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Research on the Application of Flow Experience in Popular Music Singing Teaching

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ABSTRACT

Flow is considered to be an optimal state associated with positive emotional, motivational, and cognitive experiences. When musical performers experience flow, their musical performance and sense of happiness are significantly improved. Previous studies have shown that when certain preconditions are met, individuals are more likely to have a strong flow experience. Based on the flow theory and relevant research, we summarized the four most important flow antecedents of musical performance: affection, challenge–skill balance, confidence, and clear goals. We designed a flow-facilitating procedure based on the flow antecedents and conducted a randomized controlled study among students majoring in pop singing. Results show that the flow-facilitating procedure can induce a stronger flow experience and beneficial effects (better test scores, less stage anxiety, etc.). This study shows that it is feasible to design a musical teaching process based on flow antecedent. It has good application value to improve students' musical performance ability and relieve performance anxiety.

Keywords: flow experience, flow antecedents, music performance, popular music teaching

Introduction

The concept of flow experience was first proposed by Csikszentmihalyi in 1975. It refers to the optimal experience of an individual during certain activities (such as sports, chess, etc.) (Csikszentmihalyi, 1989). When entering the flow experience, individuals forget themselves, the interference of the surrounding environment, and some of their own experiences (such as time, hunger, fatigue, etc.), and focus on the activities they are engaged in. Flow experience can make people have strong internal motivation pointing to the activity itself and show higher efficiency (Csikszentmihalyi, 1996). Flow experience itself, as a positive return given to individuals by activities, will improve their self-esteem and self-efficacy accompanied by a strong subjective happiness experience (Csikszentmihalyi, 1996). Flow experience is widely used in sports, human–computer interaction, game design, work, and other fields. A large number of studies have confirmed that people who experience flow experience more often tend to have better performance and higher happiness in their work field. Therefore, flow theory has been applied to education, sports, work, and even online shopping, games, and other fields to help objects get more involved in the activities they are engaged in and improve efficiency. (Jackson, 1996; Skadberg & Kimmel, 2004; Li & Chen, 2012; Lee & Chen, 2010).

Flow Experience in Music Activities

Flow experience also widely exists in music activities. Byrne et al. found that flow experience exists in activities such as composition, performance, and singing (Byrne,

MacDonald, & Carlton, 2003). Wrigley and Emmerson also found the existence of flow experience in the live music performances of Strings, Piano, Woodwind, Brass, Voice, etc. Different players or different instruments experienced different levels of flow (Wrigley & Emmerson, 2013). Dewi and Saraya investigated two jazz performers using in-depth interviews. One of them was able to experience flow experience smoothly during the performance and get happiness from it; the other was unable to experience flow during the performance but was able to experience flow during composition (Dewi and Saraya, 2014). Sinnamon, Moran, & O'Connell (2012) investigated 205 music students, and the results showed that elite students often experienced flow experience more than amateur students (Sinnamon, Moran, & O'Connell, 2012). Marc David Jaros found that singers can experience flow experience in chorus and help them improve their confidence and happiness (Jaros, 2008). To sum up, flow experience widely exists in various musical activities, but not everyone at any time can experience flow experience, which is often related to better musical performance and stronger happiness.

Therefore, the concept of flow experience plays an important role in the field of positive psychology. Studies encourage maximum flow experience (Csikszentmihalyi, M., 1990; Keller et al., 2011) to help individuals achieve better performance and maximize personal happiness. The same is true in the field of music teaching. By maximizing flow experience, music teaching can be improved.

Helping Individuals Improve the Flow Experience: Flow Antecedents and Its Controversies

After proposing the initial concept of flow, Csikszentmihalyi also identified nine dimensions of flow experience, including the challenge–skill balance and the corresponding nine antecedents, which are as follows (Csikszentmihalyi, 1990): (1) challenge–skill balance—task difficulty must be equal to person's ability, otherwise, feelings of anxiety/boredom will emerge; (2) action–awareness merging—actions feel automatic and little or no attentional resources are required for executing action sequences; (3) clear goals; (4) unambiguous feedback; (5) high concentration; (6) sense of control; (7) loss of self-consciousness—self-reflective thoughts and fear of social evaluation are absent; (8) transformation of time—time may seem to move faster or slower than usual; and (9) autotelic experience—an induced state of positive affect, which can make a task intrinsically rewarding. According to Csikszentmihalyi's flow theory, researchers divide flow experience into three stages—flow antecedents, flow state, and flow consequences. Studying and realizing various related conditions of flow antecedent stage can help objects to enter the flow state, and thus achieve good flow consequences (such as better performance and stronger happiness) (Stein, Kimiecik, Daniels & Jackson, 1995; Finneran & Zhang, 2003; Yongxia & Kimmel, 2004; Shin, 2006).

Theoretically, by satisfying the above antecedents of flow experience, individuals can be helped to improve

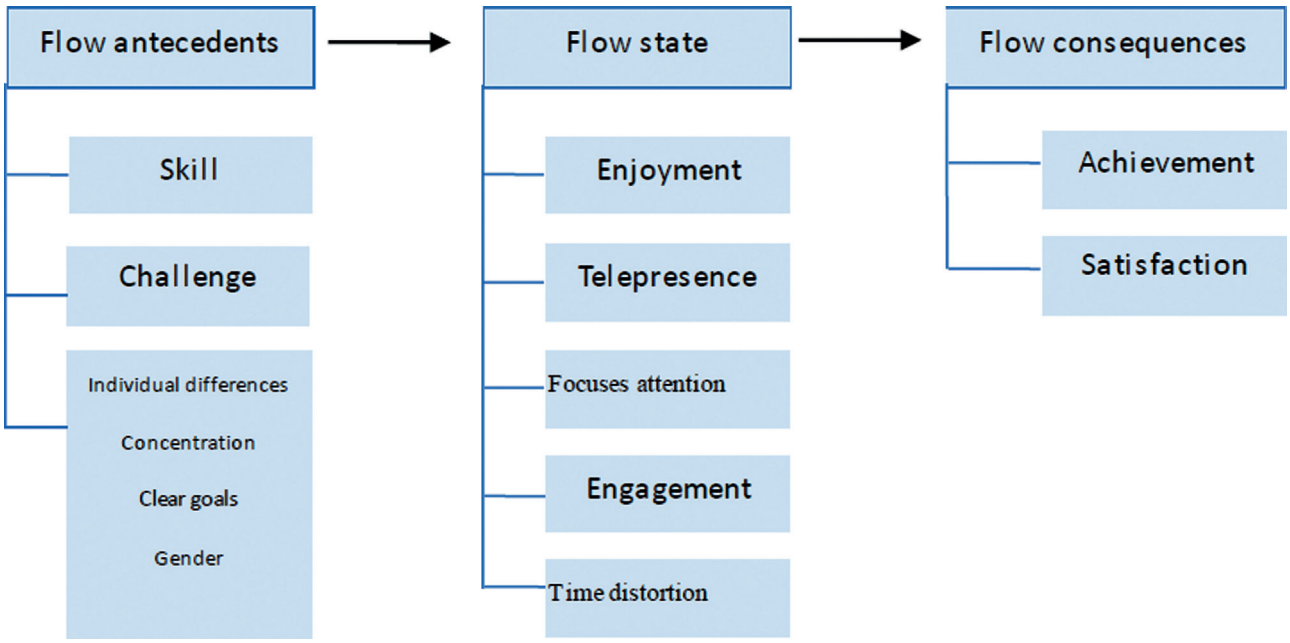

Figure 1. Conceptual model of online learner's flow experience (Shin, 2006).

their flow experience, thus achieving beneficial effects. Previous research has shown that challenge–skill balance plays a central role in the induction of flow experience (Keller & Blomann, 2008; Moneta and Csikszentmihalyi, 1996). Moneta and Csikszentmihalyi believe that the balance between challenge and skill is the best experience, and maintaining that balance is a reward in itself. So, getting participants to achieve a challenge–skill balance in some way before performing an activity can, in theory, help individuals improve their flow experience. Keller et al.(2011) support challenge skill balance by testing three conditions: the balance condition versus two high-challenge or low-challenge control conditions. Participants reported more positive subjective experiences and performed better in the balanced condition compared to the control condition. Thus, in theory, individuals will experience a more intense flow experience if the antecedent of flow experience is satisfied with the challenge–skill balance.

However, there is some debate about the definition and implementation of the antecedents of flow. For example, the concept of flow—challenge–skill balance and other prerequisite antecedents—has been difficult to accurately define and operationalize (Løvoll & Vittersø, 2014). Some research suggests that challenge–skill balance does not explain all flow experiences. Studies such as those of Løvoll and Vittersø show that challenge–skill balance can only explain part (less than 5%) of the difference in emotional experience (Løvoll & Vittersø, 2014; Voelkl, 1990). There are also experimental studies that support the idea that challenge and skill imbalance are more important than balance, for example, a study of chess players showed that when dealing with better opponents, players have the highest enjoyment and smoother experience (Abuhamdeh & Csikszentmihalyi, 2009). Essentially, a game is more fun when the perceived challenge is greater than the skill than when the challenge matches the skill.

Despite the above controversies, it is possible to induce or enhance flow experience in music teaching by satisfying the antecedents of flow experience. There are two key questions to answer in terms of antecedents for the flow experience in music performance compared to work, sports, games, etc.: (1) in addition to the challenge–skill balance, what other antecedents for flow experience are important in music performance? Are they important in any order? (2) What specific methods are used to achieve these flow antecedents in musical performances? Therefore, this study focuses on the flow experience in music performance, finds out the most relevant antecedents of flow experience in music performance activities by reviewing relevant literature, and designs implementation approaches. Through experimental research, it verifies whether the realization of these flow antecedents can enhance students' flow experience.

Antecedents of Flow Experience in Musical Performance and Their Realization Approaches

The antecedents for flow experience in music performance are different from those in games, sports, and work. Custodero conducted a series of empirical studies in the field of children's music learning. Based on Csikszentmihalyi's flow theory, Custodero observed and summarized the conditions that could help learners enter the flow state: (1) establishment and maintenance of appropriate challenges; (2) transforming teacher-delivered music materials into something meaningful—anticipation, expansion, and extension; (3) engagement—(i) opportunities for learners to contribute and (ii) prolonged, developmentally appropriate content and delivery; and (4) incorporation of physical involvement (Custodero, 2002). Bloom and Skutnick-Henley also, based on Csikszentmihalyi's flow theory combined with Green and Gallwey's 'Inner Game' theory, surveyed 90 classical music performers using a scale to analyse the factors that helped them enter the 'flow experience' (Bloom & Skutnick-Henley, 2005; Green and Gallwey, 1986). The scale survey shows that five factors are most relevant, among which the first two are the most prominent factors: (1) self-confidence and self-trust while playing; (2) desire to experience and express feelings through music; (3) having experience goals; (4) ability to maintain focus on the music; and (5) ability to play without self-criticism. Subjects were interviewed and told the main reasons leading them to flow experience. The following were mentioned most frequently: (1) love of music; (2) familiarity with the music; (3) emotionality; (4) letting go; (5) connection/rapport; and (6) concentration/focus. Mazzola and Cherlin (2008) found in their case study, on the production of Miles Davis' Bitches Brew and Geisser and Mazzola's Chronotomy album, that group flow can be encapsulated in the term 'Passion' (Mazzola & Cherlin, 2008).

As can be seen from Table 1 and related interview research, compared with flow experience in other fields (such as sports, human-computer interaction, etc.), flow antecedents of music activities are most important in that they require high emotional involvement and music learners need to resonate with works. At the same time, if learners have their inner understanding and processing of works, and have active participation, it will be easier to enter a flow state when performing.

Table 1. Flow antecedents of existing research works

Csikszentmihalyi's flow theory	Custodero's research	Bloom and Skutnick-Henley's research	
		Questionnaire Survey	*Interview Survey*
1. The task requires above-average concentration. 2. The activity stands out from daily life. 3. Challenge and skill levels are relatively matched, thus averting boredom from too little challenge and anxiety from too much challenge. 4. The task is freely chosen. 5. The task is totally absorbing, often leading one to lose track of time. 6. Goals are clear. 7. Means and methods are clear for reaching goals. 8. The experience provides immediate feedback.	1. Establishment and maintenance of appropriate challenges. 2. Transforming teacher-delivered music materials into something individually meaningful: anticipation, expansion, and extension. 3. Engagement: (1) Opportunities for learners to contribute; (2) prolonged duration; (3) developmentally appropriate content and delivery; (4) incorporation of physical involvement.	1. Self-confidence and self-trust while playing. 2. Desire to experience and express feelings through music. 3. Having experience goals. 4. Ability to maintain focus on the music. 5. Ability to play without self-criticism.	1. Love of music 2. Familiarity with the music 3. Emotionality 4. Letting go 5. Connection/rapport 6. Concentration/focus

Therefore, in combination with Csikszentmihalyi's flow basic theory and Bloom and Skutnick-Henley (2005), Custodero (2002), and other practical research in the field of music, this study believes that flow antecedents of musical performance are: (1) the music is the performer's affection and is freely chosen by him/her; (2) the difficulty of the track should match his/her performance level and be challenging; (3) practice the track repeatedly to make the performer familiar with and confident to complete the track (challenge–skill balance); (4) give them full affirmation and encouragement before the performance to help them avoid self-criticism during the performance; and (5) provide clear goals. Theoretically, when a musical performer performs under the condition of the flow antecedents mentioned above, he/she will have a great possibility to experience flow experience.

According to the above antecedents of smooth experience, the following induction process conditions are designed to meet the flow antecedents of musical performance: (1) students choose 5–6 favourite songs freely and write the reasons for their choice in short language with their emotional connection the songs; (2) among the above songs, the teacher selects two songs suitable for their timbres, range, and emotional expression with certain difficulty, and the students practice the two songs repeatedly for 4 weeks until they can master them; (3) students given sufficient affirmation and encouragement when students practice songs; and (4) informing the students that the songs they choose to perform will be counted towards their exam scores and may be given performance opportunities based on their scores.

Aims of the Present Investigation

1) To summarize flow antecedents of music performance according to existing studies and to verify if carrying out the flow-facilitating procedure based on the flow antecedents of music performance can facilitate a more intense flow experience.

2) To verify if a more intense flow experience can improve students' performance ability and reduce their stage anxiety.

Materials and Method

Participants and Procedure

Sixty freshmen and sophomores majoring in pop singing, including 38 females and 22 males, aged 18.50 ± 0.95 were selected. All students were asked to sing a song of their choice at the beginning of the semester, and at the end of the song, they were asked to perform the FSS-2 scale and the anxiety scale. And then they were randomly divided into two groups: Group A (flow-facilitating group) and Group B (control group). Group A received the flow-facilitating procedure for 4 weeks. Four weeks later, the FSS-2 and anxiety scale were tested again after the concert. The changes in flow experience and stage anxiety are observed. Group B received normal teaching instead of a flow-facilitating procedure. The rest of the learning process was identical to Group A. No flow-related teaching was facilitated to Group B. FSS-2 and anxiety scale were performed 4 weeks after the concert to understand the flow experience. At the end of the semester (a total of

18 weeks of study), the two groups were evaluated again in terms of academic performance, flow experience, and stage anxiety.

Materials

Flow State Scale-2: The measurement of the flow state was undertaken using the Flow State Scale-2 (FSS-2) questionnaire (Kawabata, Mallett, & Jackson, 2007; Jackson and Eklund, 2002). The FSS-2 consists of 36 items, with four items for each of the nine dimensions of flow. Each item is in the form of a statement that represents an element of the flow experience. These are Challenge–Skill Balance; Merging of Action and Awareness; Clear Goals; Unambiguous Feedback; Total Concentration; Sense of Control; Loss of Self-consciousness; Transformation of Time; and Autotelic Experience. Respondents indicated the extent to which they agreed with each statement on a 5-point Likert scale from 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, to 5 = strongly agree. Several studies have confirmed that FSS-2 has high reliability and validity in the field of music (William, et al., 2011; de Manzano, Theorell, Harmat, & Ullén, 2010). The FSS-2 scale was completed within half an hour after the participants finished singing.

The revised Kenny Music Performance Anxiety Inventory (revised K-MPAI) was used. This 40-item inventory was developed to assess the emotion-based theory of anxiety proposed by Barlow (2000) as it applies to anxiety in the context of music performance. Questions are answered on a 7-point Likert scale [0 = Strongly disagree to 6 = Strongly agree]. The range of possible scores goes from 0 to 240. Higher scores indicate greater anxiety and psychological distress. This scale demonstrated excellent internal reliability (Cronbach's alpha = 0.94) and a stable factor structure across professional and student classical musicians (Kenny, 2011).

Statistical Analysis

SPSS 21.0 statistical analysis software was used for data processing and statistical analysis. All measurement data were expressed as M ± SD; independent sample t-test was used for comparison between groups and a value of $p < 0.05$ was considered statistically significant.

Results

Flow-Facilitating Procedure Can Effectively Improve Students' Flow Experience

Facilitating the flow procedure can facilitate a stronger flow experience for students. We first conducted FSS-2 test on all students (N = 60). All students were randomly and evenly divided into two groups. Group A (N = 30) was facilitating the flow-facilitating procedure for 4 weeks. After 4 weeks, FSS-2 test was performed again; the results are shown in Table 2. The scores of nine dimensions of flow were calculated, and the scores after induction were significantly higher than those before induction. Two-tailed sample t-test was conducted, and the result was statistically significant ($p < 0.01$). The results showed that by implementing the flow-facilitating procedure for 4 weeks, students could benefit from a more intense flow experience.

Internal consistency checks for entries are determined by alpha coefficients. As shown in Table 2, the total α-value of flow before and after induction was 0.87 and

Table 2. FSS-2 means and standard deviations before and after flow-facilitating procedure

FSS-2 subscale	Before flow-facilitating procedure (N = 60)			After flow-facilitating procedure (N = 30)			p (Two-tailed)
	M	SD	α	M	SD	α	
Challenge–Skill Balance	3.51	0.67	0.83	3.97	0.58	0.83	0.000
Merging of Action and Awareness	3.41	0.74	0.88	3.74	0.91	0.90	0.000
Clear Goals	4.03	0.88	0.89	4.27	0.66	0.84	0.008
Unambiguous Feedback	3.59	1.06	0.93	4.05	0.84	0.89	0.000
Total Concentration	3.34	0.88	0.90	4.20	0.79	0.88	0.000
Sense of Control	3.13	0.74	0.85	3.90	0.82	0.89	0.000
Loss of Self-Consciousness	2.88	0.99	0.90	3.82	0.87	0.91	0.000
Transformation of Time	3.35	1.10	0.91	4.03	0.75	0.88	0.000
Autotelic Experience	3.52	1.06	0.92	4.27	0.48	0.85	0.000

Note: M = mean; SD = standard deviation; α = Cronbach's alpha coefficient.

Table 3. FSS-2 subscales frequencies and percentages of high flow groups

FSS-2 subscale	Before flow-facilitating procedure (N = 60)		After flow-facilitating procedure (N = 30)	
	N	%	N	%
Challenge–Skill Balance	22	36.67	23	76.67
Merging of Action and Awareness	24	40.00	19	63.33
Clear Goals	44	73.33	28	93.33
Unambiguous Feedback	32	53.33	24	80.00
Total Concentration	20	33.33	25	83.33
Sense of Control	10	16.67	22	73.33
Loss of Self-Consciousness	10	16.67	20	66.67
Transformation of Time	22	36.67	24	80.00
Autotelic Experience	28	46.67	27	90.00

Table 4. FSS-2 scores of flow-facilitating groups and no flow-facilitating group

FSS-2 Subscale	Flow-facilitating Group (N = 30)			No Flow-facilitating Group (N = 30)			p (Two-tailed)
	M	SD	α	M	SD	α	
Challenge–Skill Balance	3.91	0.73	0.87	3.57	0.79	0.89	0.000
Merging of Action and Awareness	3.83	0.83	0.88	3.33	0.94	0.90	0.000
Clear Goals	4.28	0.52	0.80	4.13	0.67	0.79	0.009
Unambiguous Feedback	3.95	0.71	0.84	3.76	0.84	0.88	0.021
Total Concentration	3.92	0.69	0.82	3.53	0.85	0.88	0.000
Sense of Control	3.73	0.78	0.90	3.36	0.91	0.90	0.000
Loss of Self-Consciousness	3.13	1.08	0.89	2.93	1.14	0.92	0.023
Transformation of Time	3.81	0.82	0.90	3.39	0.87	0.89	0.000
Autotelic Experience	4.03	0.55	0.85	3.90	0.83	0.86	0.141

Note: M = mean; SD = standard deviation; α = Cronbach's alpha coefficient.

0.86, respectively (Cronbach, 1951). The measured values of FSS-2 of nine dimensions of flow before and after induction were calculated to be between 0.83 and 0.93, respectively. All exceeded the acceptable reliability standard value (0.70) proposed by Nunnally (1978).

We further analysed the changes in the number of students who experienced a strong flow experience. Meanwhile, we divided each dimension of flow into 'High flow' (Agree and Strongly agree) and 'Low or no flow' (Strongly Disagree, Disagree, and Neither Agree nor Disagree). Table 3 shows the number of students experiencing high flow in each flow dimension. After the induction process, the number of students who experienced high flow increased to varying degrees. At the beginning of the semester, only a small number of students could experience strong feelings in the dimensions of 'Sense of Control', 'Loss of Self-Consciousness', and 'Total Concentration', while the number of these students increased significantly after induction.

The Facilitated Flow Experience Can Last for A Long Time

In our design, the flow-facilitating procedure stops after 4 weeks, and there is no similar teaching process for the students. Eighteen weeks later, we conducted the FSS-2 scale survey on all students again after the final examination; the results are shown in Table 4. The score of the nine dimensions of flow was calculated separately. The score of the flow-facilitating procedure group was significantly higher in all six dimensions than that of the group without facilitating the flow-facilitating procedure (independent sample t-test; $p < 0.01$). In Unambiguous Feedback and Loss of Self-Consciousness, the scores of the induced group were higher than those of the non-induced group ($p < 0.05$). Only in the dimension of 'Autotelic experience', there was no significant difference in scores between the induced and non-induced groups ($p > 0.05$). The results showed that after 18 weeks, students who received flow-facilitation procedure still

Table 5. Comparison of FSS-2 scores between specific groups

	p (Two-tailed)	p (Two-tailed)
	Flow-facilitating group (2 weeks) with Flow-facilitating group (18 weeks)	Before flow-facilitating procedure with No flow-facilitating group (18 weeks)
Challenge–Skill Balance	0.495	0.464
Merging of Action and Awareness	0.417	0.358
Clear Goals	0.914	0.273
Unambiguous Feedback	0.323	0.135
Total Concentration	0.005	0.060
Sense of Control	0.092	0.007
Loss of Self-Consciousness	0.000	0.669
Transformation of Time	0.028	0.718
Autotelic Experience	0.000	0.001

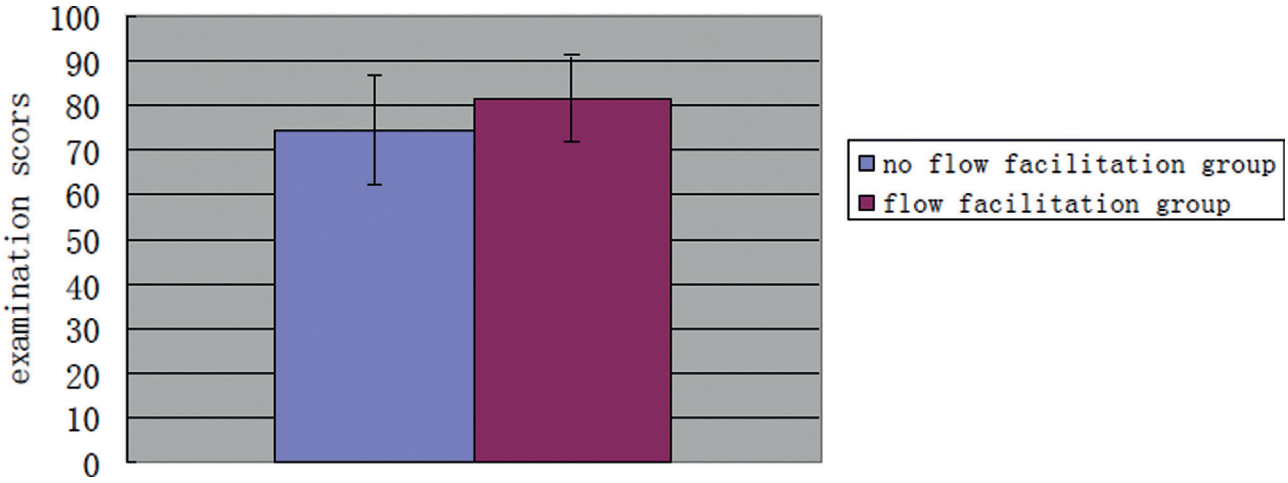

Figure 2. Examination scores of flow facilitation group and no flow facilitation group.

experienced more flow experience than students who did not receive the procedure.

We further compared the flow experience of the students after 18 weeks of flow-facilitating and immediately after the flow-facilitating procedure (Table 5). By independent sample t-test, the results show that we need to merge the concept of 'Challenge–Skill Balance', 'Action and Awareness', 'Clear Goals', 'Unambiguous Feedback', and 'Sense of Control'. There was no difference in the above five dimensions, but there were differences in the other four dimensions, 'Total Concentration', 'Loss of Self-Consciousness', 'Transformation of Time', and 'Autotelic Experience'. From the comparison of score values, there is not much difference in absolute values. This shows that the student facilitated a strong flow experience through 4 weeks of the flow-facilitating procedure and flow theory learning. Even after 18 weeks, the intensity of the experience did not decrease significantly. To verify whether such a strong flow experience is induced by goal-setting in the final exam, we compared the flow score of students without flow facilitation after the final exam with the flow score of all students at the beginning of flow facilitation. The results showed that there was no difference in the scores of the two in seven dimensions. Only 'Sense of Control' and 'Autotelic Experience' had statistical differences. This shows that students who do not receive flow-facilitation procedure do not feel more intense flow experience in the examination environment. This comparison further confirms that the induced strong flow experience can last for a long time, and it seems that it can be recalled during the later performance. Students without flow-facilitating procedures do not have this phenomenon.

Flow-Facilitating Procedure Benefits: Improved Academic Performance and Reduced Stage Anxiety

After 4 weeks of the flow-facilitating procedure, all students were exposed to the same level of instruction. At the end of the procedure, a professional examination

is conducted. The score of the exam is graded by 100 points, and the average score is taken by five professional teachers (Figure 2). Facilitating the flow procedure: The score of the student facilitating the flow procedure was 81.63 ± 9.72 compared to that of the student without facilitating the flow procedure (74.43 ± 12.26). The difference was statistically significant (independent sample t-test, p = 0.014).

To assess the students' music performance anxiety state, a revised K-MPAI scale score was performed before and after the exam, and the result is shown in Figure 3. Facilitating students' anxiety score (71.43 ± 46.72) was significantly lower than that of students without the flow-facilitating procedure (90.80 ± 42.08). The difference was statistically significant (independent sample t-test, p = 0.001).

The results showed that the 4-week flow-facilitating procedure had a beneficial effect on the students, facilitating their music performance and reducing stage anxiety.

Discussion

Based on flow theory and existing research in the field of music, this study summarizes flow antecedents of musical performance. The flow-facilitating procedure is designed according to the flow antecedents. The results obtained after applying the flow-facilitating procedure to students of pop music singing confirm that a more intense flow experience of musical performance can be induced and has long-term beneficial effects (improved test scores, less stage anxiety). De Manzano made a similar study. He selected piano performance as a flow-inducing task, which allowed players to select music fragments freely (3~7 minutes) and repeatedly performed five times to induce flow experience, to study the relationship between flow and psychological and physiological reactions (de Manzano, et al., 2010). Baker and MacDonald (2013) select therapeutic songwriting as a flow-inducing task. He found that song creation experiences generated high levels of flow in young and old participants and the degree of flow achieved predicted how meaningful the artefacts will be post-creation. The flow-inducing task we set is the singing of a song, which is also freely selected and mastered after repeated practice (Baker and MacDonald, 2013). Furthermore, we design more sufficient flow-inducing antecedents: (1) Psychological environment: the emotional connection between songs and students is emphasized. In particular, the songs that students feel most touched are freely selected during the singing. When students have some internalized emotional processing of the songs, they are more likely to experience flow experience when singing the songs. Most of the interviewed students believed that it was easier for them to enter the flow state when they sang songs with emotional connection, which was consistent with the empirical study of Bloom and Skutnick-Henley (2005) and Custodero (2002). In the process of practice, positive evaluation and encouragement are constantly given to enhance their self-confidence, so that students can reduce self-doubt and criticism when singing, and focus more on singing itself; (2) Matching of ability and challenge: According to students' voice conditions, the teacher again selects songs suitable for their timbre, vocal range, and emotional expression and with certain difficulty from the songs freely selected by students and (3) External environment: given a certain external motivation to drive, the external motivation is not too strong (such as the key audition) to avoid over-stimulation, nor is it too weak, to avoid the object of contempt. Our flow-facilitating procedure fully meets the flow antecedents of musical performance. Students who receive the flow-facilitating procedure find it easier to enter flow states, thereby facilitating flow consequences.

In this study, we found that the flow score of the students who received the flow-facilitating procedure was still significantly higher after 18 weeks than that of the students who did not have this facilitating effect, but was only slightly lower than the score right after the flow-facilitating procedure was correct for our approach. This shows that the induced strong flow experience can last for a long time, and it seems that it can be recalled during the later performance. Students who did not receive the flow-facilitating procedure did experience this phenomenon. After in-depth interviews with the students, we believe that the main reason for this is that we are facilitating the flow-facilitating procedure by explaining the basic theory of flow to the students so that they can understand their psychological state and they were asked to recall the strong flow feeling in each subsequent performance. In the interview with the students, the students expressed that learning flow theory would enable them to more consciously recall and experience the flow experience in the later singing. This study does not have a further group study of this situation. In the future study, we can divide the students who receive the flow-facilitating procedure into two groups one of which learns flow theory and the other does not, and then we can observe the difference in flow experience after a while.

Existing studies suggest that flow experience cannot be directly taught or forcibly experienced, which seems to be inconsistent with our conclusion (Jackson &

Csikszentmihalyi, 1999). In fact, in this study, the teaching of flow theory did not have a direct effect on students' strong feelings of flow experience after a long time but played an indirect auxiliary awakening role. Compared with students who have not learned flow theory, these students can more consciously recall the previous strong flow experience before singing, so that they are more confident when singing and easier to enter into the song situation. At the same time, to avoid errors caused by students' understanding of flow theory in filling in the FSS-2 scale, we explicitly required students to follow their heart in filling in the FSS-2 scale after the first performance and complete it as quickly as possible (the scale is required to be completed within 6 minutes).

The design conditions of this study satisfy the antecedents of musical performance, induce a more intense flow experience, and verify the ensuing beneficial flow consequences (better musical performance and less stage anxiety). This study, therefore, provides definitive proof of the flow theory and the benefits that the flow-facilitating procedure can offer in music teaching. At the same time, this study can provide the following implications for music education: (1) In music education, flow theory can be used as teaching content to make students more focused on music learning and improve their academic performance more quickly; (2) Pay attention to the role of flow Antecedents in music education. The flow-facilitating procedure designed in this study fully meets the flow antecedents and induces a more intense flow experience. Studies show that satisfying flow antecedents can also achieve good teaching effects, such as goal setting, classroom environment setting, teachers' speech induction, etc. Therefore, teachers who understand flow antecedents of music performance and implement them in teaching can help students make faster progress; and (3) Attach importance to students' participation in teaching, especially psychological internalization, and give immediate positive feedback. Listening more to students' feelings in teaching and making them have an active emotional connection with music works can make students prone to flow experience and thus improve students' musical performance.

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