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How does the same piano piece have a different impact on the mood of different age groups and different genders?

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Abstract:

Research on *Emotions Influenced By External Factors* is developing in the field of music therapy. This study aims to investigate the different emotional changes experienced by participants of different ages and genders when listening to the same piece of piano music. Participants will complete an emotional scale questionnaire (options include calmness, excitemend, anger, happiness, sadness) after listening to the same stimulus (the piano piece). The results will be analyzed through a paired t-test and presented graphically. The study finds that women tend to experience more positive emotions than men. Furthermore, there are significant differences in emotional responses between different age groups, particularly with regard to how older adults react emotionally to music. These findings suggest that the same piece of music can resonate differently with various demographic groups, playing a positive role in music therapy.

Keywords: emotionn—music—age-music psychology—music therapy—research

Introduction

Music, an ancient emotional connector, has the power to express and convey feelings as posited by Thayer Gaston (1968), the pioneer in music therapy. His work, including '*Music in Therapy'*(1968),has laid a strong foundation for understanding how different people can be emotionally affected by the same piece of music, thereby validating its therapeutic application.

For most individuals, music serves a number of practical purposes including: relieving boredom, alleviating tension, increasing energy, and providing a distraction from concerns (Hallam, 2010). Additionally,it has been suggested that music facilitates developmental and psychosocial tasks through fulfilment of individual and social motivations (Miranda & Claes, 2009; Schwartz & Foots, 2003). For example, music aids self-actualisation, identity formation, and coping strategies, while also promoting a sense of belonging and social integration with peers (Arnett, 1995; Baka Giannis & Tarrant, 2006; Larson, 1995; North & Hargreaves, 1999). Saar Kallio and Ekila (2007) identified two, perhaps more directly, aims to motivat people's musical engagement: feeling good and controlling mood. Having understood the general purposes of music for individuals, it is worthwhile to delve further into investigating how piano compositions elicit various emotional responses from different people.

The research objective herein is to explore how the same piano composition elicits various emotional responses from participants of different age brackets and genders; to investigate the potential associations and influencing factors between music and emotions; and to provide empirical evidence for the application of music therapy. This study employs empirical research methods, utilizing carefully selected piano pieces as stimuli to test subjects of differing ages and genders. Through observing and documenting the emotional reactions of participants, combined with relevant statistical and analytical techniques,this essay aims to thoroughly examine the intricate relationship between music and emotion.

2.Literature Review

2.1 What is emotion?

In the field of emotion recognition and expression, the prominent scholar Paul Ekman (1994) forwarded the basic emotions theory, suggesting that an emotion embodies an organized and highly structured response to an event that holds relevance for an organism's needs, goals, or survival. By contrast, William James' theory (1884) conceptualized emotion as a cognitive appraisal of bodily changes. The Cannon-Bard theory (1927) posits that emotions are the concurrent outcome of the brain's central processing of stimulus information and generation of physiological reactions, with emotional experiences and physiological arousal occurring as two distinct yet simultaneous processes. In the book '*How Emotions Are Made: The Secret Life of the Brain'*, the author Barrett(2017) chanllenged the notion that emotions are pre-programmed biological responses. Instead, she asserts that emotions are dynam-

ically constructed subjective experiences through the brain's predictive and interpretive process, as well asconceptualization.

In the field of psychology, the categorization of emotions constitutes an evolving research topic where various scholars have proposed distinct systems for classifying emotions. Ekman's (1992) work '*Emotions Revealedf'*posits six fundamental human emotions that are universal: happiness, sadness, fear, anger, surprise, and disgust. Subsequently, in his (1994) study titled '*The Nature of Emotion'*, he further refined this classification by emphasizing the dichotomy of emotions into positive (e.g., happiness) and negative (e.g., sadness and anger) categories. Meanwhile, Pletcher's (1980)book,*Emotion: A Psych evolutionary Synthesis,'*introduces a polygonal model encompassing eight primary emotions, suggesting these emotions can manifest in varying degrees and combine with one another. Concurrently, from ancient Chinese medical and philosophical texts such as the '*Huangdi Neijing'*, \the concept of '*Seven Emotional States'* (Qing), comprises joy, anger, worry, pensiveness, sadness, fear, and shock, which are considered significant psychological factors influencing both physical and mental well-being. This research primarily adopts Ekman's (1994) findings to contribute towards a deeper understanding and enhancement of the role piano music plays in psychotherapy.

2.2 Introduction and Development of the Piano

The piano, a cornerstone of modern keyboard instruments, was ingeniously invented around 1700 by Italian harpsichord maker Bartolomeo Cristofori. Combining features of the harpsichord and clavichord, he created an instrument capable of dynamic expression, known as the "gravicembalo col piano e forte" (Citation: Cristofori, B.). This innovation has laid the foundation for today's piano. Over centuries, advancements in Germany by inventors like Johann Andreas Stein and John Broadwood refined its hammer action, tonal range, and volume, culminating in mass production during the late 19th to early 20th century alongside industrial progress (Good&Bozarth, 2016). As a result, pianos became integral to concert performances, education, and home entertainment (Parakilas, 1999), transcending classical music to influence popular genres such as jazz and pop.

2.3 Music and Emotion: Summary of Previous Research

Of all the problems that may confront a music psychologist, none is perhaps more important than explaining listeners reactions to music. Some kind of musical experience is the basis for every musical activity, regardless of whether it involves composing, performing, or listening to music. Several studies have suggested that the most common goal of musical experiences is to influence emotions: people use music to change emotions, to release emotions, to match their current emotion, to enjoy or comfort themselves, and to relieve stress (e.g., Behne 1997; Juslin & Laukka 2004; Sloboda & O'Neill 2001; Zillman & Gan 1997).

In Västfjäll, Juslin and Hartig(2012)paper, they discussed an experiment concerning emotional synchrony and resonance. This study has reviewed several research projects, including the Sadness in Music study, emphasizing the necessity of considering underlying mechanisms when understanding the emotional responses elicited by music. The review highlighted that music can effectively trigger listeners' emotional reactions, known as "emotional contagion", through methods such as self-reports and physiological measures. In the realm of psychological experimentation, piano pieces have consistently demonstrated their distinctiveness in evoking a variety of emotional shifts. Juslin and Laukka (2004) conducted research examining the processes of musical expression, perception, and emotion induction. Their study involved investigating how different styles of piano compositions impact listeners' emotions, for instance, ascending melodies often evoking positive and uplifting emotions in listeners, whereas descending melodies tend to prompt feelings of sadness or contemplation; complex rhythmic structures can stimulate a sense of tension, curiosity in the audience, while gentle rhythms are more likely to bring about soothing and calming effects. These examples also illustrate distinctive attributes of music.

Moreover, Eerola and Vuoskoski (2011) employed piano music as stimulus material in their study, elucidating how the encoding of various emotional contents within music is multi-dimensional and intricate. For instance, by analysing works like Bach's 'Goldberg Variations', they revealed how music can instigate a sequence of complex emotional experiences through its dynamic changes.

Furthermore, Gabrielson and Lindström (2010) in their article delved into the ways in which the structure of music impacts emotional expression and perception, incorporating case analyses of various instrumental performances, with a particular emphasis on piano compositions. Their findings underscored the pivotal role played by structural elements within piano pieces, such as thematic development, tonal shifts, and contrasts in dynamics, in eliciting specific emotions in listeners.

2.4 The Influence of Gender and Age on Emotional Response Differences

In the field of research examining how music affects the

emotions of males and females, numerous renowned psychologists have greatly enriched our understanding of the association between music and emotions, providing valuable theoretical guidance for the effective application of music in everyday life. Thompson and colleagues (2011) conducted a study which indicated that there existed a significant difference in the interaction between music tempo and emotional responses in men and women. According to their findings, faster musical tempos tend to evoke more positive emotions such as excitement and energy in males. On the other hand, slower tempos were found to be more likely to induce positive emotional reactions among females, often resulting in feelings of calmness and relaxation.

There are also some studies about age differences of music therapy. Juslin and Västfjäll's (2008) research delved into the differential emotional responses to various types of music among different age groups. They highlighted that even toddlers aged 3 or 4 years may possess the ability to discern basic emotions conveyed in music. The elderly showed a higher emotional response only to familiar music, whereas young people exhibited a rich array of emotional reactions to different pieces.

Collectively, these psychologists' research demonstrates that there are significant gender and age differences in the way music influences the emotions, with such disparities closely related to musical elements like rhythm and melody and influenced by a combination of cognitive, physiological, and behavioural responses, which is worth further exploration.

2.5 Uniqueness and Significance of the Study

In summary, there are abundant studies about the impact of music on emotions. A number of researchers also conducted research on gender differences in this field, but few studies related to age differences can be seen. Therefore, the current research is able to fill the gap by analysing different age groups.

3.Methodology

3.1 Design

The study employed experiments, which yield robust scientific evidence, including through the control of variables to precisely investigate causal relationships, enhance data accuracy and research reliability, and support the validation of theories as well as the discovery of new insights.

The experimental design adopted in this study is a 2 (Gender) × 7 (Age Groups) Mixed Design. In this design, two independent variables are manipulated to examine their effects on the dependent variable. The first independent variable is Gender, which has two categories: Male and Female. Participants will be assigned to either of these groups based on their biological sex, allowing for an examination of how gender differences might influence the outcome. The second independent variable is Age Group, which consists of seven distinct categories: 4-8 years old, 9-13 years old, 14-18 years old, 19-25 years old, 26-35 years old, 36-45 years old, and participants who are over 45 years old. This categorization enables us to investigate how age influences the variable of interest across different developmental stages and life periods. The dependent variable under scrutiny is Emotional Response, which will be measured using well-validated emotional scales. These scales are designed to assess various dimensions of emotions and provide quantitative data on participants' emotional reactions to the stimuli or situations presented in the experiment. The aim is to determine whether and how the variables of Gender and Age Group impact the Emotional Response observed in the study population.

Hypothesis:

• There are significant emotional differences in age and gender when listening to the same piano piece.

3.2 Participants

The study observed 210 participants residing across various regions in China, with an equal number of males (n=105) and females (n=105). The age groups ranged from 4 to 8 years old up to those aged 45 and above. The research employed a stratified sampling method to contrast emotional response differences among the subjects. Sampling was conducted adhering to the principle of representativeness through multiple channels, recruiting community members, school students, and participants from different age brackets at senior activity centres, ensuring that each age group had a proportionate representation of both genders. All participants were required to complete the "NEO Personality Inventory (NEO-PI)", (more details see the following section) to ensure that the results were not confounded by potential sources of interference, all participants were verified as being in good mental and physical health, with stable emotions. This screening process excluded any factors that could potentially impact the experimental outcomes.

3.3 Materials

NEO-PI for screening participants

In the present study, it utilized the Simplified Chinese version of the Big Five Personality Inventory revised by Yang (1996), which consists of approximately 60 items designed to provide a comprehensive assessment of the five major personality dimensions: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability. The original version of this scale is an important

development derived from the work of American psychologists Paul T. Costa and Robert R. McCrae, who refined and advanced it during and following the late 1980s.

Subsequently evolved as NEO-PI, this comprehensive inventory comprises a series of items that probe an individual's propensity to experience a variety of emotional reactions, including tension, anxiety, depression, irritability, and self-doubt. Participants were instructed to rate their level of agreement with various statements based on personal experiences, exemplified by statements such as "I frequently feel tense and anxious" or "Even under high pressure, I usually remain calm."

The rating was conducted using a Likert-scale format ranging from "strongly agree" to "strongly disagree," with each response corresponding to a specific numerical value. Among these, the score for Emotional Stability was obtained through the statistical aggregation of scores pertaining to relevant questions. In the context of their study's interpretive framework, higher scores ($S \geq 39$) indicate lower levels of Emotional Stability, while lower scores ($S \leq 20$) potentially suggest heightened Emotional Stability. Consequently, this research focused on analysing the intermediate score range ($20 < S < 39$).(see appendix 1).

Pre-listening/Post-listening Scales

The design of these two scales aimed to collect personal information and the emotional states of participants before (after) listening to music. The questions divided into two sections: The first part was the basic information section, which gathered essential details such as participant ID numbers, age range, and gender. The second part comprised the pre-listening (post-listening) emotional assessment where participants were asked about their emotional state prior to (following) the music experience, including the levels of calmness, excitement, anger, happiness, and sadness they felt. Participants were required to rate their emotional experiences during the music listening process using a 1-to-5 scale. These questions were adapted from affective scales, such as the Positive and Negative Affect Schedule (PANAS), which was originally proposed by Watson and Tellegen (1988). The Music Therapy Process Scale (MTPS) is widely utilized in the course of music therapy for assessing diverse changes and advancements. It was first introduced by Alberto Bruscia in 1985, and its design and application within the field have sience been extensively expounded upon, as detailed in Alberto Bruscia(1989) publication titled *'Defining Music Therapy'*.

In the post-listening scale, an additional section for investigating the frequency at which participants listened to piano pieces, whether they had any background in music learning or performance, and their specific emotional experiences and changes brought about by the particular piano piece were designed. This part provided in-depth qualitative descriptions complementing the quantitative evaluation (see appendix 2 and 3).

Piano Piece

In this study, the selected stimulus was a piano composition titled "Paysage (Poco adagio)" by Franz Liszt. The choice of this particular piece is predicated upon its suitable duration of five minutes and five seconds, which makes it highly appropriate for the intended research purposes. Furthermore, the piano work adeptly employs various musical elements such as melody, rhythm, and harmony to vividly illustrate the process of transitioning from one emotional state to another (see appendix 4).

Informed Consent Form

In this scholarly endeavour, ethical considerations and the protection of participants' rights in psychological research were addressed through the implementation of a rigorous informed consent process. The informed consent form, which constitutes a pivotal instrument in this study, was meticulously designed to guarantee that participants attained a comprehensive understanding of the research's aims, its detailed content, the potential risks involved, as well as the possible benefits they might accrue, coupled with their explicit rights and obligations. (see appendix 5).

3.4 Procedure

The experiment comprised three stages: pre-test, music exposure, and post-test:

Pre-test Stage: First, potential subjects complete NEO-IP. Those who met the eligibility criteria proceed to the formal experiment. The purpose of the study was verbally explained to them, and they were then asked to sign an informed consent form. Subsequently, each eligible participant was assigned a consistent identifier number, and they were provided with the pre-listening scale (which was accessed by scanning a QR code).

Music Exposure Stage:in a standardized environment, all participants listened to the same pre-selected piano piece individually, with consistent sound quality and volume, and controlled external environmental variables to minimize interference from extraneous variables.

Post-test Stage: Immediately following music exposure, participants completed the Post-listening Scale to record their immediate emotional reactions. Announce the end of the experiment and thank everyone.

3.5 Data analysis

After collecting the data of the Emotional Scales, the statistical data were arranged in excel, and then the data of paired-t test were uploaded with the SPSS software, analysed and the final results were obtained

4. Results

The analysis was conducted using the results from Emotional Scales, which was collected online through participants filling it out and subsequently integrated into tabular form. Subsequently, a paired t-test was employed for the analysis, and the outcomes were presented in graphical form.

4.1 The results of all the participants

Table 1 Results of Paired t-Test Analysis

Name	Paired (Mean ± Standard Deviation)		Difference	*t*	*p*
	Pre-test	Post-test			
Calm	4.076±0.866	3.162±0.898	0.914	10.505	0.000***
Excited	1.890±0.849	3.095±1.022	-1.205	-13.299	0.000***
Angry	1.024±0.181	1.014±0.154	0.01	0.576	0.565
Happy	3.710±0.900	4.057±0.873	-0.348	-4.139	0.000***
Sad	1.024±0.206	1.052±0.342	-0.029	-1.029	0.305
* p<0.05 ** p<0.01 *** p<0.001					

According to the results of this study, a total of 5 sets of paired data on emotional changes across all participants were analysed, first demonstrating that music has an impact on emotions and further substantiating that the selected piece influenced three specific emotions (calm, excite, and happy) in them(p<0.001).

4.2 The results of different gender

Table 2 Results of Paired t-Test Analysis on males and females

Gender	Name	Paired (Mean ± Standard Deviation)		Difference	*t*	*p*
		Pre-test	Post-test			
Male	Calm	4.038±0.865	3.105±0.876	0.933	7.846	0.000***
	Excited	1.943±0.886	3.295±0.929	-1.352	-10.715	0.000***
	Angry	1.010±0.098	1.019±0.195	-0.01	-0.446	0.657
	Happy	3.676±0.946	4.000±0.855	-0.324	-2.573	0.012*
	Sad	1.000±0.000	1.057±0.412	-0.057	-1.421	0.158
Female	Calm	4.114±0.870	3.219±0.920	0.895	7.015	0.000***
	Excited	1.838±0.810	2.895±1.073	-1.057	-8.196	0.000***
	Angry	1.038±0.237	1.010±0.098	0.029	1.135	0.259
	Happy	3.743±0.855	4.114±0.891	-0.371	-3.322	0.001**
	Sad	1.048±0.290	1.048±0.255	0	0	1
* p<0.05 ** p<0.01 *** p<0.001						

According to the results displayed in the table, this study reveals that there are significant changes in all three emotions (calm, excited, and happy) among males and females after listening to the same piano piece. However, a difference emerges in the experience of happy, where the p-value for females (0.001) is notably lower than that of males (0.012), thereby providing evidence that the impact on happiness is more statistically significant in females.

4.3 The results of different age groups

In the present study, a total of five pairs of data were collected, out of which three demonstrated statistically significant differences ($p < 0.05$). Consequently, this section will proceed to conduct a comparative analysis on these three distinct experimental datasets.

Table 3 Results of Paired t-Test Analysis on different ages

Age	Name	Paired (Mean ± Standard Deviation)		Difference	*t*	*p*
		Pre-test	Post-test			
4-8years old	Calm	4.000±1.114	3.433±0.858	0.567	2.288	0.030*
	Excited	2.033±0.964	2.767±1.104	-0.733	-2.796	0.009**
	Happy	3.467±0.860	3.933±0.907	-0.467	-1.919	0.065
9-13years old	Calm	3.900±0.960	3.200±0.887	0.7	2.616	0.014*
	Excited	1.833±0.791	2.933±1.081	-1.1	-4.235	0.000***
	Happy	3.667±1.124	4.100±0.923	-0.433	-1.632	0.114
14-18years old	Calm	4.000±0.743	3.267±0.740	0.733	4.626	0.000***
	Excited	2.033±0.999	3.200±0.847	-1.167	-5.43	0.000***
	Happy	3.667±0.711	4.100±0.759	-0.433	-2.443	0.021*
19-25years old	Calm	4.100±0.759	3.167±0.950	0.933	4.731	0.000***
	Excited	1.900±0.712	3.200±0.925	-1.3	-6.04	0.000***
	Happy	3.700±0.877	4.200±0.887	-0.5	-2.289	0.030*
26-35years old	Calm	4.000±0.830	3.067±1.048	0.933	3.558	0.001**
	Excited	1.800±0.714	3.300±1.179	-1.5	-6.165	0.000***
	Happy	3.800±0.805	3.767±1.006	0.033	0.143	0.887
36 to 45 years old	Calm	4.200±0.761	2.967±0.850	1.233	5.656	0.000***
	Excited	1.767±0.817	3.200±0.925	-1.433	-6.277	0.000***
	Happy	3.933±0.944	4.100±0.845	-0.167	-0.681	0.502
Over 45 years old	Calm	4.333±0.844	3.033±0.928	1.3	5.635	0.000***
	Excited	1.867±0.937	3.067±1.048	-1.2	-4.871	0.000***
	Happy	3.733±0.944	4.200±0.761	-0.467	-2.971	0.006**
* p<0.05 ** p<0.01 *** p<0.001						

The paper presented that the data within the table significantly showed that for participants aged 14 years and over, their P-value (p = 0.000) was lower than that of the 4–8-year-old participants (p = 0.030), thereby proving that following the listening to the experimental piano music stimulus, the impact on calm emotions was more evident among those aged 14 years and above in comparison to those aged between 4 and 13 years. Furthermore, with regard to the emotion of excitement, the P-value (p = 0.000) for the cohort aged between 9 and 45 years and above had been lower than that of the 4–8-year-olds, indicating a greater influence on excitement among the older age bracket at the time. Concerning the emotion of happiness, the most substantial effect was found in participants who were 45 years and above (p = 0.06), succeeded by those aged 14-18 years (p = 0.021), and then those in the 19-25 years age group (p = 0.030).

4.4 Subjective feeling

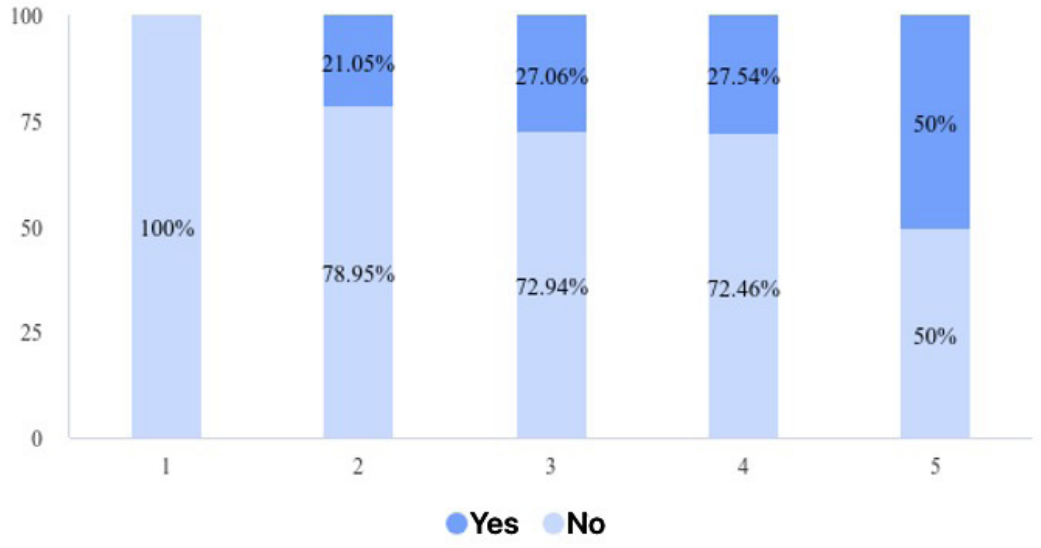

Table 4 Subjective feeling of participants with a background in learning or playing the piano(The numbers 1 through 5 denote the intensity levels of emotional change.)

The results depicted in the bar chart provide evidence indicating a clear association between the emotions of participants and their possession of either a learning or piano performance background. More accurately, the intensity of emotional fluctuations increases as the experiential accumulation among participating individuals grows.

5.Disscussion

In this part, a concise overview will be furnished concerning the varying emotional effects of listening to a specific piano composition across distinct age demographics and genders, with certain noteworthy results set for an extensive discourse. The research further explores the fundamental connections and contributing factors between music and emotions, thus furnishing empirical proof for the application of music therapy.

This research firstly found that the music played caused all participants to feel excited and calm. People's emotional responses to music were predicated upon three main factors: musical structural features, personal emotional memory and cultural background, as well as personality traits and psychological states. These elements intertwine to shape our perception and emotional experience of music. Primarily, structural characteristics such as melody, rhythm, timbre, and dynamic shifts play a role; distinct features can evoke varied emotional reactions – for instance, rapid tempos often correlate with feelings of joy or excitement, while slow and gentle melodies might elicit sensations of calmness or sadness (Dowling & Harwood, 1986).

In the research experiment, the piano music titled *PAYSAGE* was known for its varied and expressive melodic characteristics, which exuded a flowing, lyrical quality that effectively infected subjects with a sense of calm, leading to significant changes in their emotional state. The underlying rhythm of the piece did not mimic the leisurely pace of pastoral life but instead adopted a relatively slow tempo, interspersed at times with a weighty feel, thereby conveying a deeper emotional experience. Approaching the end of the composition, there emerged a small climax in the music, where the fluctuations in rhythm and melody not only demonstrated the dynamic evolution of the musical structure but also signified the transition from accumulated to heightened emotions experienced by the subjects, thus resulting in variations in their excitement levels. Secondly, personal emotional memory and cultural context encompassed individual experiences, emotional recollections, and their cultural and social milieu, which also influenced how people interpret and emotionally respond to music. A particular piece might evoke specific emotional memories in an individual, leading to intense emotional reactions (Zhang 2013). For instance, in the experiment, a 45-year-old participant named May experienced vivid recollections of her idyllic childhood days spent gardening with her grandparents in the countryside while listening to the piano piece, leading to an unusually heightened sense

of happiness. Lastly, personality traits and psychological states were at play. Listeners' personality characteristics, like openness and neuroticism levels, along with their current psychological conditions, can alter the effects of music-induced emotions(Smith & Johnson, 2019). This study's theoretical framework lended support to the experimental results obtained in this research, where all participants completed the "Big Five Personality Inventory" prior to the commencement of the experiment. Through this process, subjects were screened based on their scores pertaining to neuroticism (emotional stability), openness, extraversion, agreeableness, and conscientiousness, ensuring they met the criteria for inclusion in the experiment. The experimental data revealed significant responses across all three major emotions(calm, excited and happy) among the participants, thereby substantiating the validity of the experiment.

The second finding indicated that while both males and females were influenced by positive emotions (calm, excited and happy) after listening to piano pieces with positive connotations, it is evident that females exhibited a more pronounced experience of happiness compared to males. Liu & Pell (2012) reference several studies suggesting that women might be more sensitive in emotional recognition and expression, a characteristic which could potentially manifest in their interpretation and experience of the emotional content within music. In analogous situations, women demonstrated a greater reduction in cortisol (a stress hormone) levels through listening to music than men, implying that they may derive a heightened happy mood-regulating from musical engagement (Thomas et al., 2012). However, for males, studies have shown that men may have a stronger emotional resonance with music genres that feature strong rhythms, pronounced intensity, and an adventurous spirit, such as rock music, electronic dance music, or heavy metal (North & Hargreaves, 1999). In this research, the use of piano pieces would therefore likely provide further support to the heightened sensitivity of females to happy emotions.

The final finding that emerged from the study highlighted the subtle variations in emotional influence across different age brackets. Upon examining past data presented in tables, it was observed that children aged 4-13 years, when compared to other age groups post-listening to the same piano piece, demonstrated a lesser impact on their calmness and excitement levels. This observation was attributed to their past stage of brain development where, during early childhood, the prefrontal cortex and temporal lobes in 4–13-year-olds were not fully developed. The areas responsible for intricate emotional processing and sophisticated social cognitive functions had yet to reach full maturity at that time. As these children grow older, they will have potentially developed a higher capacity for emotional recognition (Blair, 2003). Secondly, based on the data from the above table, it was discerned that the impact of happy emotions was most pronounced in participants aged 45 years and older, followed by those in adolescence (14-18 years) and early adulthood (19-25 years). As age advanced, older adults increasingly focused on positive emotions (Charles & Carstensen, 2010). Past research indicated that personalized piano lessons for older adults improved their executive functions and working memory, and throughout the learning process, they generated positive emotional experiences, particularly in arousing feelings of happiness (Bugos et al., 2007). However, Carstensen (2006) concurrently pointed out that the pattern of emotional experience in older adults' changes with advancing age, with a possible decline in the functioning of brain regions responsible for emotion processing. Furthermore, the dopamine system might deteriorate, and dopamine, a neurotransmitter associated with pleasure, could be less effective. Although these two theories seem contradictory, it is plausible that in this study, the lack of a wider age distribution among participants aged 45 years and over might have precluded the verification of the latter theory.

For early adolescence (14-18 years), the impact of happy emotions was marginally stronger compared to late adolescence and young adulthood (19-25 years), though the difference was not substantial. During this period, the brain is undergoing rapid development, particularly in areas such as the prefrontal cortex and the limbic system, which are closely related to emotional regulation and perception (Blakemore & Choudhury, 2006). The asynchronous development of these regions might cause adolescents to be more susceptible to intense piano pieces, resulting in heightened emotional responsiveness. In the comparative analysis of the study data, it was found that adults aged 26-35 and middle-aged individuals aged 36-45 experienced similar emotional responses after listening to piano music, with significant changes only observed in calmness and excitement levels, but their reaction to happy emotions was less pronounced than those in the adolescent and elderly participant groups. Adults and young adults, facing greater pressures from work, education, and other real-life stressors, may opt for music genres that offer catharsis or strong emotional resonance, which may not always elicit a joyful experience (Renfrow & Gosling, 2003). In contrast, older adults were more likely to prefer nostalgic, melodious classical music or old songs, which often evoke pleasant memories and enhance feelings of happiness (North & Hargreaves, 2008). Adolescents, due to the nature of their cognitive developmental stage, may more intuitively feel the joy brought by music without

engaging in complex interpretations of lyrics or the depth of emotions expressed, as adults might (Sloboda & Juslin, 2001) . In music therapy, therapists selected music materials based on patients' musical backgrounds and preferences. When patients had a particular affinity or expertise in piano, therapists might have specifically chosen piano pieces to more effectively reach their inner emotions. Individuals with profound knowledge of piano tended to experience richer and more intense emotional responses when engaging with and appreciating piano music. This was because individuals with musical understanding could discern subtleties like diverse chords, melodies, rhythm variations, and playing techniques, which all evoked deep emotional resonances.

The findings from this research can provide some insights into music therapy. Music therapists and clinicians could design personalized piano interventions. For instance, for female patients with depression, they might play more piano pieces that evoke happy emotions to enhance their sense of pleasure; while for male patients, music combined with visual elements could be chosen to boost their enjoyment. Similarly, strategies can also be tailored according to different age groups' responsiveness to musical emotions. In the case of child patients, melodic and upbeat tunes could be selected to help them relax and regulate their emotions. With elderly individuals, for example, piano pieces imbued with nostalgia and emotional resonance could be used to evoke pleasant memories, thereby enhancing feelings of happiness. For adolescents, given the nature of their cognitive developmental stage, they are more likely to directly perceive joy from music, thus engaging them with powerful, emotionally rich piano compositions to stimulate excitement would be a suitable approach.

6.Evalution

Strengths of the research

The advantages of this study are as follows: First, the research methods are abundant, including an experiment with Emotional Scales and secondary research. Rich methods can better prove and summarize conclusions, and a large sample size with relatively even gender and age distribution can better prove the correctness of results. Secondly, the experimental process is scientific with other influencing variables being relatively controlled, which improves the reliability of the research. Thirdly, there is a wealth of secondary research, all of which is based on authoritative journals, and there is also sufficient secondary research to support the interpretation of the results.

Limitations of the research and improvements

The limitations of the study include the inability to collect Emotional Scales responses across multiple locales, which may result in data findings that are not universally applicable, as well as potential variables in the experimental environment that could influence participants' emotions. To address this issue, efforts should be made to distribute the Emotional Scales across a broad range of geographical areas and to maintain as much consistency in the environment as possible. In the future, it is essential to incorporate a more extensive array of regional samples and to encompass a wider variety of gender identities.

7.Conclusion

The research aims to explore how the same piano piece has a different impact on the mood of different age groups and different genders.Secondary research and experiments are carried out. The results showed that firstly, gender differences in emotional responsiveness reveal that women tend to experience happy emotions more significantly than men, potentially due to the influence of hormonal fluctuations on their positive affect. Secondly, there are variations across different age groups: children aged 4-13 years exhibit lower happy emotional recognition abilities because their brains, particularly the prefrontal cortex, are not yet fully developed. Adolescents between 14 and 18 years old undergo a period of rapid change in their endocrine systems, with surges in sex hormones often affecting the intensity and sensitivity of their emotional reactions. On the other hand, older adults aged 45 and above tend to cherish music that evokes fond memories or has strong connections to their personal histories. Such music can elicit profound emotional resonance, allowing them to relive past life experiences and derive pleasure and psychological fulfilment. These research findings provide crucial theoretical underpinnings for mental health professionals and clinical practitioners involved in music therapy, informing them about how to tailor treatments according to the emotional sensitivities and developmental stages of their patients across different genders and age brackets.

For future studies, there is a need for further investigation into the effects of various types of piano compositions or different musical instruments. It is possible to develop a tailored piano repertoire specifically designed to evoke positive emotions, or to discover the most effective methods for identifying and addressing negative emotions, thereby paving the way for innovative applications within music therapy.

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