Research on the Flow Experience of Tai Chi Chuan

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Research Article

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Abstract

(1) Objectives
Tai Chi Chuan has substantial benefits of strengthening the body, helping people to maintain a high level of energy, etc. In this paper, we investigated the experience and psychology state of Tai Chi Chuan exercise.

(2) Equipment and methods
Based on flow theory, we used semi-structured interviews and Chinese flow state scale 2 (CFSS2) to study the experience and psychology state of college students exercising Tai Chi Chuan.

(3) Results
In the process of Tai Chi Chuan, there did exist flow experience or a similar mental state. The score of "autotelic experience " dimension increased with exercise years increased, and the increasing time spent on Tai Chi Chuan after class was positively related to the score of "action-awareness merging " and "concentration on the task at hand "dimension. Also, an interaction effect was found.

1 Introduction
As one of the quintessence of Chinese traditional martial arts, Tai Chi Chuan can strengthen and maintain high level of energy in human body (Sprod et al., 2012). It plays a great role in physical therapy (Kirsteins et al., 1991), relieving depression (Zhang et al., 2018), easing pressure (Sandlund & Norlander, 2000), and improving chronic diseases (Mansky et al., 2006). It is widely loved by people all over the world (Lan et al., 2002). However, most of the current researches on Tai Chi Chuan only focus on the efficacy of it. The researches on the experience of Tai Chi Chuan participants in sports from the perspective of the participants’ psychology state are very limited.

The concept of flow in positive psychology is often used to study the experience of athletes and sports participants. The so-called flow is a concept put forward by the psychologist Csikszentmihalyi. It is a state that people deal with manageable challenges by achieving a series of goals, continuously obtaining feedback, and adjusting actions according to feedback. In this state, people will concentrate on the challenge, losing self-awareness and time perception, and do not care about the reward of the challenge, but enjoy the challenge itself (Nakamura & Csikszentmihalyi, 2014). Csikszentmihalyi classified this state into nine dimensions (Csikszentmihalyi, 1990), and several flow experience models based on challenge skill were established (Ellis et al., 1994).

Flow theory have been widely adopted in sports psychology research, such as on tennis (Fortes et al., 2019; Koehn, 2013; Koehn et al., 2013), swimming (Larson et al., 2019), E-sports (Hsu & Lu, 2004). For example, Jackson et al. conducted interviews with several high-level skiers. The results showed that when completing high-quality skiing movements, the experience they feel was very similar to the heart flow
experience (Jackson & Susan, 1992). Furthermore, Jackson et al. found that the level of flow experience was associated with high level of exercise performance (Stavrou et al., 2007). Sports psychology researchers have also found that hypnosis and target setting could be used to control the generation of flow experience (Pates & Maynard, 2000; Stavrou et al., 2015).

In the early stage, qualitative interview, self-report and experience sampling methodology (ESM) were used to study the flow experience in sports (Csikszentmihalyi & Larson, 1987; Scollon et al., 2003). After Jackson developed the flow state scale (FSS) (Jackson & Marsh, 1996), and flow state scale 2 (FSS2) successively (Jackson & Eklund, 2002), the two scales have been widely used in the study of flow experience (Huang et al., 2019; Yanar et al., 2017). However, most of the researches involve the subjects of European and American races, and focus on the world's major sports, such as ball games, swimming, skiing and so on. It is reported that there were differences in flow experience among subjects from different cultural backgrounds (Moneta, 2004). Although Sato introduced the theory of flow experience into the study of Japanese mobs in an early stage (Sato, 1988), there are still limited researches on the flow state of Asian people in the national traditional sports under the background of different cultures.

Grounded theory, which is a classic qualitative research method (El Hussein et al., 2014; Glaser et al., 1968), has been used in the sports psychology related research, such as the study of football career influencing factors of success (Holt & Dunn, 2004), the resilience of Olympic champions (Fletcher & Sarkar, 2012) and the influence of sports on the positive development of teenagers (Holt et al., 2017). This method has also been adopted in studying flow experience (Pace, 2004).

In this paper, we carried out a study of flow experience in college students who taken Tai Chi Chuan courses based on semi-structured interviews and Chinese flow state scale 2 (CFSS2). We had two hypotheses:

In the process of Tai Chi Chuan, there exists flow experience or a similar mental state.

With increasing exercise years and time for Tai Chi Chuan exercise every week, the flow experience of Tai Chi Chuan participants will also increase.

From the perspective of sports psychology, this paper explored the flow experience of Tai Chi Chuan excises, to provide a theoretical basis for the development and research of Tai Chi Chuan.

2 Research Method
2.1 Semi structured interview design
2.1.1 Interviewees

It is suggested that, in a qualitative research, more than 70% research findings were from the first six participants, and 12 participants could provide almost 92% of the saturated research findings (Guest et
al., 2006). Therefore, this paper selected 13 interviewees, 9 male and 4 female. All interviewees are college students. Three of them exercised Tai Chi Chuan for less than one year, and were classified as beginners. Four of them exercised for 1 to 3 years, and were classified as experienced ones. The other six interviewees are with more than 3 years' experience, and were classified as rich experience. Table 1 showed the basic information of the interviewees.

Table 1 Information of the interviewees

| Number | Gender  | Age | Time of Tai Chi Chuan exercise (years) | Time for Tai Chi Chuan after class every week (hours) | Time for sports after class every week (any sports except Tai Chi Chuan) |
|--------|---------|-----|----------------------------------------|------------------------------------------------------|---------------------------------------------------------------------|
| 1      | female  | 24  | >3                                     | 1-2                                                   | 1-2                                                                 |
| 2      | male    | 24  | >3                                     | 1-2                                                   | 2                                                                   |
| 3      | male    | 22  | >3                                     | 1                                                     | 2                                                                   |
| 4      | male    | 24  | >3                                     | 1-2                                                   | 2                                                                   |
| 5      | female  | 21  | >3                                     | 1-2                                                   | 2                                                                   |
| 6      | male    | 22  | <1                                     | 0                                                     | 0                                                                   |
| 7      | male    | 22  | 1-3                                    | 1                                                     | 0                                                                   |
| 8      | male    | 21  | <1                                     | 0                                                     | 0                                                                   |
| 9      | male    | 21  | 1-3                                    | 0                                                     | 0                                                                   |
| 10     | male    | 21  | 1-3                                    | 1                                                     | 2                                                                   |
| 11     | female  | 21  | <1                                     | 0                                                     | 0                                                                   |
| 12     | male    | 20  | >3                                     | 1                                                     | 1                                                                   |
| 13     | female  | 24  | 1-3                                    | 1-2                                                   | 2                                                                   |

2.1.2 Formulation of interview outline

According to the research topic, the semi-structured interview outline was formulated as follows. The interview time was controlled in about 20 minutes

(1) Background information

1. Personal background of the interviewees (such as gender, age, time of practicing Tai Chi Chuan, whether there is self-training after class, etc.)

2. Briefly introducing the concept of flow experience to the interviewees
The explanation of flow experience was:

“Flow experience is a kind of experience in which one's attention is completely immersed in the current activity and can control his movement effortlessly. In this state, people do not care about the outcome, but concentrate on fulfilling the challenge in front of them. They enjoy the feeling very much. In the process, time seems to be faster (or slower). In the current theory, the concept of flow was divided into nine dimensions: challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, time transformation, and autotelic experience.”

(2) The main contents of the interview are as follows:

Based on Liu Hong-bo's research on Tai Chi Chuan (LIU, 2012), five questions were put forward for interview.

1. Combined with your own experience, talk about your understanding of the flow experience.
2. Have you ever experienced the flow state or a similar state in Tai Chi Chuan?
3. Do you think the practicing time and level of Tai Chi Chuan will affect the generation of flow experience? Please describe your reasons in detail.
4. When Tai Chi Chuan is exerting force, it is necessary to control the strength to make it rigid and flexible, fast and slow. Do you think this concept has something in common with the concept of "sense of control" in the flow experience? Please describe your reasons in detail.
5. Do you think that the flow experience is like the state of "harmony between human and nature" in Tai Chi Chuan culture?

2.2 Questionnaire design

2.2.1 Form and distribution of questionnaire

As the common language of the questionnaire objects was Chinese, and they all grew up in the Chinese cultural background. Considering the different cultural background, we adopted the revised flow state scale translated into Chinese by researchers with the same cultural background (Fournier et al., 2007; Kawabata et al., 2008; Liu et al., 2012), with Richter 5-point evaluating scale.

We collected a total of 197 questionnaires from college students who participated in Tai Chi Chuan course. After excluding the invalid questionnaires, such as blank ones, the answers of all "yes", "very Yes" and "very no", or other invalid information, 185 valid questionnaires were used for analysis. The questionnaires was collected immediately after the Tai Chi Chuan activity, so as to minimize the interference (Jackson et al., 2004). The questionnaire was collected in the indoor gymnasium with a
suitable temperature (about 24°C) and sufficient light, and the subjects were fully warmed up and in good physical condition.

2.2.2 Questionnaire objects

Among the 185 participants, 67 are male and 118 are female, with an average age of 19.26 years old. 88 participants were with less Tai Chi Chuan experience (0-1 years), 58 participants with more experience (1-3 years), and 39 participants with rich experience (more than 3 years).

In terms of the time spent on Tai Chi Chuan every week, 44 participants do not practice Tai Chi Chuan after class. 66 participants spend less than 1 hour every week, 43 participants play Tai Chi Chuan for 1-2 hours, and 32 participants choose to spent more than 2 hours on exercising Tai Chi Chuan.

In the aspect of the time spent on sports other than Tai Chi Chuan, 24 participants do not play any sports after class. 54 participants play sports less than 1 hour every week, and 48 participants have 1-2 hours for sports every week. 59 participants will spend more than 2 hours every week on sports except Tai Chi Chuan.

2.3 Ethical statement

All participants were informed of all questions of interview and questionnaire in advance. Written informed consent was obtained before the interview and questionnaire survey conducted. All participants agreed to answer the questions and be recorded. This survey was approved by the ethics committee of the P.E Department of Fuzhou University. It was conducted according to the standards of the ethics committee of the P.E Department of Fuzhou University and laws and regulations on survey of China.

2.4 Data analysis

For the content of the interview, we conducted a qualitative study. For the questionnaire data, we first tested the normal distribution of the data, and then did one-way ANOVA to test the significance of the data of nine dimensions in different groups and compared their mean value.

3 Results

3.1 The six categories of flow experience state in Tai Chi Chuan

From the interview, it was found that the feelings of the interviewees in Tai Chi Chuan had a variety of characteristics of flow experience. Based on grounded theory, the interview materials were coded into six
categories, i.e., sense of control, concentration on the task at hand, time transformation, autotelic experience, challenge-skill balance, action-awareness merging.

3.1.1 Sense of control

In the flow experience, one of the most important characteristics is the sense of control. People have a high degree of confidence in their tasks and can easily and accurately complete the actions they want to take. The following are the key responses of the interviewees who embody the state.

P4: "When I am playing Tai Chi Chuan, my hands seemed to touch the air, and my spirit was very strong. I don't think about what the next action is or what the details are, because I am familiar with them. It's very natural to know what kind of movement to hit, what kind of rhythm, what kind of position the hands and feet need to go to."

P4: "Later, I become proficient in movements (of Tai Chi Chuan), and I can play a set of movements at will. My mental pressure is reduced. I don't want to do anything when I do the movements. I am very relaxed, but I am also very integrated into the movements I play. I mean, at that time, you will find that you will deal with some details on the contrary, and the balance is easier to maintain."

P5: "Until later, when I put myself into it and avoid the "spiritual entropy", I am able to realize the integration of movements of Tai Chi Chuan, rhythm and music in my mind, which can shield external interference and integrate Tai Chi routine and music in my mind."

P6: "The excitement of the challenge gradually decrease, but the feeling of concentration become stronger. Especially for the speed control of cloud hands, I have a clearer experience."

P9: "Because when you are skilled in technique, or remember your actions deeply, you are more in pursuing of inner peace than in remembering some actions."

From the above quoted responses, we could discover that when the interviewees' proficiency in Tai Chi Chuan is improved, they could easily reproduce the actions in their memory without deliberately recalling them. They could control their own bodies, ensure the accuracy of their actions, and have a high confidence in their own actions. This was consistent with the concept of "sense of control" in the flow experience.

3.1.2 Concentration on the task at hand

In common sense, the concept of "concentration on the task at hand" is used to describe a high degree of concentration, and it is also a major feature of flow state, including two aspects: no response to external interference and no other subjective thoughts. The following are the key responses of the interviewees who embody the state.
P8: "In this case, the desire of my teammates will not come true. This is a state still fresh in memory."

P13: "Sometimes in the process of boxing practice, there will be a very special state, very focused, focused on their own initiative out of the process of boxing. Most of the time, I may feel tired after practicing for a certain period, and even don't want to persist any more. But in that state, I can't feel tired under the same training time."

P14: "It's easy for me to show myself when I'm on the field."

In the interview, three interviewers mentioned the concentration in the process of Tai Chi Chuan, which could be seen in ordinary practice and competition, and it was difficult to take the initiative to get away from it. In this process, people did not feel tired. They immersed in their own world, not feeling the disturbance from the outside world. It was a very excellent psychological state.

3.1.3 Time transformation

In the flow experience, people often feel that the flow rate of time has changed, a few hours as fast as a few minutes, or a few minutes as fleeting as a few seconds. On the contrary, a few minutes seems to have been extended to allow enough time to complete the ongoing activities. They tend to slow down in time. The following were the key responses of the interviewees who embody the state.

P6: "I felt a little tired when I was a child (playing Tai Chi Chuan), but generally speaking, I felt that the flow of time was slowing down (at that time)."

P8: "When practicing Tai Chi Chuan, I don't think time passes quickly. On the contrary, sometimes I think time passes slowly. After each practice, I feel I have practiced for a long time, but when I look at the time, I find that it is only about half an hour."

P13: "I feel that time goes by very quickly. In fact, after completing the movements, I will find that it is not the speed of practicing Tai Chi Chuan that has been accelerated, but the psychological feeling that the time has become faster."

Similarly, the transformation of subjective time velocity was also reflected in the interviews of different interviewees, which indicated that there was a phenomenon of time transformation in Tai Chi Chuan like flow experience.

3.1.4 Autotelic experience

In the state of flow, people describe this state as very comfortable, painless, feeling very strong and having an endless source of power. The perception of clear feeling is also another element of enjoyment experience and a major feature of flow state. When athletes describe autotelic experience, they feel at the
peak state. This experience is the best reward for the hard work of sports. The following are the representative statements of the state.

P3: "(In practicing Tai Chi Chuan) Every exercise is a pleasure for me. " "In the process of practice, I will constantly experience the comfort of the body."

P4: "When playing Tai Chi Chuan, it's basically immersive. I'm totally enjoying the process. It's not too much to say that it's natural and comfortable."

P6: "(Tai Chi Chuan training) It is a very comfortable state, and it will make people more immersed in this state, very happy. It becomes a very enjoyable experience for me."

P8: "In the process of practice, I will feel my body is floating, and I am not bothered by time and trivia. I will forget all my worries and fears. I enjoy the process (practicing Tai Chi Chuan) very much. "

P11: "When practicing Tai Chi Chuan, I can feel that the it is beneficial for my body. It's a very natural state of the body. It's a very comfortable way to experience the expression of the body. I don't feel any pain or discomfort. It's more like a healthy exercise, so that I can feel a very happy feeling in my slow steps. "

P13: "I feel that the more I practice, the more I feel the pleasure of relaxation. I don't want to stop." P14: "With the deepening of practice, I can gradually focus on the whole process of practice and enjoy the process."

A considerable number of respondents expressed their experience of enjoying Tai Chi Chuan, including "immersive", "floating body", "happy and do not want to stop", and so on, which reflected the interviewees' pursuit and love for this feeling, hoping to experience this state many times, which is consistent with the "autotelic experience" dimension of flow experience.

### 3.1.5 Challenge-skill balance

One of the essential characteristics of flow state is to achieve a positive balance between the following two elements: the challenges faced by oneself and the skills possessed. In order to experience the flow state, it is not enough to match the challenges and skills, but it is necessary to expand these two elements to reach a new level. Easy victory or failure caused by uneven strength rarely leads to flow state. So, everyone can find a balance suitable for their current skill level and enter the flow state. The following are the representative statements of the challenge-skill balance concept.

P6: "I was very nervous at that time (when participating in competition), but I didn't feel nervous after I boarded the arena. I was excited and gentle. The excitement is due to the exciting feeling of competition, and the calmness is due to the smoothness of Tai Chi Chuan itself. I think this might be challenge-skill balance."
P7: "I have participated in Tai Chi Chuan competition before. In fact, I'm not proficient in playing Tai Chi Chuan. As there were many people watching me at that time, I was still a little nervous. But with this tension, there was a sense of excitement. I think Tai Chi Chuan has given me a new experience, which is exciting but should be played slowly."

Compared with the previous concept, fewer respondents mentioned their own feelings about "challenge-skill balance", but all mentioned their feelings when participating in competitions. There was a possibility that the experience of "challenge skill balance" in the flow theory would occur in the competition of Tai Chi Chuan.

3.1.6 Action-awareness merging

Action-awareness merging state can be described as follows: I feel that I am integrated with the ongoing movement, and I am in a state of physical and mental integration. In flow theory, this integration with movement is achieved without effort. In fact, feedback happens spontaneously, as naturally as breathing. In this process, physical and mental operation has reached the limit of individual ability, but it is effortless. The following are the representative statements of the state.

P4: "The action-awareness merging state of the appreciator is to completely integrate myself into the Tai Chi Chuan movement, to achieve the state of "forgetting both things and myself."

P5: "If you are a veteran of Tai Chi Chuan, and you love it from your heart, you will be able to use the electrical signals of your brain to cooperate with the movements of your hands and feet, and you can effectively integrate them."

Similarly, fewer respondents mentioned the state of "action-awareness merging", which may be since it is too close to the state of "concentration on the task at hand".

3.1.7 Summary of qualitative research findings

From the interview materials, we summarized and refined six categories related to the dimensions of flow experience, and got the representative responses which could reflect their characteristics. There are three dimensions not mentioned by the interviewees, i.e., "clear goal", "unambiguous feedback" and "loss of self-consciousness". Among them, the first two dimensions are not clearly reflected. In the question "Do you think that the flow experience is like the state of "harmony between man and nature" in Tai Chi Chuan culture? " Many interviewees mentioned their understanding of the goals and rewards of Tai Chi Chuan, but most of them could not quite grasp the deep meaning. This might be due to the characteristics of Tai Chi Chuan. However, in the evaluation of the latter dimension of "loss of self-consciousness", the interviewees' understanding of this dimension was somewhat confused with other dimensions, which might be the reason why no interviewees mentioned this state.
3.2 Factors influencing the nine dimensions of flow state

3.2.1 Influence of exercise years

After the homogeneity test of variance, the significance of variance homogeneity of seven dimensions corresponding to the influencing factors of exercise time was greater than 0.05, and ANOVA test could be used. The results of homogeneity test of variance and ANOVA test of nine dimensions scores in different exercise years groups were shown in Table 2 and Table 3.

Table 2 Homogeneity test of variance of nine dimensions scores of different exercise years groups

| Factor                      | Levin statistics | Degree of freedom 1 | Degree of freedom 2 | Significance |
|-----------------------------|------------------|---------------------|---------------------|--------------|
| Challenge-skill balance     | 2.625            | 2                   | 182                 | 0.075        |
| Action-awareness merging    | 3.155            | 2                   | 182                 | 0.045*       |
| Clear goals                 | 2.315            | 2                   | 182                 | 0.102        |
| Unambiguous feedback        | 0.796            | 2                   | 182                 | 0.453        |
| Concentration on the task at hand | 4.443       | 2                   | 182                 | 0.013*       |
| Sense of control            | 0.851            | 2                   | 182                 | 0.429        |
| Loss of self-consciousness  | 0.474            | 2                   | 182                 | 0.623        |
| Time transformation         | 0.494            | 2                   | 182                 | 0.611        |
| Autotelic experience        | 2.654            | 2                   | 182                 | 0.073        |

*p < 0.05 **p < 0.005

Table 3 ANOVA test of seven dimensions scores of different exercise years groups
After ANOVA test, it was found that the influential factors of exercise time had no significant effect on flow state score except "autotelic experience" in seven dimensions. It was partially consistent with the previous research on flow state that years of experience was unrelated with flow experience (Martin & Cutler, 2002). Only one dimensions was significantly increased as the exercise years increased (shown in Figure 1). However, it should be noted that the participants were the college students who taken Tai Chi Chuan course. Their exercise years were the time they accumulated in class, which might be different from the training years of Tai Chi Chuan athletes.

### 3.2.2 Influence of time spent on Tai Chi Chuan and other sports every week

The exercise years of college students participated in Tai Chi Chuan course might not really reflect the time and energy they consumed in Tai Chi Chuan. Thus, we further investigated their participation in Tai Chi Chuan and other sports after class. Because of the interaction between the two groups, a two-way MANOVA test was used to study the effect of time spent on Tai Chi Chuan and other sports on flow state score.

Table 4 showed the results of tests of between-subjects. When participating in other sports for the same time, the change of time spent on Tai Chi Chuan had a significant effect on two flow state score dimensions "action-awareness merging" (partial $\eta^2 = 0.067$) and "concentration on the task at hand" (partial $\eta^2 = 0.055$). As shown in the Figure 2, when practicing Tai Chi Chuan for 0-2 hours a week, the flow score state of concentration on the task at hand dimension increased with the increase of practice time. However, the score of action-awareness merging dimension firstly dropped and then rose when the practicing time went up in two hours. After practicing for more than two hours a week, both of the scores of two dimensions decreased when the practicing time increased. This trend partially confirmed hypothesis 2: with increasing exercise years and time for Tai Chi Chuan exercise every week, the flow
experience of Tai Chi Chuan participants will also increase. The drop of flow state score when practicing for more than two hours might due to participants entering the boredom or relaxation state (low challenge and high skill) defined by Csikszentmihalyi (Csikszentmihalyi et al., 1997; Deitcher, 2011).

Table 4 Tests of between-subjects effects of two groups
| Source                                      | Dependent Variable                        | Type III Sum of Squares | df | Mean Square | F     | Sig.   | Partial η² |
|---------------------------------------------|-------------------------------------------|-------------------------|----|-------------|-------|--------|------------|
| Time for Tai Chi Chuan after class every week | Challenge-skill balance                   | 0.584                   | 3  | 0.195       | 1.254 | 0.292  | 0.022      |
|                                             | Action-awareness merging                   | 2.179                   | 3  | 0.726       | 4.029 | 0.008* | 0.067      |
|                                             | Clear goals                               | 0.697                   | 3  | 0.232       | 1.875 | 0.136  | 0.032      |
|                                             | Unambiguous feedback                      | 0.363                   | 3  | 0.121       | 0.825 | 0.482  | 0.014      |
|                                             | Concentration on the task at hand         | 1.951                   | 3  | 0.65        | 3.301 | 0.022* | 0.055      |
|                                             | Sense of control                          | 1.09                    | 3  | 0.363       | 1.929 | 0.127  | 0.033      |
|                                             | Loss of self-consciousness                | 1.543                   | 3  | 0.514       | 1.441 | 0.233  | 0.025      |
|                                             | Time transformation                       | 0.298                   | 3  | 0.099       | 0.48  | 0.697  | 0.008      |
|                                             | Autotelic experience                      | 1.305                   | 3  | 0.435       | 2.232 | 0.086  | 0.038      |
| Time for sports after class every week (any sports except Tai Chi Chuan) | Challenge-skill balance                   | 0.153                   | 3  | 0.051       | 0.329 | 0.805  | 0.006      |
|                                             | Action-awareness merging                   | 0.483                   | 3  | 0.161       | 0.893 | 0.446  | 0.016      |
|                                             | Clear goals                               | 0.201                   | 3  | 0.067       | 0.542 | 0.654  | 0.01       |
|                                             | Unambiguous feedback                      | 0.071                   | 3  | 0.024       | 0.161 | 0.923  | 0.003      |
|                                             | Concentration on the task at hand         | 0.043                   | 3  | 0.014       | 0.073 | 0.974  | 0.001      |
|                                             | Sense of control                          | 0.327                   | 3  | 0.109       | 0.579 | 0.630  | 0.010      |
|                                             | Loss of self-consciousness                | 1.894                   | 3  | 0.631       | 1.769 | 0.155  | 0.030      |
|                                             | Time transformation                       | 0.936                   | 3  | 0.312       | 1.507 | 0.215  | 0.026      |
**4 Conclusion**

Through semi-structured interviews and CFSS2 questionnaires, this paper studied the flow experience in Tai Chi Chuan, and verified the three hypotheses made previously.

In the interview, we demonstrated the hypothesis 1: in the process of Tai Chi Chuan, there was flow experience, or a similar mental state. Through qualitative research and coding, we extracted six categories of Tai Chi Chuan, which are generally consistent with the six dimensions of flow experience from previous researches. The other three dimensions not mentioned were "clear goal", "unambiguous feedback", and "concentration on the task at hand".

However, when the exercise time of Tai Chi Chuan after class every week was controlled at the same level, no significance was found in the change of time for other sports after class every week. But the interaction between after class Tai Chi Chuan exercise and doing other sports had a significant impact in the flow state score of "autotelic experience" dimension. It confirmed the fact that the enjoyment of sports mentioned above was affected by many factors.
feedback", "loss of self-consciousness". It might be due to the characteristics of Tai Chi Chuan. Tai Chi Chuan paid attention to achieve the mysterious state of "harmony between man and nature", and its goal and feedback were relatively vague compared with other sports. The participants did not feel deeply about the goal and feedback of the movements of Tai Chi Chuan, and did not fully understand the meaning of "loss of self-consciousness". However, at the same time, all the interviewee described the characteristics of flow experience in the other six dimensions, especially for the dimension of "autotelic experience". Most of the interviewee said that they had a pleasant experience in Tai Chi Chuan.

Through the analysis of the CFSS2 data, we tested the hypothesis 2: with increasing exercise time, the flow experience of Tai Chi Chuan participants will also increase. Results showed that score of "autotelic experience" dimension increased with exercise years increased, and the increasing time spent on Tai Chi Chuan after class was positively related to the score of "action-awareness merging" and "concentration on the task at hand" dimension. Although it was not observed that the flow state score increased with the increase of Tai Chi Chuan exercise time in all nine dimensions, it partially confirmed hypothesis 2 in two dimensions. The change of time for other sports after class every week found no significant effect on flow state score. At last, we found an interaction effect between after class Tai Chi Chuan exercise and doing other sports on the score of "autotelic experience" dimension.

Due to the influence of covid-19 epidemic situation, it was difficult to conduct a more extensive investigation. The interviewees and questionnaire objects were students who took Tai Chi Chuan course in universities. In the subsequent investigation, we should choose the participants with different occupation, age span and Tai Chi experience.

**Declarations**

**Conflict of Interest**

The authors declare that they have no competing interest.

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**Data Availability Statement**

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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**Figures**
Figure 1

Chart of mean score of autotelic experience of different Tai Chi Chuan exercise years
Figure 2

Chart of mean score of two dimensions of different Tai Chi Chuan exercise hours after class every week.