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Life Goes On: How BTS has Turned Virtual Live Concerts During the COVID-19 Pandemic into Showbiz Dynamite

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Abstract

The COVID-19 pandemic brought the live concert industry to a near halt and led many performing artists to rethink the way they connect with their audiences. One effort to continue performing despite pandemic-related restrictions was to shift live performances to virtual streaming and bring the live concert experience directly to fans' living rooms. However, little is known about the determinants of virtual live concert (VLC) satisfaction. This study aims to identify which factors constitute audience satisfaction with VLCs and to examine the importance of each element. A total of 533 participants who attended BTS's *Map of the Soul ON:E* concert in 2020 were recruited to investigate their VLC satisfaction. The results of confirmatory factor analysis show that three dimensions—artist, audio quality, and virtual stage appearance—constructed the concept of VLC satisfaction. Analysis of covariance (ANCOVA) also revealed that video device type and previous live concert experiences were significant factors for VLC satisfaction, but not audio device type. In addition, celebrity identity and celebrity attitude were significantly and positively related to audiences' satisfaction with VLC. The outcome of this study demonstrates the opportunities of VLC as an alternative and expanded media channel of audience engagement.

Keywords: virtual concerts, online concerts, fans, BTS, COVID-19

Do virtual live concerts (VLC) provide the same exhilarating experiences as those attended in-person? This question has become increasingly common due to the advent of the COVID-19 pandemic and the subsequent shutdown of the live entertainment industry. Gone were the days of singing along with droves of fans in a packed arena while watching favorite artists perform live in front of thousands of spectators, at least for the time being. As artists across genres and fan bases had to pivot from performing live to strengthening their online presence, many turned to virtual performances. Entrepreneurial businesses popped up and pushed forward many alternative methods for artists to reach their fans through VLCs, ranging from ticketing software specializing in live streamed events (e.g., TicketSpice) to online platforms such as VenewLive, which assists with providing virtual production services and digital fan experiences.

For artists who already had a mass following, fans had been clamoring for an opportunity to experience a live show, even if it meant doing so from the comfort of their couch with a smart device in hand. Major acts, such as the South Korean boy band BTS, streamed two live concerts in October 2020 titled *Map of the Soul ON:E*. The livestreams, which drew nearly one million viewers from 191 regions, provided a possible blueprint for livestreaming large-scale productions to fans around the world. The two performances also brought in at least $35 million in ticket sales (Stassen 2020), proving that a pivot to virtual concerts was not only prescient but also profitable. On December 31, 2020, Justin Bieber performed a livestreamed New Year's Eve concert sponsored by wireless provider T-Mobile titled "T-Mobile Presents New Year's Eve Live with Justin Bieber," with two subsequent streams of the show later in January (Lovece 2020). Other performances have ranged from pop to rock, country to global music, where major and minor musical acts joined the online virtual concert platforms to livestream performances at a fixed ticket price (Horn et al. 2020).

The expectation was that live concerts would slowly ramp back up over the next few years. However, the widespread availability of technology capable of providing a holistic, live, remote-viewing experience, coupled with the ability to instantly access content from anywhere, meant that there were unprecedented opportunities for artists to reach more fans than ever (Charron 2017). Giving fans more flexibility and options to virtually view their favorite artists live in concert was simultaneously creating ad-

ditional revenue streams for artists that, if capitalized upon, could outlast the pandemic and shape the future of the music industry.

Existing research gives us an understanding of and a methodology for measuring live concert satisfaction (e.g., Brown and Knox 2017; Hausman 2011; Minor et al. 2004). Through multiple attributes that are inherent to in-person live concert experiences, we can measure satisfaction using metrics such as physical surroundings (Bitner 1992; Grove et al. 1992) and social interaction (Burland and Pitts 2016), as well as sound quality and the artist themselves (Minor et al. 2004). However, we do not yet possess a framework for measuring VLC satisfaction, given this performance model's variation from traditional live concert experiences. Therefore, the purpose of this study is first to identify the conceptual dimensions of VLC satisfaction by examining relevant factors such as artists, audio quality, and virtual stage quality. Unlike a conventional live concert experience that is driven by multi-sensory elements available at the venue (Zaltman 2003), VLC experience is limited to fewer senses because of this lack of a venue setting. However, VLC satisfaction may still be composed of multiple domains of visual and auditory cues and audiences' psychological connection with the artists. This study explores a less comprehensive version of configuration for VLC satisfaction based upon Minor et al. (2004) and Hausman's (2011) concert satisfaction models.

In addition to testing the structural significance of the VLC satisfaction measure, each dimension (i.e., artist, audio, and video) was further analyzed in regard to VLC watching environments. A VLC diverges from traditional concerts by removing complete control over the experience from the artist and placing it into the audience members' hands (e.g., the experience for someone who attends a virtual event via a laptop versus that of someone who watches on a projector with a stereo system). Hence, it was necessary to investigate how the audio and video settings as well as audiences' existing feelings toward the artists affect overall satisfaction with VLC.

Theoretical Framework

Determinants of Live Concert Satisfaction

While the development and consumption of digital music are substantial in enriching consumer experience, attending a live concert remains an irreplaceable experience (Holt 2010). Live performances in various

venues have formed the foundation of live entertainment and social interaction as vital culture in the U.S. (Minor et al. 2004). Live concerts are complex cultural phenomena that involve a combination of art, economics, ritual, and pleasure (Shuker 2008), and such service products should be treated as a multi-dimensional construct when examining how consumers perceive the quality of their experience (Minor et al. 2004).

It is evident that perceptions of service quality are based on multiple dimensions, and numerous studies have been conducted to determine service quality and consumer satisfaction. For example, Grove et al. (1992) define service experience as a mixture of four components: 1) actors who contribute to the service, 2) audiences, 3) physical surroundings, and 4) the service product itself. Rust and Oliver (1994) then assert what, how, and where the service is delivered are the initiatives to customer satisfaction. Brady and Cronin (2001) take a similar approach of having three primary dimensions of service quality: 1) functional quality (how the service is delivered), 2) physical environment quality (where the service is delivered), and 3) outcome quality (what is delivered). While the number of service quality dimensions can vary from two (e.g., Mels et al. 1997) to as many as ten (e.g., Parasuraman et al. 1985), the perceived service quality can be defined by consumers based on an evaluation of multiple dimensions, assessments of which are eventually combined to induce an overall service quality perception (Cronin and Taylor 1992).

Minor et al. (2004) put previous literature together and developed a model that demonstrates how audiences perceive the service quality of live concerts, which is mainly based on a theory by Grove et al. in 1992. The model indicates that consumers evaluate live performances as the sum of multiple features, including components of the performance and the settings of venues. Specifically, there are five attributes that establish the overall satisfaction of live performances: 1) artist, 2) sound quality, 3) stage appearance, 4) facilities, and 5) social interaction. Based upon Minor et al.'s study, Hausman (2011) empirically tested a multi-attribute satisfaction model across various types of music and venues in which she organized a more compact structure with four attributes: 1) artist, 2) musical environment, 3) venue settings, and 4) audience interaction.

The performers or musicians are the focal point of an event, significantly contributing to the perception of the consumer experience in both audio and visual aspects (Minor et al. 2004). The acoustic performances by musicians drive event experience satisfaction and, additionally, the

physical charm of the performers affects how consumers appraise both the performers and the performance (Landy and Sigall 1974). Therefore, Minor et al. (2004) argue that an artist's image is measured by the two facets of musical performance and physical appearance. Hausman (2011) then contends sound quality has a two-fold nature that impacts both the musician's performance as well as the technical aspects of the venue (i.e., sound quality and sound volume). Thus, she combined the human sound factor (musical performance) and the technical side of sound experience together to create the "musical environment" dimension. Regarding the venue settings, both studies relied upon Bitner's (1992) servicescape framework to investigate the effects of physical surroundings such as the seating, parking, and audience density on satisfaction. These physical components produce value for consumers both functionally and emotionally (Berry et al. 2002). Lastly, audience interaction, the effective enjoyment of being an audience member (Hausman 2011), includes audience density, enthusiasm, and social compatibility. Overall, previous studies imply that live concert satisfaction is composed of the integration of multi-sensory perception in a holistic manner (Holbrook and Anand 1990; Morin et al. 2007).

Advent of VLC and Satisfaction Factors

The outbreak of the novel coronavirus (COVID-19) engendered severe financial issues in diverse industries. In accordance with Maslow's hierarchy of needs, consumer demand for safety and health is more imperative than social interaction during the pandemic (Hagerty and Williams 2020). Consequently, the demand for live entertainment-related businesses contracted dramatically and, more seriously, the concert industry was forced to shut down at the outset of the pandemic. Meanwhile, concert promoters and booking agents lost their jobs, venues went unoccupied, and musicians faced problematic circumstances where their most reliable income source was no longer available. In fact, the year 2020 saw the concert business lose $9.7 billion globally in ticket sales alone, with another $30 billion lost in other streams of revenue such as sponsorships, merchandise, and concessions (Pollstar 2020).

Many industry professionals sought ways to reach out to audiences in the living room amid COVID-19 because the sustainability of the live concert business, which relies heavily on live tours, was currently not feasible. Subsequently, the pandemic forced the entertainment industry to redefine the definition of live concerts from in-person events to online streaming

performances. As individuals adjusted to the new "normal" of life under self-quarantine, several artists and musical organizations took their shows online to deliver musical pleasure to weary fans who fervently desired performances from their favorite artists. For example, South Korean boy band BTS and its label, Big Hit Entertainment, offered a live-streamed concert, *Map of the Soul ON:E*, in October 2020. The event was hugely successful, attracting 993,000 viewers from 191 regions, according to Big Hit (Stassen 2020). This new concept of a "virtual live concert" may sound contradictory, but such a notion drew noticeable attention as COVID-19 stalled the comeback of live music. After seeing the great success of several VLCs such as those performed by BTS, it is hard to imagine that musical institutions will not attempt other alternatives as there appears to be significant demand for virtual shows.

While the concept of VLC is seemingly intuitive, this new type of "live" concert is still in an embryonic stage. The current literature provides limited insight into customers' expectations and satisfaction in virtual performances. Minor et al. (2004) and Hausmann's (2011) satisfaction models are certainly enlightening to understanding audience behavior, but the discrepancy between in-person and virtual events hinders practitioners from optimizing the event experience. Live entertainment allows audiences to immerse themselves in the musical performance with the physical and social environment where multi-sensory stimuli, including all five senses, are applied (Lee et al. 2012). Hence, the total experience of a concert will be driven not only by the artists but also by subconscious sensory elements available at the venue (Zaltman 2003). On the other hand, VLC experience may confine the audience experience into fewer senses as it lacks the venue settings. Among the identified components of satisfaction (i.e., artist, audio, venue setting, and social interaction), venue-related services (e.g., seating quality or concession food), and social interaction are not available in VLC. However, VLC satisfaction still consists of multiple domains of visual and auditory cues. The emotional connection with the artists can also play into the determination of VLC satisfaction. Therefore, this study explores how VLC satisfaction is structured; in other words, the possibility of a more condensed version of the configuration for satisfaction—with artist, sound, and video—was examined based upon Minor et al. and Hausman's concert satisfaction models. The following sections provide the conceptual background and justification for each dimension of VLC satisfaction.

Effects of Celebrity Identity and Celebrity Attitude on VLC Satisfaction

Understanding the relationship between consumers and artists is crucial to explicate the attributional process of consumer satisfaction. Audience members in a VLC may feel they are directly tied to the performer, which enables them to identify with the artist. This concept of celebrity identification is multifaceted in nature and has two aspects (Soukup 2006). On the one hand, event attendees assume the artist's identity, goals, and perspective, creating a psychological connection (Cohen 2001; Eyal and Rubin 2003). In addition to such a vicarious experience, the identification process is also associated with other ritualized fans to foster a sense of belonging in a group (Benson and Brown 2002; Harwood 1999). The latter type of identification, a communal identification process, is depicted as "fandom" (Harris and Alexander 1998). The unique experience of being a member of a fan community creates the momentum to consume celebrity-related products. Accordingly, Fiske (1992) argues that highly identified fans are not just consumers but proactive and knowledgeable producers of "cultural economy."

One common suggestion made by researchers is that identification is an essential factor underlying the change of attitude and behavior (Um 2013). Media researchers have examined the role of identification in media usage. For example, forming identification with a media character leads to a sense of gratification (Perse 1990; Rubin and Step 2000). Johnson (2005) also suggests that fans who strongly identify with a celebrity are less likely to respond negatively to the celebrity's immoral behavior than those who are weakly identified with the celebrity. Moreover, her study shows highly identified fans are prone to feel proud of being a fan. These outcomes propose that the extent to which consumers identify with a celebrity positively induces consumer attitude and behavior. As such, fans who have a high level of identity are more likely to have a positive attitude toward artists either by creating a parasocial connection with the artists or having a sense of belonging in a fan group. Thus, the authors put forward this hypothesis:

Hypothesis 1: Celebrity identity will positively affect celebrity attitude.

Audiences who have a feeling of adoration toward artists may have a bias to positively evaluate the artists' performance (Landy and Sigall 1974). For many decades, psychologists have examined the impact of atti-

tude on future behavior, and Glasman and Albarracín's (2006) meta-analysis demonstrates much evidence that existing positive attitudes are likely to engender satisfaction. Hence, another hypothesis is posited.

Hypothesis 2: Celebrity attitude will positively affect VLC satisfaction.

Impacts of Audio and Video Settings on the overall VLC Satisfaction

Unlike live concerts, VLC audiences are able to control their listening environment with a variety of choices of playback systems (e.g., headphones, built-in speakers, or stereo systems). Prior literature has shown that individuals' reactions to auditory stimuli are dissimilar based on the type of audio device they use (Zelechowska et al. 2020). Such experiential differences have been demonstrated with several experimental studies. For instance, Schmidt-Nielsen and Everett (1982) uncovered that minor fluctuations of speech pitch were more easily detected with headphones than speakers. Regarding attitude and attention, Kallinen and Ravaja (2007) showed that using headphones overall was more likely to draw listeners' attention and elicit positive responses to news information than using speakers. However, participants who scored high on sociability and activity personality scales presented a high level of attention with speakers. Kallinen and Ravaja's study suggests the possibility of differences in speech perception from different playback devices and, further, that these differences may vary depending upon personality traits.

In the case of music perception, Koehl et al. (2011) examined whether different playback tools (i.e., speakers and headphones) can be used on equal terms to evaluate differences between auditory stimuli. The study demonstrated that the participants could distinguish the types of musical contents equally well with both speakers and headphones. However, the participants in the headphones condition showed a higher level of preference for one type of recording. Another experimental study by Woods et al. (2017) demonstrated that headphones, which reduce external noise dramatically, enhanced the control over the quality of the auditory stimulus. Headphones, however, may create an unusual listening environment for live performance considering live events are accompanied by significant background noise. Moreover, headphones may lead to a more tiresome experience than speakers (Zelechowska et al. 2020) due to the close proximity to the sound source.

In conclusion, the review of studies comparing the experience of using different playback methods showed that perceived sound experience is not identical with choice of audio devices. Similarly, VLC audiences can show distinctive responses and have dissimilar experiences depending on the type of playback device they use. Hence, the authors suggest the following hypothesis:

Hypothesis 3: Participants will show a different level of satisfaction depending on the audio device used to attend the VLC.

When it comes to the sense of sight, unlike conventional live concerts where audiences freely explore and set eyes on the physical settings, virtual audiences' visual exposure is confined to the screen. Hence, it is not unreasonable to assume that the visual setting of a VLC (e.g., size of the display or type of device) would be the critical determinant of sight perception. According to Skalski and Whitbred (2010), media forms such as screen sizes, viewing angles, fidelity, and resolutions construct significant psychological effects on visual perception. Scholars have particularly paid attention to the effect of screen size on consumer experience among many features of media, as a large body of work in the field of media communication has consistently demonstrated the positive association between increases in screen size and immersion, enjoyment, and realism (Hou et al. 2012; Kim and Sundar 2013).

Much empirical evidence supports the assertion that screen size affects an audience's arousal (Grabe et al. 1999; Lombard et al. 2000). Moreover, in Lombard and Ditton's experiment on viewers' evaluation of a television broadcast in 1997, participants showed a significantly more positive attitude toward both the performers on the media and the viewing environment in the large screen condition. Increases in screen size may induce immersion or realism (Kim and Sundar 2013) through which the screen conveys the "live environment" or audiences take pleasure in a simulated "being-there" experience. In conclusion, viewers' emotional responses are significantly affected by screen size. To extend this line of scholarly research to the VLC context, this study seeks to examine whether screen size is still a significant factor in audience satisfaction. Therefore, the following hypothesis is forwarded:

Hypothesis 4: Participants will show a different level of satisfaction depending on the video device used to attend the VLC.

Expectancy Disconfirmation and VLC Experience

Previous experiences shape the image of service or products, and that pre-conceptualization is known to affect consumers' future experience (Spreng and Page 2003). According to Oliver (1980), individuals compare their original expectations and the actual product or service performance. This post-purchase evaluation is jointly determined by expectation and disconfirmation. The concept of disconfirmation is the gap between a pre-purchase and actual performance that leads to either positive or negative disconfirmation (Spreng and Page 2003). The positive expectation disconfirmation (i.e., the post-experience exceeding the original expectation) is believed to enhance consumer satisfaction (Bhattacherjee 2001).

In the live event setting, facility aesthetics, lighting, and service staff directly influence the atmospheric determinants that are associated with audiences' memory and conceptualization of the event experience (Ryu and Han 2011). That sort of created image may function for event attendees to evaluate their future behavior, resulting in expectancy disconfirmation. Such a difference in pre-post perception depends on the existence of previous experience. For instance, fans who have previous experience of live concerts may have a better understanding of the sensory scene of a live event than those who have never attended a concert event. Accordingly, regular concertgoers are more likely to perceive a discrepancy with their existing memory when attending a VLC. Due to the semantic similarity, or the way VLCs are promoted as "live concerts," ticket buyers might expect to enjoy the authentic concert feeling in a VLC; however, VLC settings are limited to a streaming experience, and thus disconfirmation may occur. On the other hand, without having prior concert experience, attendees could have a lower level of perceived disconfirmation because of the absence of preexisting bias. From the predictive capability of expectancy disconfirmation, it is possible to presume that there are different levels of disconfirmation on the basis of fans' prior experience. Therefore, the following hypothesis is proposed:

Hypothesis 5: Participants who have a prior in-person concert experience will show a higher level of expectation disconfirmation with a VLC than those who do not have in-person concert experience.

Furthermore, given the current VLC setting that lacks key attributes only available in a live concert, VLC attendees' expectation disconfirma-

tion may adversely affect satisfaction (Bhattacherjee 2001), and therefore, the authors advance this hypothesis:

Hypothesis 6: Participants who have a prior in-person concert experience will show a lower level of satisfaction with the VLC than those who do not have in-person concert experience.

Methods

Participants and Procedure

A total of 533 participants were recruited in South Korea by a consumer experience management company. Individuals who purchased a ticket and attended BTS's *Map of the Soul ON:E* concert in 2020 were eligible to participate in the study. A stratified-sampling technique was implemented to examine the impact of previous live concert experience on VLC satisfaction, in which 272 participants (group I) had an experience of a live concert, and the other 261 (group II) did not have a previous live experience at a physical venue. Participants who agreed to join in the study were asked to fill out an online questionnaire. In order to minimize the time effect that could potentially distort participants' memory about the event, all of the participants were given the questionnaire within five days from the end of the concert. Several responses were eliminated due to the lack of actual attendance of the online performance or late/no response. 250 participants in group I completed the questionnaire, and 250 usable surveys were collected in group II. Those who successfully completed the questionnaire received US$3 as compensation. In the final sample of 500 participants, the age breakdown was 2% (under 18), 23% (18 to 29), 36% (30 to 39), 23% (40 to 49), and 16% (50 or over). 41% of the sample was male.

Measures

An online questionnaire was designed to measure multiple constructs including celebrity attitude, celebrity identity, VLC satisfaction, behavioral intention, and VLC expectation disconfirmation. Participants' attitude toward the celebrity was measured with the celebrity attitude scale (6-items) developed by Maltby et al. (2006). Celebrity identity was measured with the 5-item scale from a previous study (Rubin and McHugh 1987). VLC satisfaction was first measured with a modified version of Minor et al.'s (2004) multi-dimensional concert satisfaction scale to define

the domains of the new construct. Then, Oliver's (1980) satisfaction scale was used to measure the overall satisfaction of VLC. Behavioral intention was measured with two items by Boulding et al. (1993). Participants rated each item on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) with higher values indicating more positive responses to each item. VLC expectation disconfirmation was measured with a single item (Westbrook and Oliver 1991) ranging from 1 (*very different from expected*) to 5 (*not at all different from expected*) to evaluate how discrepant participants' prior expectation and post-experience of the virtual concert were. Additionally, participants were asked to answer what type of audio (i.e., Bluetooth speaker, built-in speaker, headphones, or stereo system) and video devices (i.e., mobile, laptop, less than 40-inch TV, 40-59-inch TV, 60-99-inch TV, or larger than 100-inch projector) they used to watch the VLC in order to test the effects of the auditory and visual settings on overall VLC satisfaction. Items of the measures, reliability scores, mean values, and standard deviations are demonstrated in Table 1.

An English version of the questionnaire was first developed, and a rigorous translation procedure recommended by Douglas and Craig (2007) was adopted to determine the equivalence of the original and Korean versions of the questionnaire. The English version of the items was translated into Korean by one of the authors of this study. The content equivalence and relevance of the items were established through discussions with bilingual colleagues in the United States. The Korean translation was then translated back into English by a second bilingual translator and compared to the original version. The Korean translation was examined and revised multiple times in response to the previous content analysis and back-translation, and both translators accepted the final version.

Table 1. Summary of measures:

Measures	Items	Mean	SD	Cronbach's α
Celebrity Identity$_a$	I like BTS.	5.96	1.00	α = .886
	I can easily relate to BTS.	4.94	1.31	
	I think of BTS as a good friend.	5.38	1.17	
	I have no doubt BTS and I would work well together.	5.25	1.25	
	BTS is a personal role model.	4.85	1.46	
	(Based on Rubin and McHugh 1987; Rubin et al. 1985)			

Measures	Items	Mean	SD	Cronbach's α
Celebrity Attitude[a]	I love to talk with others who admire BTS.	5.43	1.15	α = .916
	Keeping up with news about BTS is an entertaining pastime.	5.70	1.17	
	It is enjoyable just to be with others who like BTS.	5.50	1.15	
	I enjoy watching, reading, or listening to BTS because it means a good time.	5.87	1.07	
	Learning the life story of BTS is a lot of fun.	5.53	1.13	
	My friends and I like to discuss what BTS has done. *(Based on Maltby et al. 2006)*	5.49	1.19	
Overall VLC Satisfaction[a]	I was satisfied with my decision to attend this VLC.	5.80	.97	α = .908
	My choice to attend this VLC was a wise one.	5.59	1.04	
	I think that I did the right thing when I decided to attend this VLC.	5.68	1.00	
	I truly enjoyed this VLC.	5.89	.96	
	I was satisfied with my overall experience with this VLC. *(Based on Mitchell and Olson 2000)*	5.88	.98	
VLC Satisfaction[a]	I was satisfied with BTS's ability in this VLC.	5.93	.96	
	I enjoyed BTS's creativity in this VLC.	5.95	.94	
	I was satisfied with BTS's movements during this VLC.	6.17	.97	
	I liked BTS's physical appearance in this VLC.	5.60	1.06	
	BTS's clothing in this VLC was visually appealing.	5.78	1.04	See the results of CFA in Table 2 for reliability of the measures.
	The overall sound quality of this VLC was satisfactory.	5.68	.99	
	I was satisfied with the overall sound volume of this VLC.	5.69	.98	
	I enjoyed musical contents played during this VLC.	5.66	.96	
	The lighting effects of the virtual stage was satisfactory.	5.77	.96	
	I enjoyed the decoration of the virtual stage.	5.79	.97	
	I liked how the virtual stage was visually designed.	5.75	.98	

Measures	Items	Mean	SD	Cronbach's α
Behavioral Intention[a]	I am likely to attend a VLC similar to this one.	5.61	1.17	α = .792
	I am likely to recommend this VLC. *(Based on Boulding et al. 1993)*	5.59	1.07	
VLC Expectation Discon-firmation[b]	How do you evaluate your experience with this VLC compared to your expectation? *(Based on Westbrook and Oliver 1991)*	3.86	.87	–
[a] Items measured using a 7-point Likert-type (1=strongly disagree, 7=strongly agree). [b] Items measured using a 5-point semantic differential scale (1=not at all different from expected, 5=very different from expected).				

Table 1. Summary of measures.

Statistical Analysis

Based on the guideline by Anderson and Gerbing (1988), confirmatory factor analysis (CFA) was conducted in RStudio to identify VLC satisfaction's conceptual dimensions and evaluate the caliber of the factor structure. In addition to statistically testing the significance of the CFA model, criterion-related validity of the VLC satisfaction scale was also tested by examining the scale's associations with external variables (i.e., celebrity identity, celebrity attitude, and behavioral intention) within a structural model. In the structural model, the three latent factors (i.e., artist, audio quality, virtual stage appearance) of the VLC satisfaction merged into a latent satisfaction variable, creating a second-order structure. Awang (2012) recommends testing a hierarchical model as the multi-order structure is more parsimonious and constrained than a first-order model. Once the factor structure of VLC satisfaction had been confirmed, one-way ANCOVA was conducted three times to further determine how audio and video settings, as well as the existence of attendees' prior experience of a live concert, influenced the overall VLC satisfaction.

Results

Testing Multi-dimensionality of VLC Satisfaction

The major purpose of CFA was to deliver evidence of whether multiple items of each latent factor demonstrate a satisfactory fit to the data. As shown in Table 2, the chi-square statistics for the model was significant ($\chi^2/df = 75.747/38$, $p < .001$), yet the value was less than three times the

degrees of freedom, indicating the model fit was acceptable (Schermelleh-Engel et al. 2003). Other widely used fit indices (CFI = .993; AGFI = .952; RMSEA = .045; SRMR = .024) also revealed a good model fit (Hu and Bentier 1999). Considering factor loadings, all scale items loaded highly on their matching factors ranged from .704 to .863, and their accompanying test statistics were all highly significant ($p < .001$). The results also presented no high cross-loadings based on the modification indices. In addition, the composite reliability scores of factors were all greater than .8, which indicated the items had satisfactory internal consistency (Raykov 1997). Therefore, the CFA model was satisfactory enough to confirm the three dimensions of VLC satisfaction. The reliability and validity were further examined in the next validation stage.

Model	χ^2	*df*	CFI	AGFI	RMSEA	SRMR
Three Factor Model	75.747***	38	.993	.905	.45	.24
Factors	**Items**	**Standardized Loading**	**Composite Reliability**		**AVE**	
Artist	Artist1	.771***	.856		.543	
	Artist2	.718***				
	Artist3	.759***				
	Artist4	.704***				
	Artist5	.729***				
Audio Quality	Audio1	.861***	.887		.723	
	Audio2	.863***				
	Audio3	.827***				
Virtual Stage Appearance	Video1	.780***	.800		.572	
	Video2	.779***				
	Video3	.708***				
Note: CFI = Comparative Fit Index; AGFI = Adjusted Goodness-of-fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Squared Residual. *** *p* < .001.						

Table 2. Results of confirmatory factor analysis (*N* = 500).

The average variance extracted (AVE) from each factor was computed to bring a more rigorous analysis of the internal structure and test convergent validity of the measures. A score of .5 indicates an acceptable level of AVE (Fornell and Larcker 1981), and all values presented in Table 2 satisfy this criterion. Discriminant validity was then tested with the pro-

cedure guided by Fornell and Larcker. The AVE of a construct should be higher than the squared correlation between the construct and other constructs in the model (Barclay et al. 1995). Table 3 presents the squared inter-construct correlations with the AVE scores on the diagonal. Discriminant validity was achieved as all the diagonal components are greater than the associated off-diagonal scores. A series of analyses indicated that the measure of VLC satisfaction was reliable and valid.

	Artist	Audio Quality	Virtual Stage Appearance
Artist	**.543**		
Audio Quality	.220	**.723**	
Virtual Stage Appearance	.319	.600	**.572**
Note: The average variance extracted from each construct is shown on the diagonal. Off-diagonal values are squared construct correlations.			

Table 3. Results of discriminant validity test.

To measure criterion-related validity, a structural model was examined, in which the second-order latent factor of satisfaction was included to test how participants' overall satisfaction with the VLC was associated with external variables (i.e., celebrity identity, celebrity attitude, and behavioral intention). According to the aforementioned fit indices, the structural model illustrated in Figure 1 showed an acceptable fit (χ^2/df = 962.954/243; CFI = .932; TLI = .922; RMSEA = .077; SRMR = .070). The path coefficient from celebrity identity to celebrity attitude was significant and positive (standardized coefficient = .881, $p < .001$) to the extent that celebrity identity explained 78% of the variance in celebrity attitude. The path coefficient from celebrity attitude to VLC satisfaction was also positive and significant (standardized coefficient = .754, $p < .001$). Furthermore, the path coefficient from VLC satisfaction to behavioral intention was significant and positive (standardized coefficient = .877, $p < .001$) indicating that 77% of the variance in behavioral intention was explained by VLC satisfaction. The relationships among these variables were consistent with the authors' theoretical prediction, providing evidence in support of Hypotheses 1 and 2. Overall, the VLC satisfaction measure offered evidence of validity.
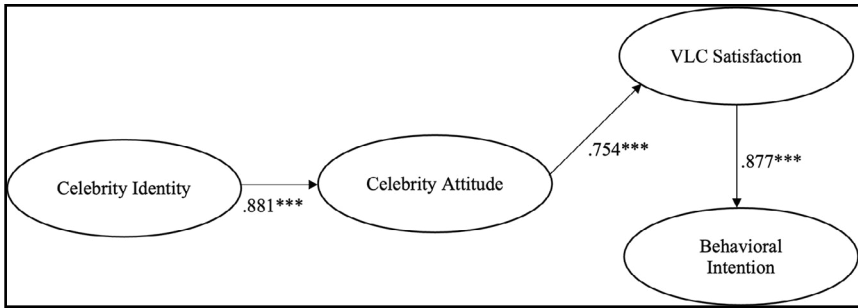
Figure 1. Structural model for testing criterion-related validity of VLC satisfaction (*** *p* < .001).

Effects of Audio Device and Screen Size, Celebrity Identity and Attitude, and Prior Concert Experience on Overall VLC Satisfaction

Analysis of covariance (ANCOVA) was conducted three times to test the effects of prior concert experience (dichotomous), audio device (four categories), and video device (six categories) on the overall satisfaction of VLC. Factorial ANCOVA was not a viable option due to the violation of unequal sample size and variances among categorized groups when all three factors were included. Having both unequal sample sizes and variances significantly weakens statistical power and raises Type I error rates (Rusticus and Lovato 2014), and thus multiple times of ANCOVA analyses were employed separately. The averaged scores of celebrity attitude (α = .916) and celebrity identity (α = .886) were used as covariates in order to examine the pure effects of the independent variables controlling for the covariates, those which were determined to be impactful from the previous SEM analysis. The averaged value of overall satisfaction (α = .908) was used as the dependent variable in all three analyses. The results of ANCOVA analyses are presented in Table 4.

The first ANCOVA test was for the impact of audio device type on overall satisfaction. A preliminary evaluation of homogeneity of regression slopes showed that the mean differences among the four groups were approximately equal throughout the range of celebrity attitude ($F(3, 488)$ = 1.05, p = .37) and celebrity identity ($F(3, 488)$ = 1.96, p = .12), and thus the assumption was not violated. The result of the first ANCOVA model was significant ($F(5, 494)$ = 116.40, $p < .001$, η^2 = .54), but the effect of audio type on overall satisfaction was not statistically significant

	SS	df	MS	F	η2
Model 1 [a]					
Main Effect					
Audio Device [b]	2.23	3	20.65	1.73	.01
Covariate					
Celebrity Identity	20.65	1	20.65	52.82***	.10
Celebrity Attitude	26.19	1	26.19	66.99***	.12
Model 2 [a]					
Main Effect					
Video device [c]	5.128	5	1.025	2.66*	.03
Covariate					
Celebrity Identity	19.32	1	19.32	50.02***	.09
Celebrity Attitude	24.42	1	24.42	63.22***	.11
Model 3 [a]					
Main Effect					
Prior Experience [d]	7.22	1	7.22	19.06***	.04
Covariate					
Celebrity Identity	18.29	1	18.29	48.26***	.09
Celebrity Attitude	24.42	1	24.42	64.44***	.12

[a] Homogeneity of regression for covariates tested and not significant.
[b] Four categories: Bluetooth speaker, built-in speaker, headphones, and stereo system.
[c] Six categories: mobile, laptop, less than 40-inch TV, 40-59-inch TV, 60-99-inch TV, or larger than 100-inch projector.
[d] Two types: with prior concert experience and without previous concert experience.
* $p < .05$. *** $p < .001$.

Table 4. Results of ANCOVA analyses for VLC satisfaction.

$(F(3, 494) = 1.73, p = .16)$ controlling for the effect of covariates. Both celebrity attitude and celebrity identity were significantly related to overall satisfaction in the model $(F(1, 494) = 66.99, p < .001; F(1, 494) = 52.82, p < .001)$. Based on the results, Hypothesis 3 was not supported.

The second ANCOVA was performed to test the effect of video type on overall satisfaction. The test of homogeneity of regression slopes indicated that the relationship between the covariates and the dependent variable did not differ significantly across the video types $(F(5, 482) = 1.06,$

$p = .38$; $F(5, 482) = 1.34$, $p = .25$). The ANCOVA model was significant ($F(7, 492) = 85.31$, $p < .001$, $\eta^2 = .55$), and the effect of video type on overall satisfaction was statistically significant ($F(5, 492) = 2.66$, $p < .05$) controlling for the effect of covariates. Thus, Hypothesis 4 was supported. Pairwise comparisons using the Holm-Bonferroni method were further conducted to assess the differences among the groups, controlling for type I errors. There were group differences ($ps < .05$) in the adjusted mean between the laptop group ($M = 5.72$) and the small TV group ($M = 5.36$), and the projector group ($M = 5.88$) and the small TV group. Both covariates were significantly associated with overall satisfaction in the model ($F(1, 492) = 63.23$, $p < .001$; $F(1, 492) = 50.02$, $p < .001$).

The third ANCOVA test was conducted to assess the effect of prior concert experience on overall satisfaction. The test of homogeneity of regression slopes presented that the relationship between the covariates and overall satisfaction was not significantly different between the two groups so that the assumption was not violated ($F(1, 494) = 3.45$, $p = .64$; $F(1, 494) = 2.18$, $p = .14$). The result of the final ANCOVA model was significant ($F(3, 496) = 204.75$, $p < .001$, $\eta^2 = .55$), and the effect of prior concert experience on overall satisfaction was statistically significant ($F(1, 496) = 19.06$, $p < .001$) controlling for the effect of covariates. Group I (without prior concert experience) had a smaller adjusted mean ($M = 5.52$) than group II ($M = 5.77$), and also, both covariates were significantly related to overall satisfaction ($F(1, 496) = 64.44$, $p < .001$; $F(1, 496) = 48.26$, $p < .001$). Moreover, the results from an independent samples t-test indicated that participants in Group II ($M = 3.75$, $SD = .85$, $N = 250$) scored lower on expectation disconfirmation than those in Group I ($M = 3.97$, $SD = .87$, $N = 250$), $t(17) = 2.79$, $p < .01$, two-tailed. Based on these findings, there is evidence to support Hypotheses 5 and 6.

Discussion

This study identifies and analyzes three dimensions of Virtual Live Concert satisfaction in order to ascertain the utility of this model and whether VLCs have post-pandemic potential for artists as an additional means of engaging with audiences and generating new revenue streams. Those three factors are: 1) artist (i.e., the key attributes of performers that audiences are satisfied with); 2) audio quality, which is determined by the audiences' subjective perception of the audio production quality; and 3) virtual stage appearance, as determined by the visual attractiveness of the
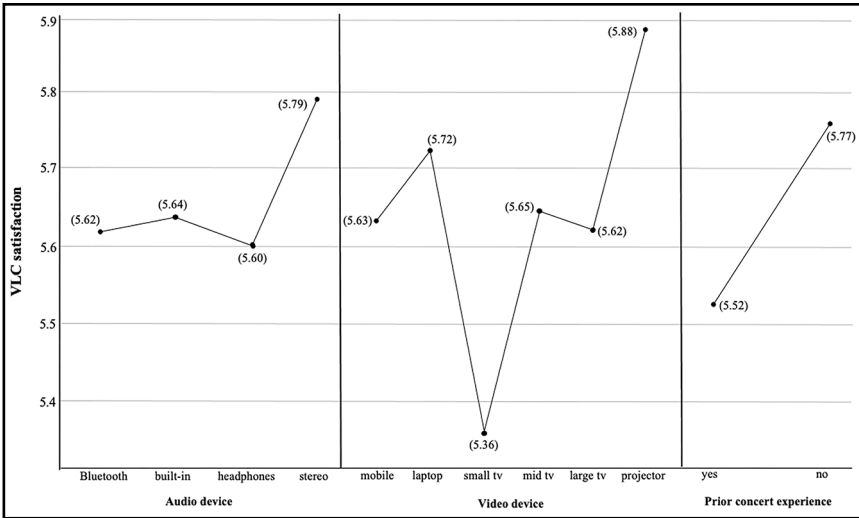
Figure 2. Main effects of audio device, video device, and prior concert experience on VLC satisfaction.

event on the screen. Given the differences between VLC and in-person concerts, a new model was needed to evaluate consumer satisfaction and, statistically, the results of this study support the proposed three-factor structure for determining VLC satisfaction (see Figure 2).

Despite the demonstration of a slightly higher preference for in-person events (among the participants who reported a previous in-person concert experience), VLCs are inherently different from live concerts and their necessity has been driven by extraordinary circumstances that have prevented live concerts from happening. This natural difference necessitates and allows for a standalone framework to measure and understand VLC satisfaction given the absence of traditional determinants such as facility services (e.g., venue and concessions) and social interaction and engagement. The results of this study validate the efficacy and usefulness of the proposed model for evaluating VLC satisfaction. Further, they show that taking these satisfaction factors into consideration when planning a VLC makes it a valid entertainment and performance option for many artists to attract and grow audiences around the world even after the pandemic.

The research supports Hypothesis 1, which posits that celebrity identity (i.e., how much participants personally identify with the artist) will positively affect participants' attitude toward the artist. Virtual celebrity-

fan interactions often have the ability to create a sense of intimacy and authenticity (Click et al. 2013). Based on participants' responses to the online questionnaire gauging their level of identification with BTS, a positive correlation between celebrity identity and VLC satisfaction is evident. Thus, fans who identify closely with an artist are more likely to have a positive attitude toward the artist.

Similarly, the research strongly supports the second hypothesis, which asserts that the audiences' attitude toward the celebrity will positively affect VLC satisfaction. As borne out by the research, audience members who already possess positive feelings or attitudes towards an artist are more likely to be satisfied by a VLC experience, as it appears they may have a bias to positively evaluate the artist's performance (Landy and Sigall 1974). This study supports the supposition that existing positive attitudes are likely to engender satisfaction (Glasman and Albarracín 2006). Furthermore, research indicates that celebrities who use virtual platforms to engage with their fans generate higher levels of attachment among those fans. (Krause et al. 2018). Thus, Hypotheses 1 and 2 work in conjunction to demonstrate that the strength of an audience member's identification with an artist informs their attitude toward the artist, and that attitude is a strong predictor of VLC satisfaction.

Hypothesis 3 assumed that participants would show a different level of satisfaction based on the audio device they used when attending the VLC. This assertion was not supported, meaning that the level of satisfaction was not dependent on the type of audio device or the resultant audio quality. This could be due to the fact that participants did not use the same quality audio devices, which could have created inconsistencies that distorted the information. Further, audience members likely opted to use the best device they had available to them personally, thus making their audio experience subjectively satisfactory. Variations in participants' satisfaction based on audio device were minimal, regardless of whether a participant used a Bluetooth speaker, built-in speakers, headphones, or a stereo system; however, participants with a dedicated stereo system did show the highest level of satisfaction. This outcome is undoubtedly a positive one for artists and performers since the audio device that an audience member uses to listen to the concert is one aspect of a VLC that is simply out of the artist's control. While audio quality is an important (some might say the most important) aspect of a live performance, audiences likely understand that the audio experience for a VLC cannot mirror that of an in-person

concert, and they will consequently filter that aspect out of a determination of their satisfaction with the VLC.

Video type, as posited by Hypothesis 4, did affect VLC satisfaction, with participants exhibiting differing levels of satisfaction based on how they viewed the VLC. Participants who viewed the concert on a small TV reported the lowest levels of satisfaction, and those who viewed the concert on a projector reported the highest levels of satisfaction. Studies have demonstrated that screen size significantly affects the perceptions of mobile internet users (Chae and Kim 2007). Those who viewed the concert on a mobile device, a mid-sized TV, or a large TV all reported similar levels of satisfaction that fell within the range between viewers using a small TV and those using a projector. Because increases in screen size can translate to a feeling of immersion or realism, a larger screen size is likely the optimal way to view a VLC because it provides an audience member with the closest approximation of the live environment. Engaging with virtual environments through a larger screen has been shown to produce higher feelings of both physical and self-presence (Hou, Nam, Peng, and Lee 2012). Given that a virtual audience's visual exposure is confined to the scope of the camera that is recording the VLC, a larger field of view more closely replicates the freedom of an audience member to visually explore the concert setting.

Hypothesis 5 propounds that participants who have a prior in-person concert experience will show a higher level of negative expectation confirmation with a VLC than those without such experience. Disconfirmation is the gap between pre-purchase and actual consumption that leads to either positive or negative disconfirmation (Spreng and Page 2003), and positive expectation disconfirmation is believed to enhance consumer satisfaction (Bhattacherjee 2001). Questionnaire responses supported the assertion of Hypothesis 5, bearing out the assumption that participants with prior in-person concert experience demonstrated a higher level of negative expectation disconfirmation. This is likely due to a level of expectation held by those participants that was based on their in-person experiences, as well as a bias toward believing a VLC would not be as good as an in-person concert. Audience members with prior concert experience were more likely to experience negative expectation disconfirmation with the VLC because their expectation for a virtual show is inherently reduced against what their expectation would be for an in-person show.

Building from that idea, Hypothesis 6 was also supported in its assertion that these participants with prior in-person concert experience would demonstrate a lower level of satisfaction with the VLC than those without in-person concert experience. Because a VLC inherently lacks certain key attributes of a live show that are only available in-person, participants with previous in-person concert experience (i.e., those with a higher level of negative expectation disconfirmation) showed a lower level of satisfaction with the VLC than those without such previous experience.

This dimension of VLC satisfaction is significant, not only for the purposes of this study, but also for contributing an additional framework through which to test the theory of expectancy disconfirmation. Testing this theory in the context of VLCs serves to mutually reinforce the underpinnings of both the theory and this study. This is because: 1) the study provides a new field in which to test expectation disconfirmation, demonstrating the concept's utility when applied to the subject of VLCs; and 2) the theory serves to support the conclusions of this study, demonstrating both the reliability of the concept and its usefulness in determining VLC satisfaction.

Overall, participants showed a higher level of satisfaction with in-person concerts. This is understandable given certain factors that are inherent to a live, in-person concert that are simply unattainable in the VLC format (e.g., immersion and a sense of community). However, the difference in satisfaction levels, while observable, was not outstanding. Thus, VLCs can still be a valid and viable entertainment format to attract audiences, even after the pandemic.

Examples such as BTS and others demonstrate the potential for an artist to reach audiences through a VLC that far surpasses the capacity of a traditional event venue or concert space. In addition to generating a new revenue stream for artists that they can layer onto or incorporate into traditional live concerts, the VLC provides an opportunity for artists to expand their reach and grow their audiences around the world. This study demonstrates the value of the live concert, and it draws attention to the opportunities that capitalizing on this new concert format can create for artists in a post-pandemic world.

Limitations and Future Research

This study has a few limitations to be acknowledged. First, the current study explored the impacts of sound quality on satisfaction by exam-

ining different types of audio devices. It measured the overall sound quality based on the participants' perception, which did not comprehensively investigate the objective quality of the audio. Thus, future research may inspect the technical side of the produced sound in order to measure the sound quality objectively. Moreover, an experimental setup may be necessary to control for the quality of video settings. Screen size is known to be the most impactful element (Kim and Sundar 2013), but other factors, such as screen resolution and fidelity, could be further evaluated. Network connection stability might also be an element to be included in a future study. Overall, there are numerous other attributes that may also affect audiences' VLC satisfaction to be explored further.

Second, while this study rigorously inspected how celebrity identity and attitude affect VLC satisfaction, the level of those two constructs in the data set were high, and thus the impact of low identity was not fully captured from this research setting. Hence, it might be a good idea to examine another VLC that has a broader spectrum of celebrity identity and attitude. Specifically, a future study may perform a group comparison to investigate how the different levels of the two constructs (e.g., median split of low and high) could affect VLC experience.

Third, the identified three-factor model of VLC satisfaction was adapted from existing scales created for live concert satisfaction. The social interaction dimension was dropped in the model considering the uniqueness of the VLC in this study. Nevertheless, audience interaction was available during the VLC, even though highly limited to simple chatting. Audiences may still want to have social interaction as the psychological connection is one of the most impactful elements of a concert experience (Earl 2000). Future research, therefore, should test whether emotional interaction within audiences is still possible in a virtual format or, if available, compare the extent of audience interaction between live and virtual performances.

Lastly, this study cannot be applied conclusively to all entertainment events as the sample of the study was limited to South Korean participants. To be able to generalize the findings of this study, similar studies can be replicated with a broader group of participants.

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