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Social Media Affecting Online Music Learning Willingness of Chinese Older Adults

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Abstract

Recognizing the growing relevance of digital learning platforms for the elderly, this research aims to understand the dynamics influencing their engagement in online music education. Employing the online and offline questionnaires to collect 617 valid data from Chinese older adults live in shanghai, and with the experience to use social media (Tiktok) to learn music. By conducting the structural equation model, the results reveal significant direct effects of repeat exposure, online reviews, and perceived value on the willingness to engage in online music learning. Furthermore, perceived usefulness and ease of use are identified as key mediators in these relationships. These findings underscore the multifaceted influence of social media on elderly learning intentions, highlighting the roles of community engagement and perceived value in technology adoption. The research underscores the necessity for tailored strategies that address the unique needs of elderly learners, promoting lifelong education and digital inclusivity in the rapidly evolving educational landscape.

Key Words: *music learning, social media, digital education, long-life education, structural equation model, elderly*

JEL Classification C63, M21, Z32

1. Introduction

Music learning online means all age groups need music regulation and demand, especially in today's high-speed development of digital society (Shu, 2023). Music learning online refers to the process of acquiring musical skills or knowledge through digital platforms. It's akin to how social media functions - just as social media connects users from diverse locations, enabling them to share and interact with content, online music learning connects users with instructors, resources, and fellow learners globally (Flynn et al., 2022). Platforms can range from dedicated educational websites to video tutorials on YouTube, mirroring the diverse formats found in social media (Luo et al., 2022). This approach to music education offers flexibility and a vast array of resources, much like the varied and accessible nature of content on social media.

With the improvement of life, the demand for music will inevitably increase, and facts have proved that people can be engaged in music learning at any age in their lives, not only

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appreciation, but also have a particular development possibility, but the degree is different, the magnitude is different (Karg et al., 2019). Music is not just a form of entertainment for older people. It has therapeutic potential, aiding in memory recall, emotional expression, and cognitive functioning (Zou & Kim, 2022). For many elderly individuals, music from their youth evokes nostalgia and offers a bridge to their past. Learning music or a musical instrument in later years can also be a source of newfound passion, a means to challenge cognitive decline and a way to connect with younger generations (Sharma, 2022).

Geriatric education belongs to a particular stage in lifelong education, and it is also the last stage in lifelong education (Thwe & Kálmán, 2023). The number and proportion of people over the age of 60 is growing at an unprecedented and alarming rate (Gu et al., 2021). According to the research report on China's population aging market and development trend, China will enter the rapid aged stage from 2015 to 2035, and the elderly population will increase from 212 million to 418 million. According to the seventh National Census bulletin, China had 260 million people aged 60 and above as of February 2022 (Zhao et al., 2023). China's aging population is becoming more and more serious, and the demand for education for older people is increasing day by day (Zhao et al., 2023). With the rapid advancement of population aging and the rapid development of the Internet industry, China has entered the age of population aging and digitalization (Yuan et al., 2023).

With the advent of the digital age, learning via social media has become increasingly prevalent across various age groups (Williamson et al., 2020). Social media, in particular, has emerged as a powerful tool, extending its influence to a range of sectors, including music education (López-Íñiguez & Bennett, 2021). While a plethora of studies have delved into the role of social media in the educational landscape of the younger generation, there's a noticeable gap in understanding its impact on the elderly population, especially within China, which boasts a significant elderly demographic.

The Chinese elderly population is proliferating, with a concomitant increase in their free time and desire for lifelong learning (Lee & Shin, 2022). Their unique socio-cultural experiences, cognitive capacities, and digital learning curves differ substantially from those of younger generations, making this a pertinent line of inquiry (Vanneste et al., 2020). Online platforms provide unprecedented opportunities for continuous education, making it feasible for individuals from all walks of life to access a plethora of resources (Yu et al., 2023). However, while a broad exploration of lifelong learning in the digital age exists, there's a conspicuous absence of detailed research on elderly populations in non-Western settings (Jiang & Pu, 2021). This omission presents a significant research gap, given the unique needs and experiences of this demographic.

The educational potential of social media platforms, such as YouTube, Facebook, and TikTok, has been the subject of extensive research (Li et al., 2023). These platforms have democratized education, offering diverse learning resources to global audiences. Yet, most of these studies predominantly focus on younger demographics, sidelining the older generation's unique learning needs, digital challenges, and engagement patterns (Lei et al., 2021). This oversight underscores the need for more inclusive research that encompasses all age groups.

Online platforms have made music education, from instrumental tutorials to in-depth theoretical lessons, accessible to a global audience (Joseph & Lennox, 2021). But here too, the bias persists. Most studies revolve around younger learners, neglecting elderly learners, especially in non-Western contexts (Joseph & Lennox, 2021). Given the universal appeal of music, this gap in research is especially glaring.

The way China's elderly engage with digital platforms, especially in niche areas like music education through social media, is an area ripe for exploration. The nation's socio-cultural nuances, coupled with its elderly population's distinct technological competencies and learning preferences, warrant a deeper dive. This study seeks to bridge these gaps by focusing on the Chinese elderly's engagement with online music education through social media.

Hence, this research aims to 1) explore the factors affecting the willingness of Chinese elderly to learn music via social media. 2) verify the mediation role of the variables among the social media, perceived value, identity, and the willingness of Chinese elderly to learn music in social media. 3) provide suggestions to the stakeholders for online music learning to the elderly.

2. Literature Review

Cultivation theory focuses on the long-term impact of media on audience perceptions, attitudes, and behaviors (Valkenburg & Oliver, 2020). In music learning for older people, cultivation theory can be applied to study the cultivation effect of music learning on the attitudes, beliefs, and values of older people and the impact of music learning on the life experience and well-being of older people. In the music learning of older people, the cultivation theory can be applied to study the cultivation effect of music learning on the attitudes, beliefs, and values of older people, so the acceptance of online music education by older people group can be increased through the exposure of music courses and online reviews (Calderón-Garrido & Gustems-Carnicer, 2021). Perceived value theory is a behavioral research method in consumer behavior (Watjatrakul, 2020). The theory is that consumers do not calculate the actual value of goods or services and that their decisions to purchase goods are based on perceived value rather than actual value (Molinillo et al., 2021). Social identity theory holds that an individual's self-identity and group identity impact their behavior and attitudes (Watjatrakul, 2020). In older adults' music learning, social identity theory can be used to study the impact of older people's participation in music learning on their social identity, such as a sense of belonging to the music learning community, social support, and social interaction (Kertz-Welzel, 2021). The Technology Acceptance Model describes the mechanisms for the acceptance and adoption of technology (Scherer et al., 2019). In the field of online music education, the perceptual usefulness and ease of online music education are directly affected by the public's willingness to accept online music learning through the technology acceptance model and the influence mechanism and influencing factors of older people in buying and using online music education are obtained through the model and related variables.

Hence, according to the different theoretical approach, table 1 introduce the different variable we will use in this study.

Table 1. Theoretical Basis and Related Variables of Research.

Theoretical Basis	Related Variables	Source
Cultivation Theory	Repeated exposure, Online reviews; Social media receptiveness	Hermann et al. (2023)
Perceived Value Theory	Perceived social media value; Social media knowledge learning willingness	Watjatrakul (2020)
Social Identity Theory	Elderly Community Identity.Online Music Learning Willingness	Mingfang and Qi (2018)
Educational Technology Acceptance Model	Perceived the usefulness of online music learning; Perceived ease of use of online music learning; Online Music Learning Intention	Esteban-Millat et al. (2018)

(**Source:** Made by this Research).

Based on the cultivation theory, the most profound technologies are those that are invisible and weave themselves into the details of everyday life until they become a part of it (Borning et al., 2020). When psychologists studied the neuroimaging of the brains of literate and illiterate people, they found that the two had many ways of doing brain activity, whether they were reading or not, and people who grew up with writing and reading technology had different ways of thinking (Shrum, 2017). Similarly, frequently pushing online music education knowledge to elderly users will also increase their familiarity and acceptance (Allison et al., 2023).

Repeated Exposure refers to the continuous and frequent engagement or interaction with online music learning platforms or resources. Perceived usefulness pertains to the belief that using a particular system, in this case, online music learning platforms, would enhance performance or be beneficial (Mican et al., 2020). Cultivation Theory explains how repeated exposure to online music learning platforms gradually shapes and cultivates the perceived usefulness of such platforms among Chinese older adults by fostering familiarity and perceived competence. The belief that using a particular system, in this case, online music learning platforms, would be free from effort or would be straightforward to use (Waddell & Williamon, 2019). The prolonged exposure to media influences perceptions and attitudes (Ilari, 2013).

Factors such as learner satisfaction, perceived usefulness, attitude, and subjective norms have an impact on learners' willingness to learn (Rajeh et al., 2021). Performance expectations, effort expectations, social influences, motivators, and hedonistic motivation had a positive impact on MOOC learning intentions (Rajeh et al., 2021). Social impact, platform ease of use, and external recommendation significantly affect the willingness to use (Singh et al., 2020).

Perceived Usefulness pertains to the belief that using a particular system, in this case, online music learning platforms, would enhance one's performance or be beneficial (Davis, 1989). Media exposure, in this context, exposure to online reviews, shapes perceptions and attitudes (Hermann et al., 2023). In this case, the regular exposure to positive online reviews can cultivate a heightened perceived usefulness of online music learning platforms among Chinese older adults. The significance of perceived benefit in influencing behavioral intentions (Pan et al., 2022). The regular exposure to positive online reviews can gradually shape the perception that online music learning platforms are easy to use (Pal & Vanijja, 2020).

Perceived Value Theory highlights the significance of perceived benefits in influencing choices and behaviors (Li & Shang, 2020). Online reviews can be seen as communicating the value proposition of online music learning platforms, including their ease of use (Li & Shang, 2020). Positive reviews enhance the perceived value of the platform, of which ease of use is a component. Group norms and shared experiences are positively to affect perceptions (Mingfang & Qi, 2018), while the perceived ease of use as a determinant for technology adoption (Esteban-Millat et al., 2018).

Users tend to accept a new technology when they believe that it can provide a better service or product and be more useful and valuable than existing technology (Esteban-Millat et al., 2018). In the music learning of older people, the theory of perceived value can be used to study the cognitive value perception of music learning by older people, and similarly, by promoting the perceived value of older people on social media, it can improve the interest of older people group in online music learning, change the willingness to learn, and improve their personal growth, physical and mental health and social interaction (Zhu et al., 2020).

H1: *Repeated exposure positively affects the willingness of elderly to use online music learning platforms.*

H2: *Repeated exposure positively affects the perceived the usefulness of online music learning.*

H3: *Repeated exposure positively affects the perceived ease of use online music learning.*

H4: *Online reviews positively affect the willingness of elderly to use online music learning platforms.*

H5: *Online reviews positively affect the perceived the usefulness of online music learning.*

H6: *Online reviews positively affect the perceived ease of use online music learning.*

H7: *Perceived value of social media positively affects the willingness of elderly to use online music learning platforms.*

Perceived Value of social media refers to an individual's assessment of the benefits derived from using social media, relative to the costs or efforts (Yu et al., 2013). The prolonged exposure to media content can influence perceptions and beliefs (Shrum, 2017). The perceived usefulness is crucial for technology adoption (Paiman & Fauzi, 2023). If the value of social media is perceived positively, it can bolster the perceived usefulness of platforms or services discussed within that community (Alalwan, 2022), such as online music learning. When older adults discern high value in social media, especially in the context of learning or gaining information, it stands to reason that they would find platforms promoted or discussed on social media, like online music learning platforms, to be useful. Therefore, this study develops:

H8: *Perceived value of social media positively affects the perceived the usefulness of online music learning.*

The sustained and regular media consumption can mold and shape an individual's perceptions (Mingfang & Qi, 2018). one could argue that the older adults perceive value in social media, due to their continued interactions, the more they might be inclined to believe in the user-friendliness of platforms or services highlighted by social media, like online music learning (Amenuvor et al., 2019). If older adults find considerable value in social media, especially in terms of its capacity to elucidate or simplify complex topics, they might naturally infer that tools or platform recommended or featured on social media, such as online music learning platforms, are similarly user-friendly. Therefore, this study develops:

H9: *Perceived value of social media positively affects the perceived ease of use online music learning.*

A person's attitude towards a technology depends on whether they think that the social group to which they belong also accepts the technology (Zhu et al., 2020). Therefore, in order to improve the acceptance of the willingness of older people to learn music, they must feel the acceptance and support of the people around them, and in the same way, improving the community identity of older people in online music education will promote the acceptance and recognition of older people group on social media music education platforms, and greatly enhance the willingness of older people group to learn online (Morrison & McCutheon, 2019). Therefore, this study develops:

H10: *Elderly community identification positively affects the willingness of elderly to use online music learning platforms.*

Elderly Community Identification refers to the extent to which older adults identify with, and feel a sense of belonging to, a particular community or group of their age cohort, especially in the realm of social media (Woolrych et al., 2022). Individuals often derive their self-concepts from the groups they belong to and adopt group norms and beliefs. If the community emphasizes the value of online music learning, individual members will likely perceive it as useful (Stuart et al., 2022). The perceived usefulness is a critical determinant of technology

adoption. In the context of this hypothesis, the model suggests that older adults' perception of the usefulness of online music learning, influenced by their community identification, will be a pivotal factor in their decision to engage with such platforms (Tsai et al., 2020). Therefore, this study develops:

H11: *Elderly community identification positively affects the perceived the usefulness of online music learning.*

Elderly Community Identification signifies the depth of connection and allegiance older adults feel towards a particular community of their age peers, particularly within the domain of social media (Fu et al., 2022). Perceived Ease of Use denotes an individual's judgment that using a specific system or platform, in this context, online music learning platforms, would be straightforward and devoid of complexity (Stuart et al., 2022). Individuals often define themselves by the groups they associate with and internalize group norms and beliefs (Mingfang & Qi, 2018). Perceived ease of use is a crucial determinant of technology acceptance (Esteban-Millat et al., 2018). Therefore, this study develops:

H12: *Elderly community identification positively affects the perceived ease of use online music learning.*

Perceptual usefulness is defined as the extent to which learners perceive online music platform learning to improve their learning effect (Pal & Patra, 2021). The perceptual usefulness can be used to measure the usefulness of an individual user's perception of an information technology, and if learners believe that using the technology will bring great help to their studies and work, they will change their attitude towards the information technology and increase their willingness to use it (Pal & Vanijja, 2020). If learners find that the effect of work and learning has not been greatly improved after multiple exposure to the platform and technology, it is easy to lose their enthusiasm for the information technology and gradually abandon the use (Król, 2019).

Perceptual ease of use refers to the ease of learning by individual learners using online music platforms (Pal & Vanijja, 2020). The perceived ease of use, as an important factor influencing user technology acceptance, plays an important role in the early stages of user exposure to a new information technology (Pal & Vanijja, 2020). If users perceive that a technology or platform is simple and convenient to use, learners will be more active in exploring the platform or resources, which will help them improve their work performance (Rakic et al., 2020). Therefore, this study develops:

H13: *Perceived the usefulness of online music learning positively affects the willingness of elderly to use online music learning platforms.*

H14: *Perceived ease of use online music learning positively affect the willingness of elderly to use online music learning platforms.*

The behavior of individuals is formed after certain training and cultivation, and the results of this training and cultivation can guide and influence the behavior of individuals, thereby affecting their willingness to accept new technologies (Ho et al., 2020). Among them, repeated exposure alleviates the dilemma of information selection of network users with accurate information push, and quietly changes the user's information cognitive mode and thinking mode, affects the information contact vision of network users, and becomes a hidden force to shape users, therefore, by repeatedly pushing music learning related knowledge for older people on social media, cultivating and increasing the familiarity of older people with music education, and then making older people group perceive the usefulness and ease of use of online music education (Kim & Choudhury, 2021). Finally,

it has an impact on the willingness of older people to learn online music. Therefore, this study develops:

H15: *Perceived the usefulness of online music learning mediates the relationship between the repeated exposure and willingness of elderly to use online music learning platforms.*

H19: *Perceived ease of use online music learning mediates the relationship between the repeated exposure and willingness of elderly to use online music learning platforms.*

In older adults' music learning, if older adults have been educated and trained in the skills of music learning, they are more likely to be inclined to use social media for learning than to oppose or reject the technology (Zeng, 2020). In the same way, older learners who perceive the usefulness and ease of online music learning through online comments in social media will be inclined to use the channel to learn (Mulla, 2022). Older learners' willingness to use online learning platforms is affected by the usefulness of online reviews. Therefore, this study develops:

H16: *Perceived the usefulness of online music learning mediates the relationship between the online reviews and willingness of elderly to use online music learning platforms.*

H20: *Perceived ease of use online music learning mediates the relationship between the online reviews and willingness of elderly to use online music learning platforms.*

In the context of this study, perceived usefulness mainly refers to the perceived benefit when the user purchases the paid course, that is, the user's perceived usefulness level of the learning outcome of the paid course compared to the free course (Pozón-López et al., 2021). At present, in online education services, most platforms will provide users with free courses, so only when users think that the courses, they need to pay are far greater than the free courses, so that users have a higher perceived value and willingness to pay courses (Song & Wang, 2021). Conversely, if the user's perception of the usefulness of the paid course is low, that is, the perceived benefit is less, then the user's perceived value of the paid course will be lower, and the intention to pay for the corresponding course will be lower. Therefore, the perception of learning value in social media by older people affects the usefulness and ease of use of online music education perceived by them, and ultimately changes the willingness of elderly learners to use online music education platforms (Yuan, 2023). Therefore, this study develops:

H17: *Perceived the usefulness of online music learning mediates the relationship between the perceived value of social and willingness of elderly to use online music learning platforms.*

H21: *Perceived the usefulness of online music learning mediates the relationship between the perceived value of social and willingness of elderly to use online music learning platforms.*

Identity is an intricate concept that involves the questioning of the deeper meaning of one's own existence by the individual as a social subject (Fitzgerald, 2020). Identity in the field of psychology is based on self-theory and identity theory, focusing on self-identity, and belonging in the sense of the mind. Essentialism and constructivism express different views of identity. The former believes that identity is pre-existing, clear, and solidified. The latter, on the other hand, sees identity as developing, uncertain, and continuously constructed (Engeness, 2021).

Community learning generally refers to the occurrence of individuals or groups in a community in a natural community context, including both traditional organized, planned, purposeful learning activities carried out in formal settings and unconscious, incidental, self-worth-needed informal learning activities that occur in a community environment (Coy et al., 2021). In this

form of learning, same consciousness, co-master and mutual teacher are the characteristics of common learning in the community, and older people in the community participate in community learning equally and freely based on the common learning interests and needs, communicate and influence each other, change the perception of new things in older people group of the community (Admiraal et al., 2021), affect the perceived usefulness and perceived ease of use of online music education of older people learning group in the community, and then affect their interest and willingness to learn music in social media (Pihlainen et al., 2021). Therefore, this study develops:

H18: *Perceived the usefulness of online music learning mediates the relationship between the elderly community identification and willingness of elderly to use online music learning platforms.*

H22: *Perceived ease of use online music learning mediates the relationship between elderly community identification and willingness of elderly to use online music learning platforms.*

Based on the hypothesis, this research proposes the model to encourage the older adults to use social media for music learning.

3. Research Method

This study uses a combined online and offline questionnaire to survey elderly people aged 60-74 in Shanghai who have experience in learning music through social media (Douyin). By contacting the heads of senior universities and senior communities in Shanghai, questionnaire surveys and collections were conducted among the elderly. Three staff members with survey experience were organized to conduct on-site visits and surveys. A total of 617 valid questionnaires were collected. The questionnaire includes basic information survey (age, gender, education level, familiarity with using social media to learn music), and the second to eighth parts are scale questions about Repeated exposure (6 items) (Dijksterhuis & Smith, 2002; Fang et al., 2007), Online reviews (6 items) (Mudambi & Schuff, 2010; Zhang et al., 2014), Perceived value of social media (6 items) (Kim et al., 2011; Lin & Lu, 2011), Elderly community identification (6 items) (McMillan & Chavis, 1986; Obst et al., 2002), Perceived usefulness of online music learning (6 items) (Davis, 1989; Venkatesh & Davis, 2000), Perceived ease of use of online music learning (6 items) (Venkatesh et al., 2003) , and Willingness of elderly to accept online music learning (6 items) (Chen & Chan, 2014; Venkatesh et al., 2012). After data recovery, the study used data analysis software to conduct descriptive statistical analysis, reliability and validity analysis, confirmatory factor analysis, model fitness analysis, structural equation modeling, path analysis and other methods for data processing.

4. Results

Table 2 encapsulates the fundamental demographic characteristics and variables of the studied population, delineated across gender, age, education level, and familiarity with utilizing social media platforms, specifically Douyin, for music study purposes.

Regarding gender distribution, the table indicates a slight preponderance of female participants, accounting for 55.1% (n=340) of the sample, compared to male participants who constitute 44.9% (n=277). The age range is categorized into three brackets: individuals aged between 60-65 years represent the majority, comprising 45.9% (n=283) of the respondents. Those within the 65-70 years age group form 37.8% (n=233), and a smaller segment of 16.4% (n=101) is attributed to the 70-74 years age bracket. Educational attainment is segmented into

five levels. Participants with an education level below high school represent 19.4% (n=120) of the sample. High school graduates account for 25.3% (n=156), while those with a bachelor's degree constitute 26.4% (n=163). Furthermore, individuals with a master's degree form 17.7% (n=109), and those possessing a Doctorate or higher qualification make up 11.2% (n=69) of the participants. Lastly, the table 2 presents a stratification of respondents' familiarity with using social media platforms for studying music. A proportion of 27.9% (n=172) are slightly familiar, 26.1% (n=161) are moderately familiar, 29.8% (n=184) are very familiar, and 16.2% (n=100) are extremely familiar with platforms like Douyin for the said purpose. Table 2 provides a quantitative overview of the sample's demographic and educational background, along with their proficiency in engaging with modern digital tools for educational enrichment in the realm of music.

Table 2. Essential Information.

		Frequency	Percent
Gender	Male	277	44.9
	Female	340	55.1
Age	60-65	283	45.9
	65-70	233	37.8
	70-74	101	16.4
Education level	Below High School	120	19.4
	High School Graduate	156	25.3
	Bachelor's Degree	163	26.4
	Master's Degree	109	17.7
	Doctorate or Higher	69	11.2
Familiarity with using social media platforms such as Douyin to study music	Slightly familiar	172	27.9
	Moderately familiar	161	26.1
	Very familiar	184	29.8
	Extremely familiar	100	16.2

In Table 3, The Cronbach's Alpha value is 0.963. This is considerably high and is often interpreted as excellent internal consistency. Generally, an alpha value above 0.9 is deemed excellent, between 0.8 and 0.9 is good, between 0.7 and 0.8 is acceptable, between 0.6 and 0.7 is questionable, between 0.5 and 0.6 is poor, and below 0.5 is unacceptable. Therefore, the value of 0.963 confirms that the items in the instrument are highly inter-correlated, suggesting that they reliably measure a common latent construct. In conclusion, the instrument utilized in this study exhibits excellent internal consistency, as evidenced by the Cronbach's Alpha value. This lends credence to the reliability of the results derived from this instrument, strengthening the overall validity of the research findings.

Table 3. Reliability Statistics.

Cronbach's Alpha	N of Items
.963	46

In Table 4, The KMO statistic measures the proportion of variance among variables that might be common variance. The index ranges from 0 to 1, with values closer to 1 indicating that the patterns of correlations are relatively compact and hence factor analysis should yield distinct and reliable factors. In the present study, the KMO =0.962. This is exceptionally high, suggesting that the dataset is highly suitable for factor analysis. Typically, a KMO> 0.8 is

considered meritorious, implying that the data is likely to factor well. The test statistic for Bartlett's Test of Sphericity in this study is a chi-square value of 19,466.616 with 1,035 degrees of freedom. The associated significance value is reported as 0.000. This p-value is well below the commonly accepted alpha level of 0.05, indicating that the test is statistically significant. This means that the correlation matrix of the dataset is significantly different from an identity matrix, thus confirming the appropriateness of the data for factor analysis.

Table 4. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.962**
Bartlett's Test of Sphericity	Approx. Chi-Square	19466.616
	df	1035
	Sig.	.000

Table 5 presents the results of the convergence validity assessment for various latent variables, which are pivotal constructs in the study. Convergence validity is a subtype of construct validity that determines the degree to which multiple items measure the same construct. It is usually evaluated using three metrics: factor loadings, Composite Reliability (CR), and Average Variance Extracted (AVE).

Factor loadings represent the correlations between the observation indicators and their respective latent variables. Typically, factor loadings above 0.7 are considered satisfactory, suggesting that a significant proportion of the variance in the observation indicator is accounted for by the latent variable. Across all latent variables, all observation indicators exhibit factor loadings well above the 0.7 threshold. This implies that each item is a robust indicator of its respective latent construct, underscoring the relevance of these items.

Composite Reliability (CR) is a measure of the internal consistency of the indicators in reflecting the latent variable. A CR value above 0.7 is deemed acceptable, while values above 0.8 are considered good. The CR values for all latent constructs in the study range between 0.904 and 0.928, indicating excellent internal consistency. This suggests that the observation indicators cohesively represent their respective latent constructs.

Average Variance Extracted (AVE) measures the amount of variance captured by a construct in relation to the amount of variance attributable to measurement error. AVE values above 0.5 are considered acceptable, indicating that the construct explains more than half of the variance of its indicators. The AVE values for all constructs are above the 0.5 threshold, with values ranging from 0.611 to 0.683. This provides evidence that a significant proportion of the variance in the observation indicators is captured by the latent constructs.

Table 5. Convergence Validity.

Latent variables	**Observation indicators**	**Factor loading**	**CR**	**AVE**
Repeat exposure	Re1	0.841	0.928	0.683
	Re2	0.764		
	Re3	0.839		
	Re4	0.810		
	Re5	0.828		
	Re6	0.871		
Online reviews	Onr1	0.765	0.904	0.612
	Onr2	0.778		
	Onr3	0.786		

Latent variables	Observation indicators	Factor loading	CR	AVE
	Onr4	0.787		
	Onr5	0.798		
	Onr6	0.778		
Perceived value of social media	Pv1	0.776	0.912	0.634
	Pv2	0.790		
	Pv3	0.841		
	Pv4	0.793		
	Pv5	0.785		
	Pv6	0.789		
Elderly community identification	Io1	0.817	0.919	0.655
	Io2	0.795		
	Io3	0.794		
	Io4	0.818		
	Io5	0.836		
	Io6	0.795		
Perceived usefulness of online music learning	Pu1	0.793	0.904	0.611
	Pu2	0.767		
	Pu3	0.760		
	Pu4	0.793		
	Pu5	0.783		
	Pu6	0.793		
Perceived ease of use of online music learning	Pe1	0.765	0.913	0.637
	Pe2	0.806		
	Pe3	0.811		
	Pe4	0.812		
	Pe5	0.795		
	Pe6	0.800		
Willingness of elderly to accept online music learning	Wo1	0.788	0.923	0.666
	Wo2	0.752		
	Wo3	0.876		
	Wo4	0.790		
	Wo5	0.786		
	Wo6	0.894		

Note: Re: Repeat exposure; Onr: Online reviews; Pv: Perceived value of social media; Io: Elderly community identification; Pu: Perceived usefulness of online music learning; Pe: Perceived ease of use of online music learning; Wo: Willingness of elderly to accept online music learning.

Table 6 presents the results of a discriminant validity analysis involving seven latent variables: Repeat exposure (Re), Online reviews (Onr), Perceived value of social media (Pv), Elderly community identification (Io), Perceived usefulness of online music learning (Pu), Perceived ease of use of online music learning (Pe), and Willingness of the elderly to accept online music learning (Wo). Discriminant validity is assessed by comparing the square roots of the Average Variance Extracted (AVE) for each dimension, shown on the diagonal of the matrix, with the inter-construct correlations, shown off-diagonal. In this matrix, the diagonal elements (bolded for emphasis) represent the square root of the AVE for each latent variable. These values should be greater than the off-diagonal elements in the corresponding rows and columns to satisfy the criteria for discriminant validity. This criterion is based on the Fornell-Larcker criterion, which stipulates that the square root of AVE of each factor should be higher than

its highest correlation with any other factor. For instance, for 'Repeat exposure' (Re), the square root of AVE is 0.826. This value is higher than all its correlations with other variables (0.551 with Onr, 0.604 with Pv, and so forth), indicating that Re possesses discriminant validity with respect to the other variables. A similar pattern is observed for the other latent variables.

Overall, the data in Table 4-6 suggests satisfactory discriminant validity for each of the constructs, as the square roots of the AVEs (diagonal values) are consistently greater than the inter-construct correlations (off-diagonal values). This implies that each latent variable in the study captures a distinct concept or construct, which is not excessively overlapped with the others. Such results are crucial in confirming the adequacy of the measurement model in a structural equation modeling framework.

Table 6. Distinguish Between Validity Tests.

Latent variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Re	0.826						
Onr	0.551	0.782					
Pv	0.604	0.620	0.796				
Io	0.604	0.552	0.604	0.809			
Pu	0.662	0.575	0.643	0.602	0.782		
Pe	0.576	0.575	0.611	0.552	0.636	0.798	
Wo	0.649	0.610	0.640	0.608	0.667	0.642	0.816

Table 7 delineates the confirmatory factor model fit metrics, crucial for evaluating the model's adequacy in the structural equation modeling framework. The table 7 encompasses several fit indices along with their reference standards and the corresponding results obtained. The $\chi 2/df$= 1.851 (<3), indicating a favorable model fit. The Root Mean Square Error of Approximation (RMSEA)= 0.037(< 0.08), pointing to an excellent fit. The Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) measure the variance accounted for by the estimated population covariance, adjusting for the number of degrees of freedom, respectively. The study reports GFI=0.907 and AGFI= 0.895, both surpassing their respective reference standards of greater than 0.9 and 0.85. These indices collectively suggest a satisfactory model fit. Additionally, the Normed Fit Index (NFI) and the Comparative Fit Index (CFI) compare the chi-square value of the model to that of a null model, with values greater than 0.9 indicating a good fit. The study's NFI and CFI values stand at 0.925 and 0.964, respectively, both exceeding the desired threshold and reinforcing the model's robustness. Lastly, the Tucker-Lewis Index (TLI), which compensates for model complexity, shows a result of 0.961, well above the recommended standard of greater than 0.9.

In conclusion, the confirmatory factor model demonstrates an excellent fit across all the evaluated indices in Table 7 and figure 2, each meeting or surpassing the established reference standards. This comprehensive alignment underscores the model's robustness and its aptness in representing the data and the underlying theoretical constructs within the study's framework.

Table 7. Confirmatory Factor Model Fit Metrics.

Fit index	**$\chi 2/df$**	**RMSEA**	**GFI**	**AGFI**	**NFI**	**TLI**	**CFI**
Reference standards	<3	<0.08	>0.9	>0.85	>0.9	>0.9	>0.9
Result	1.851	0.037	0.907	0.895	0.925	0.961	0.964

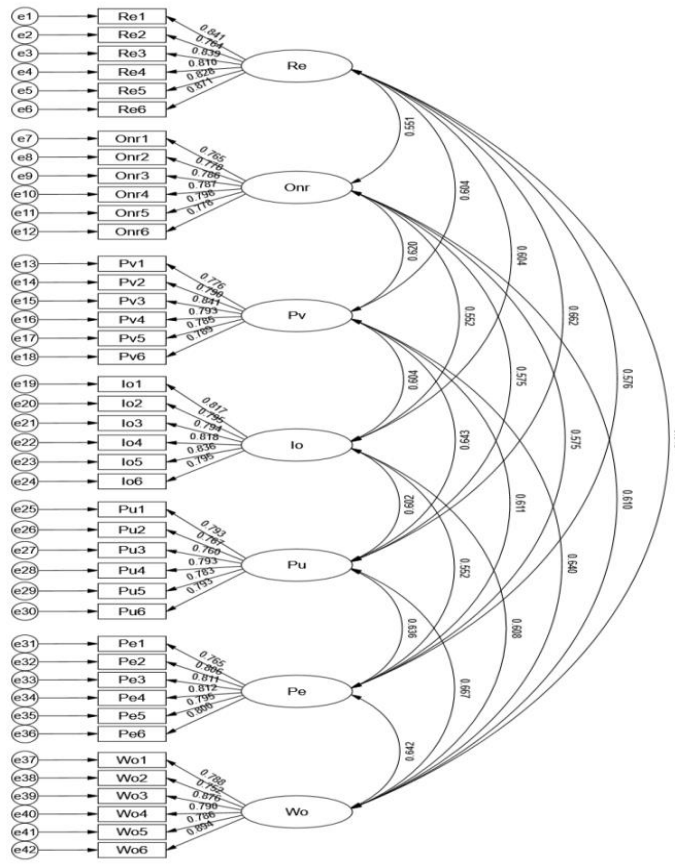

Figure 2 CFA for Measurement Model**.**

Table 8 showcases the results of a fitness analysis of a structural equation model (SEM), employing several key fit indices against established reference standards.

The $\chi 2/df$ =1.879 (<3), suggesting that the model is not overly complex relative to the data. The RMSEA=0.038 (> 0.08) considered satisfactory, indicates a close fit of the model to the data. GFI and AGFI with values of 0.905 and 0.893, respectively, both indices are slightly below the reference standards (>0.9 and >0.85), suggesting a reasonable but not optimal fit. NFI, TLI, and CFI are relative indices comparing the specified model with a baseline model. The NFI, TLI, and CFI values (0.924, 0.960, 0.963, respectively) exceed the desirable threshold of 0.9, indicating that the proposed model provides a better fit to the data than the null model. Overall, the results in Table 8 demonstrate a generally good fit of the SEM to the data, with most indices meeting or closely approaching the recommended standards, thus validating the model's utility in the research context.

Table 8. Model Fit Metrics.

Fit index	$\chi 2/df$	RMSEA	GFI	AGFI	NFI	TLI	CFI
Reference standards	<3	<0.08	>0.9	>0.85	>0.9	>0.9	>0.9
Result	1.879	0.038	0.905	0.893	0.924	0.960	0.963

Table 9 presents the results of hypothesis testing within a structural equation model (SEM), focusing on the direct effects between various constructs.

The hypothesis verification follows a quantitative approach, using path coefficients (β), standard errors (S.E.), critical ratios (C.R.), and p-values to assess the significance and strength of the relationships between variables. Each hypothesis (H1 to H14) tests the direct path from one construct to another.

H1 to H3 test the effects of Repeat exposure (Re) on Willingness (Wo), Perceived usefulness (Pu), and Perceived ease of use (Pe). All three hypotheses are supported with significant β values (ranging from 0.187 to 0.213) and p-values less than 0.001.

H4 to H6 examine the impact of Online reviews (Onr) on the same set of dependent variables. These hypotheses are also supported with significant path coefficients and p-values (0.001 or less).

H7 to H9 focus on the Perceived value of social media (Pv) and its influence on Wo, Pu, and Pe. The results indicate significant positive effects in all cases, with p-values ranging from 0.008 to less than 0.001.

H10 to H12 explore the relationship between Elderly community identification (Io) and the three dependent variables. All hypotheses are supported, with β values showing moderate effects and p-values indicating statistical significance.

H13 and H14 test the effects of Perceived usefulness (Pu) and Perceived ease of use (Pe) on Willingness (Wo), respectively. Both hypotheses are supported, demonstrating significant positive relationships.

Table 9. Structural Equation Model Path Test.

Hypothesis	Path	Estimate	β	S.E.	C.R.	P	Results
H1	Re→Wo	0.162	0.187	0.040	4.005	***	Supported
H2	Re→Pu	0.290	0.326	0.042	6.963	***	Supported
H3	Re→Pe	0.187	0.213	0.043	4.394	***	Supported
H4	Onr→Wo	0.135	0.145	0.041	3.282	0.001	Supported
H5	Onr→Pu	0.139	0.145	0.044	3.187	0.001	Supported
H6	Onr→Pe	0.203	0.214	0.046	4.403	***	Supported
H7	Pv→Wo	0.128	0.131	0.048	2.665	0.008	Supported
H8	Pv→Pu	0.259	0.257	0.050	5.169	***	Supported
H9	Pv→Pe	0.264	0.264	0.053	5.023	***	Supported
H10	Io→Wo	0.110	0.121	0.040	2.756	0.006	Supported
H11	Io→Pu	0.162	0.172	0.043	3.752	***	Supported
H12	Io→Pe	0.139	0.149	0.045	3.075	0.002	Supported
H13	Pu→Wo	0.180	0.185	0.048	3.772	***	Supported
H14	Pe→Wo	0.186	0.189	0.043	4.285	***	Supported

Note: Re: Repeat exposure; Onr: Online reviews; Pv: Perceived value of social media; Io: Elderly community identification; Pu: Perceived usefulness of online music learning; Pe: Perceived ease of use of online music learning; Wo: Willingness of elderly to accept online music learning.***: $p<0.001$.

In summary, the structural equation model's path testing confirms all the hypothesized direct effects, indicating that each independent variable significantly influences the dependent variables. The results underscore the robustness of the relationships within the model, as evidenced by the consistent support across all hypotheses and the statistical significance of the findings, mostly at $p < 0.001$.

Table 10. Mediation Effect Bootstrap Test.

Hypothesis	Mediation path	Effect size	SE	Bias-Corrected 95%CI		Results
H15	Re→Pu→Wo	0.052	0.022	0.014	0.104	Supported
H16	Onr→Pu→Wo	0.025	0.017	0.003	0.073	Supported
H17	Pv→Pu→Wo	0.047	0.022	0.013	0.109	Supported
H18	Io→Pu→Wo	0.029	0.016	0.006	0.071	Supported
H19	Re→Pe→Wo	0.035	0.016	0.010	0.078	Supported
H20	Onr→Pe→Wo	0.038	0.018	0.010	0.084	Supported
H21	Pv→Pe→Wo	0.049	0.021	0.014	0.101	Supported
H22	Io→Pe→Wo	0.026	0.015	0.004	0.064	Supported

Table 10 presents the results of a mediation analysis using bootstrapping, a resampling method used to estimate the sampling distribution of a statistic. The mediation analysis aims to test whether the effect of an independent variable on a dependent variable is mediated by one or more intervening variables.

Bias-Corrected 95% Confidence Interval (CI): Bootstrapping generates a distribution of effect sizes. From this distribution, a 95% confidence interval can be created. If this confidence interval includes zero, it indicates the effect is not statistically significant. The 'Bias-Corrected 95% CI' considers any bias in the estimation of the confidence interval due to the sample data.

Table 10 indicates:

The 95% upper and lower intervals of the "Re→Pu→Wo" mediation path were [0.014, 0.104], excluding 0, indicating that Pu had a significant mediating role between Re and Wo, with an effect value of 0.052. Hence, H15 is supported.

The 95% upper and lower intervals of the "Onr→Pu→Wo" mediation path were [0.003, 0.073], excluding 0, indicating that Pu had a significant mediating role between Onr and Wo, with an effect value of 0.025. Hence, H16 is supported.

The 95% upper and lower intervals of the "Pv→Pu→Wo" mediation path were [0.013, 0.109], excluding 0, indicating that Pu had a significant mediating role between Pv and Wo, with an effect value of 0.047. Hence, H17 is supported.

The 95% upper and lower intervals of the "Io→Pu→Wo" mediation path were [0.006, 0.071], excluding 0, indicating that Pu had a significant mediating role between Io and Wo, with an effect value of 0.029. Hence, H18 is supported.

The 95% upper and lower intervals of the "Re→Pe→Wo" mediation path were [0.010, 0.078], excluding 0, indicating that Pe had a significant mediating role between Re and Wo, with an effect value of 0.035. Hence, H19 is supported.

The 95% upper and lower intervals of the "Onr→Pe→Wo" mediation path were [0.010, 0.084], excluding 0, indicating that Pe had a significant mediating role between Onr and Wo, with an effect value of 0.038. Hence, H20 is supported.

The 95% upper and lower intervals of the "Pv→Pe→Wo" mediation path were [0.014, 0.101], excluding 0, indicating that Pe had a significant mediating role between Pv and Wo, with an effect value of 0.049. Hence, H21 is supported.

The 95% upper and lower intervals of the "Io→Pe→Wo" mediation path were [0.004, 0.064], excluding 0, indicating that Pe had a significant mediating role between Io and Wo, with an effect value of 0.026. Hence, H22 is supported.

After the structural equation model (Figure 2) is established, the estimated value of the detection path, the standardized path coefficient, the standard error S.E., C.R. value and the significance P value are obtained through the model fitting and measurement of the software. In general, if the decision value C.R. is greater than 1.96, and the p value is less than 0.05, it can be considered that this path coefficient can pass the significance test within the 95% confidence interval, indicating that the corresponding path hypothesis of the preset model is true; Otherwise, the assumption is not true.

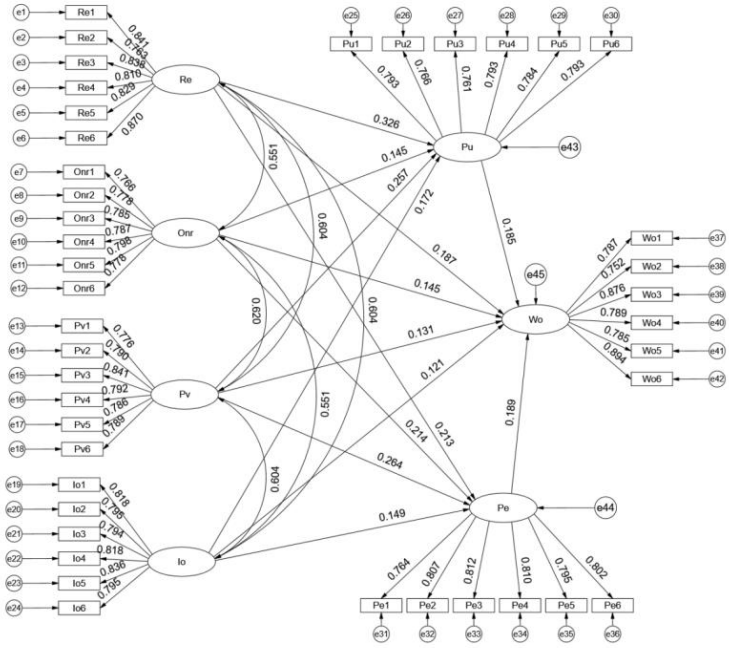

Figure 3. Path Diagram for the Structural Model (With Hypotheses).

5. Discussion

This research innovatively integrates Cultivation Theory, Perceived Value Theory, Social Identity Theory, and the Technology Acceptance Model (TAM) to explain the online learning intentions of Chinese older adults. This unique combination allows for a more holistic view, moving beyond the traditional, singular theoretical approaches. Particularly, the application of Social Identity Theory in this context provides new insights into how the identification within elderly communities impacts their engagement with online learning platforms.

The results from the study empirically validate the constructs drawn from the combined theoretical framework. This not only reinforces the individual theories but also substantiates their collective relevance in understanding the dynamics of online learning intentions among the elderly. The direct impacts of variables such as perceived value and online reviews on willingness to engage in online music learning underline key principles of Perceived Value Theory and Cultivation Theory, particularly within the realm of digital education. The study

extends TAM by incorporating variables like Repeat exposure and Elderly community identification, highlighting the significance of social elements and contextual factors in technology adoption among older adults. This adaptation of TAM to a more mature audience challenges and enriches the traditional application of the model, predominantly focused on younger users. The mediation effect analysis reveals the crucial roles of perceived usefulness and ease of use as mediators in online music learning for older adults. This not only aligns with TAM's core propositions but also expands its scope by empirically demonstrating these mediation effects in a new demographic and context, enriching the existing literature on technology acceptance.

Focusing on Chinese older adults, the study contributes to the body of knowledge in technology acceptance by underscoring the influence of cultural and social factors in technology adoption in this specific demographic. This aspect of the research is particularly vital, offering insights into global variations in technology acceptance and the importance of considering demographic-specific factors. In essence, the study offers significant theoretical contributions by demonstrating the applicability and interplay of various theoretical frameworks in understanding online learning intentions among older adults. It also highlights the importance of cultural context and demographic specificity in technology acceptance research, providing a foundation for future studies in this area. This study highlights key factors that influence older adults' willingness to engage in online music learning. Educational technologists and e-learning content providers can leverage these insights to design more effective and user-friendly online learning platforms. Understanding the role of perceived usefulness and ease of use can guide the development of more intuitive interfaces and instructional designs that cater to the specific needs of older learners. Additionally, the importance of repeat exposure suggests that regular, engaging content updates could enhance user engagement.

The findings underscore the need for policies and programs that encourage and facilitate online learning among older adults. Policy makers and educational institutions could use these insights to develop targeted initiatives aimed at increasing digital literacy and reducing technological barriers for the elderly. By recognizing the significant role of social identity and community in technology acceptance, these initiatives could include community-based programs that foster a sense of belonging and support among older learners.

The research demonstrates the influence of social media in shaping older adults' learning intentions. This presents an opportunity for social media platforms to play a more active role in promoting educational content. By curating and highlighting educational resources, especially in music learning, these platforms can become valuable tools for lifelong learning. They can also design features that enhance the perceived value of educational content and facilitate positive online reviews, further encouraging learning engagement among older users.

For the elderly population, this research validates the feasibility and benefits of engaging in online learning. It provides them with the assurance that online platforms can be user-friendly and valuable in their pursuit of lifelong education. The study also encourages older adults to explore online learning communities, where they can find social support and a sense of identity, enriching their learning experience.

In summary, the practical implications of this research are far-reaching, offering significant benefits to various stakeholders involved in the realm of online education and elderly learning. By addressing the specific needs and preferences of older adults, these stakeholders can

effectively facilitate and enhance the online learning experience for this demographic, promoting lifelong education and digital inclusivity.

6. Conclusion

This study, focusing on the impact of social media on online music learning intentions among Chinese older adults, has yielded significant findings. By integrating Cultivation Theory, Perceived Value Theory, Social Identity Theory, and the Technology Acceptance Model, the research provides a comprehensive understanding of the factors influencing older adults' engagement with online music learning. There are strong direct effects of variables like repeat exposure, online reviews, and perceived value on the willingness to engage in online music learning. Perceived usefulness and ease of use have significant mediation effects in the relationship between the independent variables and the willingness to accept online music learning. The study highlights the multifaceted influence of social media on online music learning intentions, considering factors such as community identification and perceived value.

While this study contributes significantly to the field, it is not without its limitations, which open avenues for future research. The study focuses exclusively on Chinese older adults. Future research could explore similar models in diverse cultural and demographic contexts to understand the global applicability of the findings. The cross-sectional nature of the study limits the ability to infer causal relationships. Longitudinal studies could provide deeper insights into how these relationships evolve over time. While the study incorporates several important variables, the inclusion of additional factors, such as personal innovativeness, digital readiness, or emotional factors, could offer a more comprehensive view. With the rapid evolution of technology, future studies should consider the impact of emerging digital platforms and learning tools on older adults' learning intentions. Practical interventions based on the findings could be implemented and studied to empirically assess the effectiveness of targeted strategies in enhancing online music learning among older adults.

In conclusion, this research sheds valuable light on the factors influencing online music learning intentions among Chinese older adults, providing both theoretical and practical insights. The study's findings have important implications for educational practitioners, policy makers, and the elderly population, advocating for tailored approaches to facilitate and enhance online learning experiences. Future research should build upon these findings, exploring broader contexts and incorporating evolving technological trends to further enrich our understanding of lifelong learning in the digital age.

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Visualization: Runchun Ma, Jirawan Deeprasert, Songyu Jiang
Writing – original draft: Runchun Ma, Jirawan Deeprasert, Songyu Jiang
Writing – review & editing: Runchun Ma, Jirawan Deeprasert, Songyu Jiang

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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