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## Analysis of Flow Experience and Heart Rate Measured in the Startup Weekend Program.

### Introduction

Startup Weekend is an established entrepreneurship program, which has hosted up to 8,000 events in 150 countries. It is a 54-hour program that holds between Friday and Sunday nights. The program is rigidly designed, with a team building session on Day 1, a planning and coaching session on Day 2 and a presentation and reviewing session on Day 3. Despite the strict time constraints, the participants are solely autonomous in their decision-making, while the tentative teams work organically. Their seriousness can lead to heated debates and internal discord. In other words, each team can experience what amounts to real entrepreneurial activity.

### Research Objectives

Our study is aimed at contributing to the literature regarding the impact of educational efforts on students' flow experiences by evaluating this intensive active-learning program. And we want to investigate the availability of heart rate as an indicator of psychological state.

The unique characteristics of the flow experience include enhanced concentration and a sense of control, loss of self-awareness, and a distorted perception of time (Csikszentmihalyi 1975, 1990). A good balance between the level of challenge and individual skills enhances the flow experience. That is to say, the small distance between Challenge and Skill is desirable. Regarding a team factor, we use collective efficacy, which was proposed by Bandura (1997) and collective anxiety, which is the opposite type of variable to

collective efficacy. In addition, Research attempting to elucidate the relationship between heart rate and flow experience is just getting started and we are pioneers.

Research Question is the followings.

RQ1. Does the balance between challenge and skill (individual factors) and collective efficacy (team factors) influence the flow intensity?

RQ2. What is the relationship between flow intensity and heart rate (HR)?

## **Methodology**

### ***Sample acquisition***

We surveyed 27 participants in Osaka city in Japan, in 2024. Experience data for flow intensity and collective efficacy were measured three times, at the end of day 1 and day 2, before the presentation of day 3. And participants wore Fitbit devices during the events.

### ***Variable set-up***

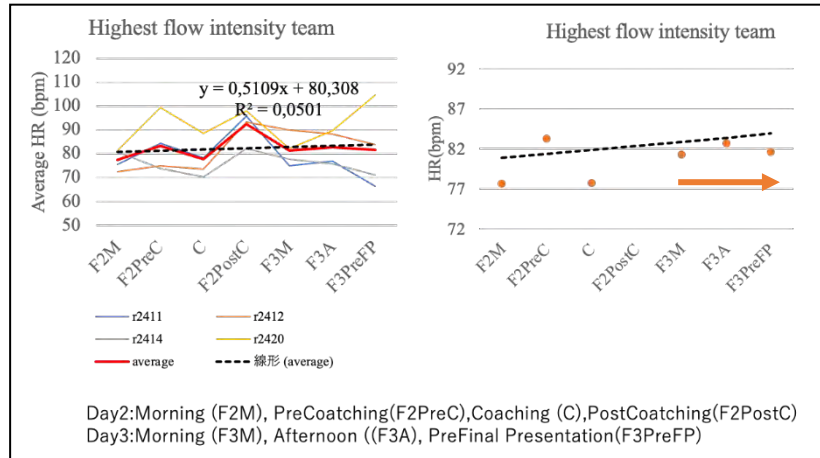
Flow intensity( $\alpha=.913$ ) was measured by 10 items (Ishimura,2014). Collective efficacy( $\alpha=.888$ ) was measured by five items which was adapted of Schwarzer's (1999) . Collective anxiety ( $\alpha=.787$ ) was measured by six items (Salanova, 2023; Warr, 1990).

## **Result**

As regards RQ1, we conducted a regression analysis for flow intensity, distance between challenge and skill ( $B = -.241$ ,  $p = .004$ ) were significantly and negatively related to flow intensity. And collective efficacy ( $B = .579$ ,  $p < .001$ ) were significantly and positively related to flow intensity. However, collective anxiety was not related to flow intensity ( $B = -.135$ , n.s.). The fit of this model was good (the adjusted  $R^2=.578$ ,  $F=37.49$ ). Incidentally, although we tried to ensure the interaction effect between each variable, we did not find any interactions.

As regards RQ2, 27participants were divided into seven teams. First, the highest flow intensity team showed ups and downs in HR change, the state of which would reflect active discussion and experimentation. However, the average heart rate tended to increase gradually (black dotted line) and remain stable (orange colored line) before the presentation (see the figure). Presumably, each member was able to maintain concentration on the activities and had strong confidence in the presentation.

The lowest flow intensity team showed a gradual decrease in heart rate and a rapid increase before the presentation. It is likely that each member was unable to maintain concentration and became nervous as they prepared to give a presentation.



**Figure: HR Change at Highest Flow Intensity Tea**

## Conclusion

RQ1. The balance of challenge and skill (individual factors) negatively correlate with the flow intensity. And collective efficacy (team factors) positively correlates with the flow intensity. And Collective anxiety does not influence flow intensity, which means that even if there is widespread anxiety in the team, as long as the collective efficacy is high, the flow experience will increase.

RQ2. Changes in HR reflect the level of activity of the team and the concentration and tension of the team members. Therefore, the HR indicator, together with the flow intensity variable, allows a deeper analysis of the psychological state of the team members.