACGN content via their smartphones. There is an increasing trend of addiction to smartphones and to the ACGN subculture among Chinese youths. Using social capital theory and drawing on survey data from Chinese ACGN fans, this paper examines the mechanisms underlying smartphone and ACGN subculture addiction using a moderated mediation model. The findings reveal that smartphone addiction is positively related to ACGN content addiction. Bridging and bonding social capital mediate this relationship, whereas perceived stigma of participation in the ACGN subculture moderates it. The implications of the findings regarding participation in technology-enabled Chinese subcultures are also discussed.

Keywords: subculture; addiction; social capital; stigma; Chinese youths.

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1 Introduction

The anime, comics, video games, and novels (ACGN) genre, which is popular in many East Asian societies, originated in Japan (Sun, 2018). The introduction of the ACGN genre to China can be traced back to the 1980s, when TV sets started to become increasingly commonplace and demand for TV content, especially content suitable for children, increased correspondingly. The Chinese TV industry could not keep up with the demand for such content, resulting in the introduction of Japanese anime to broadcast TV programs. Japanese comics (e.g., *Dragonball* and *Doraemon*) and games were introduced along with anime, resulting in the development of China's ACGN subculture.

The ACGN content genre is also known in Chinese as *Erciyuan*, which literally translates to 'two-dimensional space' and refers to the imaginary world of ACGN content (as opposed to the real and physical three-dimensional world). The ACGN subculture is very popular among Chinese youths; according to iResearch (2019), the number of *Erciyuan* fans reached 345 million in 2019. The line between subculture and mainstream culture is not demarcated by audience numbers; rather, this distinction is based on the social and cultural norms within a society. Subcultures consist of shared values and cultural practices that may not only be distinct from but even oppose those of the dominant cultures (Blackman, 2014). Shared values and cultural practices develop within a subculture's community. The ACGN subculture among the community of Chinese youths is a contemporary youth culture that is characterised by lifestyle and consumption choices (Shildrick and MacDonald, 2006).

As smartphones became increasingly affordable and major ACGN content-sharing platforms such as *Bilibili* and *Acfun* rose to prominence, TV lost its position as the dominant source of ACGN content. Almost 80% of Chinese ACGN fans now use a smartphone as their main device for accessing ACGN content (iResearch, 2019). In addition to increasing accessibility, smartphone and video-sharing applications have significantly contributed to the development of ACGN as a subculture in China by providing a temporal virtual space for engagement with ACGN content and participation in related activities with other members of the ACGN subculture (Chen, 2021).

Heavy consumption of ACGN content, however, can result in addiction. Heavy ACGN consumers, also called *otaku*, are commonly viewed as social misfits and are stigmatised (Azuma, 2009). In the Chinese context, smartphone addiction is an increasingly serious social problem (Jiang et al., 2018). Smartphones are the dominant means of both consuming ACGN content and partaking in activities in the Chinese ACGN subculture community. However, little is known about the relationship between smartphone addiction and addiction to ACGN content. This paper draws on social capital theory to examine this relationship among Chinese youths, positing bridging and bonding

social capital as a mediation pathway between smartphone addiction and addiction to ACGN content. In addition, given that addiction to ACGN content is stigmatised, we also posit a moderating effect of perceived stigma on smartphone addiction and addiction to ACGN content. In the next section, we focus on virtual communities in our review of the literature on social capital theory, as well as the literature on smartphone addiction, addiction to ACGN content, and stigma. Our main research question is as follows: "what is the mechanism underlying ACGN content addiction in China?"

2 Literature review

2.1 From smartphone addiction to ACGN content addiction: technology-enabled subcultures in China

Smartphone addiction among ACGN fans is closely linked to ACGN content addiction. By 'addiction', we mean impulsive, difficult-to-control behaviour that does not involve physical intoxicants such as drugs or alcohol and is more similar to pathological gambling or lying (Park and Lee, 2011). Studies have shown that self-control is an antecedent to mobile phone addiction (Khang et al., 2012). Smartphone addiction is associated with a number of problems, such as personal insecurity, anxiety, loneliness, depression, and low self-esteem (Kim et al., 2017; Kim and Koh, 2018). Smartphone addiction has become a serious social problem globally (Lin et al., 2017), and China is not immune to this issue (Jiang et al., 2018). According to the 48th statistical report on China's internet development, which was made public in June 2021, smartphones are the predominant devices used to access the internet. Of internet users, 15.7%, or 158 million people, are teenagers aged six to 19 years, and 92.2% of these individuals use a smartphone as their primary device for web surfing (China Internet Network Information Center, 2021). Online ACGN platforms such as *Bilibili* have attracted 267.2 million monthly active users (MAUs) and 249.9 million mobile MAUs, which accounts for 93.5% of the total number of MAUs (Bilibili Inc., 2021). That being said, mobile devices are the primary channel through which ACGN fans consume content. In turn, the methods of content consumption have also shaped the ACGN culture and fandom identity in China (Lin, 2016; Yin and Xie, 2018). Consequently, ACGN fans who are addicted to their smartphones are likely to immerse themselves in virtual culture and thus become addicted to this culture as well. Therefore, we propose the following research hypothesis:

H1 Smartphone addiction is positively related to ACGN content addiction.

2.2 The moderating effect of stigma on ACGN addiction

Heavy consumers of ACGN content have long been disparaged. The use of the derisive Japanese term *otaku* to ridicule those who consume ACGN content excessively at home and become socially awkward dates to 1981 (Morikawa, 2012). The term *otaku* entered the Chinese language as the loanword *yuzhai* around 2000 and was subsequently superseded by the term *zhai-nan* or *zhai* around 2005 to 2006 (Yueh, 2019). ACGN fans are often viewed as immature or juvenile and as participating in low-culture pursuits (Peeples et al., 2018). In the Chinese context, as in the Japanese context, the term *zhai* is a social stigma that ostracises heavy consumers of ACGN content from the broader

society (Yue and Li, 2021). Stigma is rooted in the identification and labelling of human differences, the association of differences with negative attributes, the establishment of a distinction between 'us' and 'them' on the basis of these differences, and subsequent discrimination against 'them' (Link and Phelan, 2001). Although the literature suggests pervasive negative social stereotyping of the effects of excessive consumption of ACGN content, to the best of our knowledge, little is known about how ACGN fans' perception of this stigma moderates their ACGN content consumption, especially among users who are also addicted to their smartphones. Therefore, we propose the following research hypothesis:

H2 Perceived stigma moderates the relationship between smartphone addiction and ACGN content addiction.

2.3 Smartphone addiction and ACGN addiction through the lens of virtual social capital

Social capital theory considers the relationships among individuals as resources that individuals can leverage to achieve productive outcomes. There is no authoritative definition of social capital, with various definitions being used in various fields (Adler and Kwon, 2002). The term has been defined as "the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition" [Bourdieu and Wacquant, (1992), p.14]. Other scholars emphasise social connections and the reciprocal norms associated with such connections (Putnam, 2000). However, most theoretical and empirical work on social capital generally considers social capital as an adhesive that strengthens the social bonds among individuals and groups (Coleman, 1998).

Scholars have argued that social capital yields societal benefits, such as improved public health outcomes, greater efficiency in financial markets, and reduced crime (Adler and Kwon, 2002). Communities that are deficient in social capital are more likely to experience societal disorder and mistrust alongside reduced civic consciousness, while an abundance of social capital increases community commitment and spurs collective action that benefits the entire community (Ellison et al., 2007). At the individual level, possession of social capital allows a person to access resources, such as useful information and personal connections, within their social circle (Paxton, 1999). Personal connections also increase subjective psychological well-being and are associated with, for example, increased life satisfaction (Helliwell and Putnam, 2004).

As is the case with 'social capital', there is no authoritative definition of a 'virtual community'. With the proliferation of technology, virtual communities have become important sites for social activities (Williams, 2006). However, there is consensus that a distinctive feature of virtual communities is that participation is mediated by technology and digital communication networks (Blanchard and Horan, 1998; Jones, 2006). Work on virtual communities from a social capital perspective, broadly speaking, has examined either member-generated content, focusing on communication and information-sharing in these communities (Hagel and Armstrong, 1997) or how relationships can be cultivated (Tomai et al., 2010). Among the various theoretical components of social capital theory, the concepts of bridging and bonding social capital have received significant attention in studies of virtual communities. According to Putnam (2000), bridging social capital is

salient in relationship networks that are more heterogeneous in nature, while bonding social capital is more characteristic of relationship networks that have a more homogeneous nature. In other words, bridging social capital refers to weak ties, such as those between the individual and their acquaintances and colleagues, while bonding social capital refers to strong ties or close relationships, such as those connecting the individual to family and close friends (Putnam, 2000). Although conceptually distinct, in practice, these two concepts are more like two ends of a continuum than dichotomous groups (Norris, 2002).

Like traditional offline social capital, social capital in virtual communities is based on trust, norms of reciprocity, and identification (Kirkwood, 2016). Although some early internet researchers adopted a dystopian perspective on the relationship between internet use and social capital, many later researchers have adopted the opposite position, arguing that internet use has positive effects on social capital (Hofer and Aubert, 2013). Computer-mediated social networks, including virtual communities, exhibit both bridging and bonding social capital. In virtual communities, social identity cues such as gender, race, and socio-economic status are often not readily visible, thus increasing bridging capital by reducing the barriers to connecting to networks comprised of members with different social identities (Norris, 2002). In addition, because barriers of entry and exit to virtual communities are often low, virtual communities can offer increased bonding social capital, as members who choose to remain in the community are likely to share beliefs and interests (Norris, 2002).

Prior research has stressed the importance of information and communication technologies (ICTs) in facilitating social connections (Norris, 2003; Srivastava, 2005). However, smartphone addiction weakens an individual's connection with family, close friends, and relatives (Mahmud et al., 2020) and thus reduces social capital acquisition (Gergen, 2008; Yang et al., 2016). In contrast, some scholars argue that smartphone addiction might also have positive effects such as helping young people cope with the outside world by relieving depression, boredom, and irritability (Sansone and Sansone, 2013; Thomée, 2018). This is probably because smart devices can provide amusement, reduce pain, and ultimately provide an escape from the real world (Ting and Chen, 2020). Some researchers have also found that addiction to smartphone can be conducive to the accumulation of social capital because such compulsive behaviour in using smartphone is often associated with greater communicative behaviour to meet social needs (Bian and Leung, 2015).

Furthermore, research in fan studies has found that the consumption of popular culture content through media increases one's perception of belonging to the fan community (Tsay-Vogel and Sanders, 2017). Therefore, for ACGN fans who are addicted to smartphone, they are likely to both consume impulsively ACGN content and participate actively on ACGN-centric platforms such as *Acfun* and *Bilibili* to meet their social needs, which in turn increases their perception of belonging to the virtual ACGN community. From a social capital perspective, addiction to smartphone potentially increases both bridging and bonding social capital in the virtual ACGN community because an increased sense of belonging to the community can increase the sense of connectedness.. Therefore, we propose the following research hypotheses:

H3 Smartphone addiction is positively associated with virtual bridging social capital (H3a) and bonding social capital (H3b).

Among the various virtual ACGN communities in China, the largest by far is *Bilibili*, which was founded in 2009. *Bilibili* is a video-sharing platform that hosts user-generated ACGN content. By the time of its initial public offering on the Nasdaq in 2018, its MAUs numbered over 70 million, of which more than 80% were Generation Z users born between 1990 and 2009 (Chen, 2021). Most of the content uploaded to *Bilibili* consists of ACGN-related videos, either anime bought by the platform or user-generated collages such as vlogs, video remixes, and trailers. As the platform grows, more content is being collated and user numbers are soaring, making the platform akin to an ACGN version of YouTube.

In addition, *Bilibili* encourages users to contribute to the community, not only by producing videos but also by video comments, *danmaku*[1] and regular offline activities such as annual ACGN carnivals. While watching content on *Bilibili* is free, community participation, such as uploading content and commenting, is limited to registered members. To become a registered member with access to community participation features, a user has to pass a 100-question membership test that assesses their knowledge of both the ACGN culture and the *Bilibili* platform's etiquette and practices (Chen, 2021). After passing the test, ACGN fans are able to upload content and input *danmaku*. The continuous horizontal movement of the *danmaku* comments can be distracting and annoying, but, as a unique culture within the *Bilibili* community, *danmaku* characterises the idiosyncracies of the community and makes interaction between content producers and their audiences more synchronous and virtually connected (Chen et al., 2017). Stronger social connections with others in Chinese ACGN communities can strengthen an individual's virtual social capital in these communities and can result in addiction to ACGN content. Prior research has found that creating and sharing YouTube content exacerbates addiction to such content (Balakrishnan and Griffiths, 2017). Parasocial relationships, which are perceived relationships with real or fictional characters formed through consumption of media featuring these characters, are associated with addiction to YouTube content consumption (de Bérail et al., 2019). Collectively, these findings suggest that ACGN fans who are highly active on content-sharing platforms can become addicted to ACGN content on these platforms. The risk of addiction is especially pronounced on major Chinese ACGN platforms such as *Acfun* and *Bilibili*, which have features that can significantly increase an individual's sense of belonging to the ACGN virtual community. Therefore, we propose the following research hypotheses:

H4 Bridging social capital (H4a) and bonding social capital (H4b) are positively associated with addiction to ACGN content.

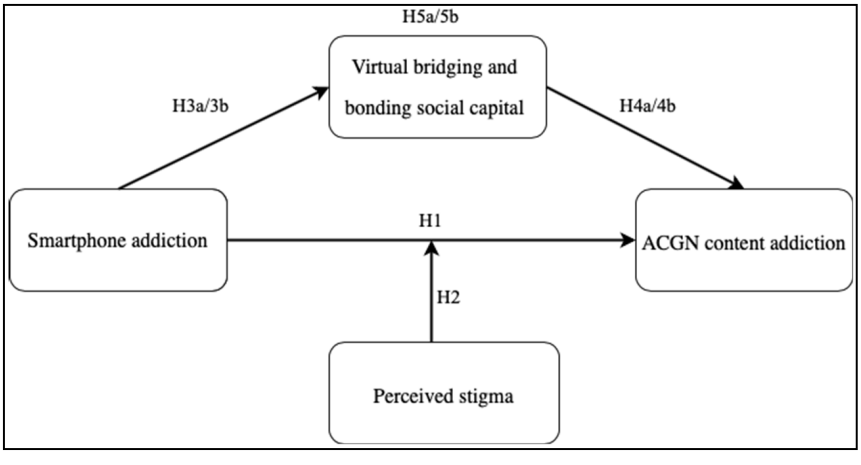
The literature provides some support for a potential link between addiction to smartphones and addiction to ACGN content consumption. However, what is less clear is the underlying mechanism through which addiction to smartphones is associated with addiction to ACGN content. This lack of clarity is because an ACGN fan who is a smartphone addict may not necessarily be an ACGN content addict. Social capital in virtual communities provides a plausible pathway linking smartphone and ACGN content addiction. As discussed above, the literature supports the existence of a relationship between mobile phone addiction and social capital, as well as a potential relationship between social capital and ACGN content consumption. Overall, relevant literature suggests that social capital may mediate the relationship between addiction to smartphones and addiction to ACGN content consumption for Chinese ACGN fans. Smartphones can increase bridging and bonding social capital because fans who are

addicted to ACGN content increase their activity and participation on ACGN platforms such as *Bilibili* and *Acfun*. In turn, the increased social capital they attain through doing so in turn exacerbates their addiction to ACGN content because of the increased amount of content they consume through their active participation on ACGN platforms. Therefore, we propose the following research hypotheses to examine the mediating effect of social capital on the relationship between smartphone and ACGN content addiction:

H5 Bridging social capital (H5a) and bonding social capital (H5b) mediate the relationship between smartphone addiction and ACGN content addiction.

We summarise our hypotheses to produce a single moderated mediation research model, which is presented in Figure 1.

Figure 1 The theoretical model



3 Methods

3.1 Sample

This study employed a questionnaire to collect data. The survey introduction first defined the ACGN subculture and then asked respondents to indicate whether they were ACGN fans in order to screen out non-ACGN fans. Only those who reported that they were ACGN fans were allowed to continue with the survey. Participants were recruited through major Chinese social media platforms, such as WeChat and Weibo, and an online survey company from December 2019 to July 2020. In total, 453 ACGN fans completed the questionnaire. After invalid responses were removed, the final sample consisted of 447 valid responses.

Measured variables include smartphone addiction, virtual social capital, perceived stigma, and ACGN content addiction. The variables were measured using five-point Likert scales. The final part of the questionnaire addressed demographic variables. Gender, age, and education level were selected as control variables. The sample was analysed descriptively using SPSS 24.0, the reliability and validity of the measurement

concepts were tested (see Table 2 for the confirmatory factor analysis), and the hypotheses were tested using the PROCESS plug-in for SPSS.

3.2 Measurement

3.2.1 Smartphone addiction

This study assessed the extent to which ACGN fans are addicted to mobile devices using a questionnaire adapted from Leung (2008). Participants responded to the following statements using a five-point Likert scale (1 = strongly disagree; 5 = strongly agree): "missing planned work due to smartphone usage"; "having a hard time concentrating in class while doing assignments or while working due to smartphone use"; "feeling pain in the wrists or at the back of the neck while using a smartphone"; "won't be able to stand not having a smartphone"; "feeling impatient and fretful when I am not holding my smartphone"; "having my smartphone in my mind even when I am not using it"; "I will never give up using my smartphone even when my daily life is already greatly affected by it"; "constantly checking my smartphone so as not to miss conversations between other people on Twitter, Facebook, or WeChat"; "using my smartphone longer than I had intended to"; and "the people around me tell me that I use my smartphone too much." The reliability coefficient, Cronbach's alpha, was 0.88, and the Kaiser-Meyer-Olkin (KMO) index was 0.89.

3.2.2 ACGN content addiction

ACGN content addiction refers to the extent to which ACGN fans are addicted to the ACGN virtual world. Because there is no established scale for this variable, this study drew on previous theoretical discussions on ACGN as an imagined utopia (Lin, 2016) and a heterotopia (Chen, 2021) that provides an escape from reality. Participants responded to the following statements using a five-point Likert scale (1 = strongly disagree and 5 = strongly agree): "I want to get away from the real world and go to the two-dimensional space"; "relative to the two-dimensional space, my life is monotonous and boring"; "I feel like I live in a world of dissatisfaction"; "I think the two-dimensional space is better than the real one"; "I look at my real life through the eyes of a two-dimensional space"; "I often express my opinions in the language of the two-dimensional space"; "I think two-dimensional culture can convey deep ideas better than other cultures"; "I think two-dimensional cultures can convey cutting-edge thinking better than other cultures"; "when I'm in trouble, the two-dimensional space can give me moral support"; and "when I'm in trouble, the two-dimensional space can give me solutions to my problems." The reliability coefficient, Cronbach's alpha, was 0.87, and the KMO index was 0.86.

3.2.3 Virtual bridging and bonding social capital

Bridging and bonding social capital were measured using statements adapted from Ellison et al. (2007). Participants responded to the following statements using a five-point Likert scale (1 = strongly disagree and 5 = strongly agree): "I feel I am part of the two-dimensional community"; "I am interested in what goes on in the two-dimensional community"; "the two-dimensional space is a good place to be"; "I would be willing to contribute money to the two-dimensional space"; "interacting with people in the

two-dimensional space makes me want to try new things"; "interacting with people in the two-dimensional space makes me feel like a part of a larger community"; "I am willing to spend time to support general two-dimensional space activities"; "in the two-dimensional space, I come into contact with new people all the time"; "interacting with people in the two-dimensional community reminds me that everyone in the world is connected"; "there are several people in the two-dimensional community I trust to solve my problems"; "if I need an emergency loan, I know someone in the two-dimensional community I can turn to"; "there is someone in the two-dimensional community I can turn to for advice about making important decisions"; "the people I interact with in the two-dimensional community would be good job references for me"; and "I do not know people in the two-dimensional community well enough to ask them to do anything important" (reversed). The first nine items relate to bridging social capital (Cronbach's alpha = 0.94), and the last five items to bonding social capital (Cronbach's alpha = 0.83).

3.2.4 Perceived stigma

Goffman (2009, p.8) defines stigma as "an attribute that is deeply discrediting." ACGN fans are "discredited generally as [having] … poor interpersonal skills, [a] lack of intelligence and [a] lack of self-esteem", which thus leads to "fanboys and fangirls also commonly making … self-derogatory or self-effacing comments about themselves" [Lopes, (2006), p.406]. This study assessed the extent to which ACGN subculture is perceived as stigmatised by ACGN fans using eight five-point Likert scale items (1 = strongly disagree and 5 = strongly agree): "if I watch *fanju* [a Japanese anime TV series], people will think I am childish"; "I think very few people fall in love with geeky guys"; "if people know I am a homebody, it will lower their opinion of me"; "I do not dare to participate in two-dimensional-related activities, lest people suspect I am a geek"; "I avoid watching and talking about two-dimensional cultures in public"; "being geeky will have negative impacts on making friends or maintaining friendships with others"; "two-dimensional hobbies will negatively impact communication with my family"; and "I avoid awkward scenarios that arise from my being a geek." The reliability coefficient, Cronbach's alpha, was 0.86, and the KMO index was 0.88.

4 Data analysis and results

4.1 Descriptive analyses

Gender, age, and education were included as control variables in the model. The gender distribution was 305 males and 148 females (male = 67.3%; female = 32.7%), and the age distribution was predominantly between 14 and 26 years (90.4%). It should be noted that we treated as missing values the ages of respondents who reported the implausible values of 0, 4, 88, and 188 years. Of the respondents, 91 (20.1%) had less than a high school education, 301 (66.4%) had an undergraduate degree, 38 (8.4%) had a master's or doctoral degree, and 23 (5.1%) had another type of education level. Before conducting hypothesis testing, we carried out a confirmatory factor analysis to test the reliability and validity of our constructs. The results showed that the reliabilities, convergent validities, and discriminant validities of our constructs were more than acceptable (see Table 1 and Table 2).

Table 1 Mean, standard deviation, correlation analysis

	M	*SD*	*Sma*	*ACGNca*	*Brsc*	*Bosc*	*Pes*
Gender	1.33	0.470					
Age	21.80	9.35					
Education	1.98	0.70					

Notes: *p < 0.05, **p < 0.01; smartphone addiction = Sma; ACGN content addiction = ACGNca; bridging social capital = Brsc; bonding social capital = Bosc; perceived stigma = Pes.

Table 1 Mean, standard deviation, correlation analysis (continued)

	M	*SD*	*Sma*	*ACGNca*	*Brsc*	*Bosc*	*Pes*
Sma	3.13	0.86	1				
ACGNca	2.50	0.79	0.19	1			
Brsc	2.92	0.91	0.13	0.41	1		
Bosc	2.71	0.78	0.13	0.37	0.78	1	
Pes	2.49	0.80	0.25	0.10	–0.11	–0.08	1

Notes: *p < 0.05, **p < 0.01; smartphone addiction = Sma; ACGN content addiction = ACGNca; bridging social capital = Brsc; bonding social capital = Bosc; perceived stigma = Pes.

Table 2 Confirmative factor analysis (CFA)

CFA	*Variables*				
	1	*2*	*3*	*4*	*5*
	Smartphone addiction	*ACGN content addiction*	*Virtual bridging social capital*	*Virtual bonding social capital*	*Perceived stigma*
CR	0.885	0.878	0.953	0.872	0.869
AVE	0.437	0.427	0.693	0.605	0.459
Square root of AVE	0.661	0.653	0.832	0.778	0.677
MSV	0.063	0.168	0.608	0.608	0.004
ASV	0.033	0.088	0.201	0.192	0.023

Notes: CR: composite reliability; AVE: average variance extracted; MSV: maximum shared variance; ASV: average shared variance. Acceptable reliability means CR > 0.7 acceptable convergent validities indicate that the following criteria were met: for each construct

a the composite reliability was greater than 0.50
b the square root of AVE was larger than 0.50
c the composite reliability was larger than AVE; an acceptable discriminant validity for each construct means that the AVE was greater than MSV and the ASV.

4.2 Hypothesis testing

SPSS 24.0 and the PROCESS macro (models 4 and 5) were employed to test the research hypotheses presented in this paper. First, model 4 tested the direct relationships between smartphone addiction and ACGN content addiction (H1), smartphone addiction and

bridging social capital (H3a) and bonding social capital (H3b), and bridging social capital (H4a) and bonding social capital (H4b) and ACGN content addiction. Second, model 5 tested the mediating effects of bridging social capital (H5a) and bonding social capital (H5b) on the relationship between smartphone addiction and ACGN content addiction and the moderating effects of perceived stigma (H2) on the relationship between smartphone addiction and ACGN content addiction.

Given the exploratory nature of the study, we did not conduct an a priori power analysis. A sensitivity power analysis (Faul et al., 2007) was conducted after participants had been recruited. It showed that 434 participants would make a linear regression model with nine predictors sensitive to an effect size of 0.036 ($\alpha = 0.05$, power = 0.80), which is marginally above Cohen's (1987) suggested value for a small effect size.

Table 3 Mediation of virtual social capital

N = 443	*Bridging social capital*			*ACGN content addiction*		
	B	*SE*	*t*	*B*	*SE*	*t*
Gender	0.36***	0.09	3.97	–0.10	0.07	–1.29
Age	–0.01	0.01	–1.00	–0.01	0.01	–0.70
Education	0.02	0.06	–0.25	0.04	0.05	0.78
Smartphone addiction	*0.14***	0.05	2.84	*0.12***	0.04	3.04
Bridging social capital				*0.35****	0.04	9.07
R^2 (F)	0.057*** (6.67)			0.190*** (20.68)		
Indirect effect	*Effect*		*Boot SE*		*95% Boot CI*	
Smartphone addiction – bridging social capital – ACGN content addiction	0.05		0.02		(0.0105, 0.0869)	
N = 443	*Bonding social capital*			*ACGN content addiction*		
	B	*SE*	*t*	*B*	*SE*	*t*
Gender	0.35***	0.08	4.52	–0.09	0.07	–1.29
Age	–0.01	0.01	–1.05	–0.01	0.01	–0.71
Education	0.02	0.05	0.31	0.03	0.05	0.54
Smartphone addiction	*0.12***	0.04	2.82	*0.13***	0.04	3.12
Bonding social capital				*0.37****	0.05	7.95
R^2 (F)	0.07*** (7.82)			0.16*** (16.70)		
Indirect effect	*Effect*		*Boot SE*		*95% Boot CI*	
Smartphone addiction – bonding social capital – ACGN content addiction	0.04		0.02		(0.0070, 0.0844)	

Notes: *p < 0.05, **p < 0.01, ***p < 0.001. All the β coefficients listed in the table and the paper are the standardised β.

Model 4 (a simple mediation model) was chosen to test the mediating effects of bridging and bonding social capital on the relationship between smartphone addiction and ACGN content addiction while controlling for gender, age, and education level. The results (Table 3) showed that smartphone addiction was positively related to ACGN content

addiction (B = 0.12, SE = 0.04, p < 0.01; B = 0.13, SE = 0.04, p < 0.01); H1 was supported. Smartphone addiction was positively associated with bridging social capital (B = 0.14, SE = 0.05, p < 0.01) and bonding social capital (B = 0.12, SE = 0.04, p < 0.01), supporting H3a and H3b. Bridging social capital (B = 0.35, SE = 0.04, p < 0.001) and bonding social capital (B = 0.37, SE = 0.05, p < 0.001) were positively related to ACGN content addiction, with support for H4a and H4b. The relationship between smartphone addiction and ACGN content addiction was mediated by bridging social capital (B = 0.05, SE = 0.02, 95% CI = 0.0105 to 0.0869) and bonding social capital (B = 0.04, SE = 0.02, 95% CI = 0.0070 to 0.0844), with H5a and H5b supported.

Table 4 The moderated mediation model of the obsession with the 'two-dimensional world'

N = 443	*ACGN content addiction*				*ACGN content addiction*			
	B	*SE*	*95% CI*		*B*	*SE*	*95% CI*	
Gender	–0.04	0.08	–0.1911	0.1075	–0.05	0.08	–0.2064	0.1006
Age	–0.01	0.01	–0.0102	0.0042	–0.01	0.01	–0.0104	0.0043
Education	0.05	0.05	–0.0498	0.1430	0.04	0.05	–0.0617	0.1354
Smartphone addiction	0.11*	0.04	0.0253	0.1890	0.12**	0.04	0.0361	0.2029
Perceived stigma	0.09*	0.05	0.0024	0.1853	0.07	0.05	–0.0238	0.1625
Bridging social capital	0.36***	0.03	0.2818	0.4323				
Bridging social capital * perceived stigma	0.12**	0.05	0.0338	0.2129				
Bonding social capital					0.37***	0.05	0.2795	0.4594
Bonding social capital * perceived stigma					0.13**	0.05	0.0364	0.2194
Indirect effects	*Effect*	*Boot SE*	*95% boot CI*		*Effect*	*Boot SE*	*95% boot CI*	
Smartphone addiction – bridging social capital – ACGN content addiction	0.05	0.02	0.0103	0.0890				
Smartphone addiction – bonding social capital – ACGN content addiction					0.04	0.02	0.0068	0.0825
R^2 (F)	0.21 (17.15)				0.18 (13.8363)			

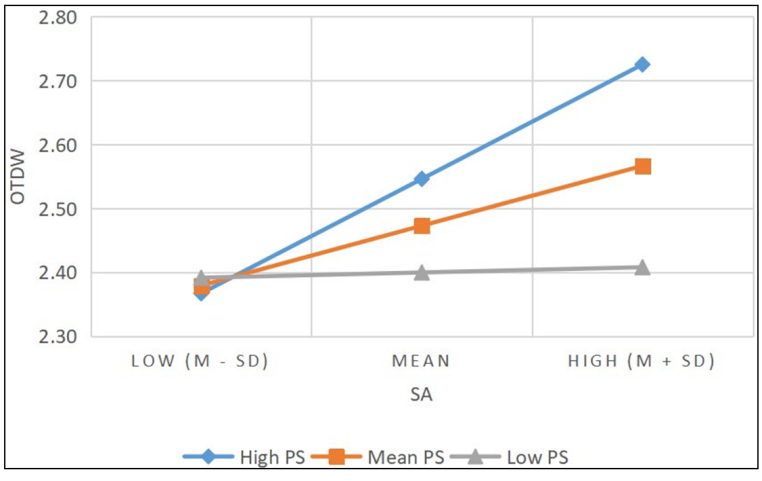
Notes: *p < 0.05, **p < 0.01, ***p < 0.001. All the β coefficients listed in the table and the paper are the standardised β.

Model 5 (a moderated mediation model) was used to test the mediating effects of bridging social capital and bonding social capital on the relationship between smartphone addiction and ACGN content addiction, as well as the moderating effects of perceived

stigma on smartphone addiction and ACGN content addiction, while controlling for gender, age, and education level (Table 4). The first moderated mediation model showed that the effect of smartphone addiction on ACGN content addiction was mediated by bridging social capital (B = 0.05, SE = 0.02, 95% CI = 0.0103 to 0.0890) and moderated by perceived stigma (B = 0.12, SE = 0.05, 95% CI = 0.0338 to 0.2129). The second moderated mediation model showed that the effect of smartphone addiction on ACGN content addiction was mediated by bonding social capital (B = 0.04, SE = 0.02, 95% CI = 0.0068 to 0.0825) and moderated by perceived stigma (B = 0.13, SE = 0.05, 95% CI = 0.0364 to 0.2194). Thus, H2 was supported.

The moderating effect in Figure 2 shows that for ACGN fans with high stigma perception, the positive effect of smartphone addiction on ACGN content addiction was greatest. For ACGN fans with medium stigma perception, the positive effect of smartphone addiction on ACGN content addiction was moderate. For ACGN fans with low stigma perception, the positive effect of smartphone addiction on ACGN content addiction was minimal.

Figure 2 The moderating effect of perceived stigma on ACGN content addiction (see online version for colours)



5 Discussion

By examining the mechanisms underlying smartphone and ACGN content addiction and how the relationship between these two phenomena is moderated by perceptions of stigma in the Chinese context, this study contributes to a better understanding of how electronic and digital media intersect with fandom and popular culture in a non-Western context. The use of electronic and digital media and fan consumption of popular culture can have negative consequences, such as addiction. To the best of our knowledge, our study is the first to examine how these negative consequences are related and the mechanisms underlying the relationship.

Unsurprisingly, we found that smartphone addiction is positively associated with ACGN content addiction among Chinese ACGN fans. Because ACGN content is now

mostly accessed through smartphones in the Chinese context, ACGN fans who are addicted to their smartphones will likely also be addicted to ACGN content. However, what is surprising is how perceptions of stigma moderate the relationship between smartphone addiction and addiction to ACGN content: ACGN fans who perceive high levels of stigmatisation for consuming ACGN content are more strongly addicted to ACGN content than those who perceive low levels of stigmatisation. In other words, greater perception of stigmatisation appears to drive more compulsive ACGN content consumption.

A possible explanation for the positive moderating effect of stigma perception on addiction to ACGN content consumption is that perceived ostracisation by broader society causes the individual to react defensively in order to resist stigmatisation. Subculture participation provides an avenue through which individuals can resist negative stereotypes (McGrady, 2016), which helps members of a subculture cope with stigma more effectively and increases their sense of empowerment (Shih, 2004). In the context of Chinese ACGN subculture, it appears that when faced with perceived societal disapproval of their interests, instead of choosing to conform to societal expectations or taking 'flight', Chinese ACGN fans choose to 'fight' and resist societal disapproval of their interests by increasing the intensity of their ACGN content consumption. Researchers have argued that stigmatisation is counter-productive in devising effective interventions intended to reduce addiction-related behaviours (Anderson and Ripullo, 1996; McGinty et al., 2019). Our results appear to support this perspective. More broadly, the observed moderating effect of stigma perception on the relationship between smartphone addiction and ACGN content addiction aligns with the perspective that technology, although dynamic, cannot act independently of societal values and interactions (Das and Kolack, 2008). More research is needed to better understand how other societal values impact smartphone addiction and addiction to the consumption of popular culture.

Our finding that virtual bridging and bonding social capital act as mediators of the relationship between smartphone addiction and addiction to ACGN content also highlights the importance of understanding the role of social interactions when examining the effects of digital and electronic media. While smartphone addiction is potentially a cause of ACGN content addiction, the mediating effects of virtual bridging and bonding social capital suggest that there is another possible explanation of addiction to ACGN content. The positive effects of smartphone addiction on ACGN addiction obscure the underlying mechanism of the complex entanglements among addiction, the need for social connection, perceived stigma, and the subsequent difficulties in making connections in real life faced by Chinese youths. Excessive smartphone use provides a way of connecting to the virtual ACGN community and increases users' virtual social capital, thus allowing them to carve out a niche in which they can acquire virtual support and resist stigma they may encounter in the real world.

Heavy consumers of ACGN content, as discussed previously, are often given derisory labels such as *otaku* and *zhai*. Although such stigma may prompt individuals to take defensive actions to resist societal disapproval, it is also possible for individuals to adopt a more proactive approach by increasing their social connections with others in the ACGN virtual community. Therefore, smartphone addiction can increase social capital through the heightened sense of social connectedness brought about by the interactive features of ACGN content platforms such as *Bilibili* and *Acfun*, which provide a buffer against the societal disapproval of ACGN consumption.

Our findings are consistent with past observations: mobile devices provide easier access to the internet, and the internet helps those who are disadvantaged and stigmatised in society to form and engage in online communities in which enthusiasts can gain support and recognition (Peeples et al., 2018; Lee and Park, 2021). Regarding the study of fandom cultures, smartphones lower the threshold of participation in such cultures, increasing the likelihood that fans will become obsessed with cultural practices in ACGN-like communities and further enhancing their sense of belongingness to these virtual communities (Tsay-Vogel and Sanders, 2017). Our findings also suggest that the relationship between smartphone addiction and addiction to ACGN content consumption is more complicated than it appears. More research is needed to improve our understanding of the underlying mechanism of association between smartphone addiction and virtual culture addiction. Although our study focuses specifically on ACGN content, we believe that our findings are also relevant to the consumption of other forms of virtual culture, such as games and live streaming.

Our study, however, is not without limitations. First, we did not conduct random sampling, which may affect the extent to which our results can be generalised. Second, we relied on participants' self-identification as ACGN fans to filter respondents. Finally, although we employed a moderated mediation model, our findings cannot be taken as evidence of causality due to the cross-sectional survey design. Nonetheless, we believe that our study provides some useful insights into the mechanisms underlying the relationship between smartphone addiction and addiction to popular cultural content such as ACGN content. Future research could employ a research design that will enable causal inferences to be drawn. Cross-cultural studies are another potentially fruitful area for future research, especially cross-cultural comparisons between Asian contexts, such as between Japan (where the term *otaku* originated) and China (where the term *zhai* was derived from the original Japanese term).

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Notes

1 Danmaku refers to real-time comments are superimposed onto streaming videos that continuously move across a video horizontally such that that older comments are superseded by newer comments.