

The Interactive Effect of Change Preferences and Intrinsic Motivation on Performance: A Longitudinal Study on French Learning

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Abstract: This paper introduces the new construct of change preferences. Radical changes follow a steeper and faster temporal trajectory whereas incremental changes follow a slower but steady trajectory. To explore the effect of different change preferences, we consulted a similar construct of goal setting. Previous studies suggested an interaction between goal proximity and intrinsic motivation. Similarly, we hypothesized that there is an interactive effect of change preferences and intrinsic motivation on task performance. We ran a longitudinal study on French learning with between-group design. Participants were assigned to three change preferences conditions, then they had to study French on a language-learning app and report their progress throughout the week. We used participants' self-reported French skills and French vocabulary test scores to measure their performance, and investigated the relationship between their intrinsic motivation, assigned condition and performance. Our research results showed no significance evidence for our hypotheses that people who are interested in task show better performance when they adopt radical change strategy, and people who are less interested show better performance when they adopt incremental change strategy. Our study suggests that people's preferences for change may not influence their subjective improvement. The key of pursuing a goal may not be the change trajectory, but to get started.

Keywords: Intrinsic motivation; Goal setting; Goal proximity

1. Introduction

We set goals every day, smaller ones such as "I have to get up 8:00 in the morning" and bigger ones such as "I will start to exercise this year." Many of them have been sitting on our New Year's Resolution list for years but never got completed. Then the question follows: How to achieve these goals? For some people, may prefer to save up energy and achieve the goal as soon as possible. Others, may find it intimidating to make a big commitment, so they prefer to approach the goal slowly. These two trajectories of change may lead to different results, but previous literature has not examined the effects of change trajectories. To understand the effect of change preferences, we propose a model of radical change and incremental change. Both radical and incremental change are aimed towards the same ultimate goal, yet the ways of pursuing the goal are different. Radical change refers to a steeper trajectory of improvement, and incremental change corresponds to slower but steady improvement. This study aims to introduce the new construct of change preferences and to explore how it interacts with the level of intrinsic motivation and then affects individuals' task performance.

1.1. Change preferences model

The change preferences model is a spectrum based on the amount of change. People at the lower (incremental) end of the spectrum prefer gradual change, and those who are at the upper (radical) end prefer abrupt change. Taking exercise as an example, people who prefer radical change will jump into 3.5 hours of exercise per week directly, whereas those who prefer incremental change start from 45 minutes per week and then move to 3.5 hours. To estimate the effect of change preferences on task performance, we derive our hypotheses from a similar construct of distal and proximal goals. Distal goals are ultimate long-term goals at higher complexity, and proximal goals are short-term sub-goals which dividing the ultimate goal into small attainable pieces. For example, exercising for 3.5 hours a week is a distal goal, and the proximal goal will be exercising for 30 minutes every day. The proximal goal divides the distal goal of 3.5 hours into seven parts of smaller goals of 30 minutes, which are more accessible and temporally closer. Eventually, people achieve the ultimate goal through proximal goals. Though sharing some similarities, change preferences deviate from goal proximity. In change preferences

model, people all work towards the same goal, only their decisions of how to pursue the goal across time differ. As illustrated above, people who prefer radical change may jump into the ultimate (distal) goal instantly, whereas people who prefer incremental change will start from 45 minutes and then gradually move to the ultimate goal of 3.5 hours. Even for people who pursue the proximal goal of 30 minutes of exercise per day, trajectories of change can differ. They can decide whether to start from 30 minutes from the beginning or to start from 10 minutes and then increase to the 30-minute sub-goal.

1.2. Conflicting effects of change preferences

Hypothesize that incremental change could have similar effects as dividing a complex task into attainable ones. People can finish small steps easily and gain satisfaction from the achievement, which increases their intrinsic motivation and improves their performance.

However, proximal goals may hinder the attainment of the ultimate goal due to the self-complacency of current progress. The premature satisfaction from temporary success encourages relaxation, thus interfering with the achievement of the ultimate goal. Also, the perception of external constraint reduces intrinsic motivation and further worsens task performance. When task interest is originally high, the sense of being controlled by experimenter will reduce participants' interest. In this case, proximal goals are not beneficial because they require individuals to fulfill specific criteria continuously, which may be perceived as controlling by participants. When people have proximal goals of 30 minutes of exercise every day, they are required to reach the amount of time in seven consecutive days. However, people with a distal goal of 3.5 hours in a week can distribute the time as they want. The limited degree of freedom may reduce individuals' interest in exercise, resulting in worse performance eventually. Thus, we can infer that incremental change may reduce intrinsic motivation as well, leading to worse task performance.

Similarly, distal goals have both positive and negative effect on task results. Distal goals are too far away to mark continuing progress and facilitate the development of self-efficacy. They cannot provide strategic advice for future improvement. However, distal goals provide individuals with a higher degree of freedom. Bandura's study used elementary students who showed low interest in arithmetic activities and measured their performances on this skill. The results showed that attainable sub-goals were positively

Correlated with mastery of math, higher perceived self-efficacy, and higher interest. Contrarily, in Manderlink's study, participants were initially interested in the word game task, and the results showed that their interest was reduced when assigned with proximal goals. When participants are interested in the task, distal goals seem to be

more beneficial. These results lay the groundwork for our prediction that people with high initial intrinsic motivation can perform better when they prefer radical change.

1.3. Intrinsic motivation

Empirical results from prior research could suggest that the effect of radical or incremental change on performance interacts with initial motivational level. According to self-determination theory, there is a continuum of different motivations based on the level of self-determination. At the lowest end of the continuum is amotivation, where people are unwilling to perform a task because they feel incompetent and have no control over the outcome, while the highest end is intrinsic motivation, where people fully determine what to do and they get pleasure from the chosen behavior. Within the span of amotivation to intrinsic motivation, there are further four types of extrinsic motivations—external, introjected, identified, and integrated motivation—from a low level of self-determination to high self-determination.

Previous studies have identified a positive correlation between high levels of self-determination and task performance, both for physical and for mental tasks. Participants with intrinsic and integrated motivation show higher persistence and better psychological well-being in academic settings. However, amotivation predicts negative outcomes on task performance. Intrinsic motivation is closely related to task performance, and the potential interaction between goal proximity and intrinsic motivation predicts a similar interactive effect of change preferences and intrinsic motivation.

1.4. Present study

The goal of this study is to explore the relationship between intrinsic motivation and trajectories of change. Supported by empirical results that proximal goals go along with increased competence, self-efficacy and intrinsic motivation, yet they may reduce intrinsic motivation when initial interest is high. The central hypothesis of the study is that intrinsically motivated individuals may show better performance when they are persuaded that radical change is good than who persuaded themselves that incremental change is good. Conversely, less intrinsically motivated individuals may show better performance when they are persuaded that incremental change is good compared to radical change.

2. Methods

2.1. Participants

The target sample was people who are interested in learning French but not an expert. Most of the sample (91%) are University of Illinois undergraduate students who participated in this study in exchange for 2 course credits. Others were recruited through online advertising, Reddit,

campus flyer, in-person recruitment, etc. Those who did not participate for course credits were eligible for a raffle of \$10 gift card. One credit or one raffle entry was given to the first survey (T1), and half credit or one additional entry was given for every three follow-up surveys. By March 20, 2019, 243 participants finished T1 (44 participants were excluded for initial subjective French level over 50 out of 100 scale or for initial crown number (participants could earn one crown for finishing one lesson on the app) exceeding 100) and 166 participants (68%) finished the last survey (T7). Three participants were excluded for different reasons: one for participating a similar study, one for using Google translator in French vocabulary test, and another for taking T1 twice.

The final sample had $N = 141$ participants, which contained 104 women (74%) and 37 men (26%), ranging in age from 18 to 44 ($M = 20.42$, $SD = 3.74$). Among the participants, 40% of participants identified themselves as Asian, 35% as White, 7% as Latino, Latina or Hispanic, 4% as African American, and 14% as other ethnicities.

2.2. Procedure

Every participant was enrolled in the study for one week, with one survey every day. For participants who were recruited through a subject pool, they took the first survey in the laboratory and completed online follow-up surveys on each of the next six days. Other participants who were recruited through online advertising, campus flyers, email invitations, or in-person recruitment took all surveys online. In the first survey (T1), participants were assigned to one of three conditions – control condition, incremental change, and radical change. Participants who were assigned to the control condition were asked to write about a song they enjoyed and the specific role the song played in their life. Those who were assigned to the incremental condition were asked to write about why the step-by-step strategy works after they were informed that this strategy was more successful. Similarly, participants who were assigned to the radical/ condition were asked to write about why radical change is good after they were informed that this strategy was more successful. Then we measured participants' change preferences using trajectory preferences scale to check if our manipulation was successful. The

Survey also gave participants instructions on how to use Duolingo, an app we used in our study as the primary tool of learning French. Participants also indicated their intention strength and intrinsic motivation. Lastly, participants reported their demographic information including gender, age, ethnicity, language, and education. T2 through T6 were identical follow-up surveys on participants' subjective French skills and the time they spent on Duolingo. The last survey (T7) was the regular follow-up survey plus a French vocabulary test measuring participants' objective performance in French.

2.3. Materials

Duolingo. Duolingo is a free language-learning platform providing users with simple language learning courses and language proficiency assessment exams. In our study, we used the French course provided by Duolingo. We gave participants tutorials on how to download the app and sign up for the French course. They were asked to choose a daily goal: Casual (5 minutes a day), regular (10 minutes), serious (15 minutes), or insane (20 minutes) and reported their choices in the survey.

Subjective French Skill. Participants had to report their current French level on a sliding scale from 1 (complete beginner) to 100 (expert) in the first survey. Those who reported more than 50 were excluded from our study. On the next 6 days, participants rated their French skills every day. In this study, we only used subjective French skills from T1 and T7 to calculate participants' subjective improvement in French level.

Trajectory Preferences Scale. This scale was created specifically for measuring participants' preferences for change. The 15 items of the scale are divided into three subscales – 7 items on preferences for starting a behavior (e.g., I refer to begin with a small sub-task), 4 items on preferences for stopping a behavior (e.g., I prefer to stop doing the behavior entirely), and 4 reverse-coded items on beliefs about the durability of radical and incremental change (e.g., Sudden change tend to not last for very long). In this study, the first subscale was used and reworded to measure participants' preferences for different strategies when starting learning French, $\alpha = .87$. Participants needed to report how much they agree with each item (e.g., When I need to make a change in my life by starting to learn a new language, I prefer to ...) on a 5-point scale (1 = not at all to 5 = very much so). Higher scores indicated more preference for radical change.

Intrinsic Motivation Inventory. The Intrinsic Motivation Inventory (IMI) is a multidimensional measurement device for assessing participants' subjective experiences related to an activity. In our study, we used the 7 items of the interest/enjoyment subscale to measure participants' interest in learning French, $\alpha = .93$. Participants had to report how much they agree with each item (e.g., I enjoy learning French very much) on a 5-point scale (1 = not at all true to 5 = very true), and higher scores indicated higher intrinsic motivation.

French Vocabulary Test. The vocabulary test consisted of 36 items -- 18 English phrases needed to be translated into French (e.g., the milk = le lait) and 18 French phrases needed to be translated back to English (e.g., mes canards = my ducks). All words were drawn from the learning materials in Duolingo in December 2018. Each item that was translated correctly got 1 point, and partial credit (0.5) was given for minor spelling mistakes or wrong article; otherwise, no points were given for wrong translation.

3. Results

3.1. Manipulation check

The manipulation was successful. Participants assigned to three conditions had very different preferences for behavior change strategies, $F(2,138) = 9.31$, $p < .001$. However, the simple ANOVA test only showed that at least two of the three conditions differ. To investigate which groups differed the most, we conducted a follow-up Tukey test, and the results showed that participants in incremental condition and radical condition had the most distinct preferences for change trajectories, $d = 0.68$ 95% CI = [0.29, 1.06].

3.2. Descriptive analysis

The average level of intrinsic motivation was 3.61 (SD = 0.88), indicating that participants' interest in learning French was initially high. The mean of their self-reported change preference for radical change was 2.32 (SD = 0.82), and the distribution was slightly skewed to the right, indicating a few more people preferred incremental change than radical change. The two dependent variables used for examining the interactive effect were participants' subjective improvement in French skill ($M = 7.38$, $SD = 8.49$) and their average scores on the French vocabulary test ($M = 0.33$, $SD = 0.33$).

3.3. Regression analysis

Our main hypothesis was that intrinsically motivated individuals would show better performance when they are persuaded that radical change is good and that less intrinsically motivated individuals would show better performance when they are persuaded that incremental change is good. To test the interactive effect, we ran a linear regression for the two explanatory variables and their interaction term. Two dependent variables, participants' subjective

Improvement in French skills and scores of the French vocabulary test, were chosen to measure participants' performance in French learning.

When using participants' self-reported improvement as the dependent variable, the change preferences conditions assigned to participants significantly influenced their performance, $F(2, 133) = 3.50$, $p = .033$. Participants in the incremental condition outperformed those in the control condition, $b = -16.02$, $SE = 7.25$, $p = .029$, or those in the radical condition, $b = -14.05$, $SE = 7.87$, $p = .077$. Participants who were less intrinsically motivated reported marginally more improvement in French improvement, $b = -2.62$, $SE = 1.49$, $p = .081$, however, this main effect was qualified by a marginally significant interaction with condition. As Figure 1 shows, the two regression lines

representing incremental and radical condition intersect, indicating that intrinsic motivation moderates the relationship between change preferences and performance. The interaction term of radical versus incremental change was marginally significant, $b = 3.62$, $SE = 2.11$, $p = .088$, yet the overall interactive effect across all three change preferences conditions was not statistically significant, $F(2, 133) = 1.85$, $p = .161$. The difference between these two interaction terms was the control group. When taking the control group into account, intrinsic motivation seemed not to affect the relationship between people's change preferences and subjective improvement. The effect we had tested so far showed only the average interactive effect, and to get a full picture of the effect, we conducted simple slopes analyses to examine the significance of the interaction term at different levels of intrinsic motivation. The results showed that the effect of incremental versus radical was marginally significant only when participants were not intrinsically interested, $M = 1$, $t(86) = 1.68$, $p = .096$. However, when participants were intrinsically interested in the task, their assigned conditions did not influence their perceived improvement in French skills.

The linear regression of average French test scores on intrinsic motivation, conditions, and their interaction terms showed that participants scored higher when they were interested in learning French, $b = 0.13$, $SE = 0.06$, $p = .028$, yet conditions assigned to participants did not have significant effects on their test performance, $F(2, 117) = 2.14$, $p = .123$. No significant interactive effect between radical change and intrinsic motivation was detected, $b = -0.06$, $SE = 0.09$, $p = .490$. Figure 2 also suggested that there might be no interaction because there was no obvious intersection between the two lines of incremental and radical change. The simple slopes analyses showed that participants in the incremental change condition scored significantly higher than those in the radical condition when they were interested in learning French, $t(77) = -2.26$, $p = .027$, yet the results contradicted our hypothesis that people who were interested would perform better when adopting radical change trajectories. We found a significant correlation between participants' initial French level and their French test scores, $b = 0.01$, $SE = 0.00$, $p < .001$, suggesting advanced French learners performed better than beginners, regardless of their conditions. However, after eliminating the protentional confounding effect of initial French level by adding the variable into our regression model, the interaction term between radical change and intrinsic motivation was still not significant, $b = -0.06$, $SE = 0.08$, $p = .431$. Thus, there might be other reasons for the absence of an interaction in the second regression model.

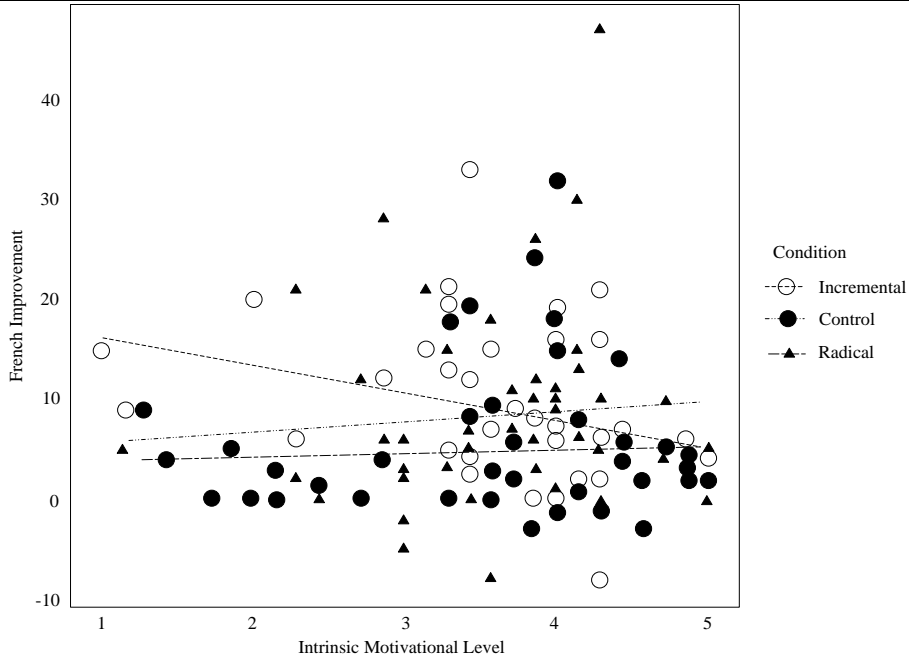


Figure 1. Interaction between intrinsic motivation and condition on French improvement.

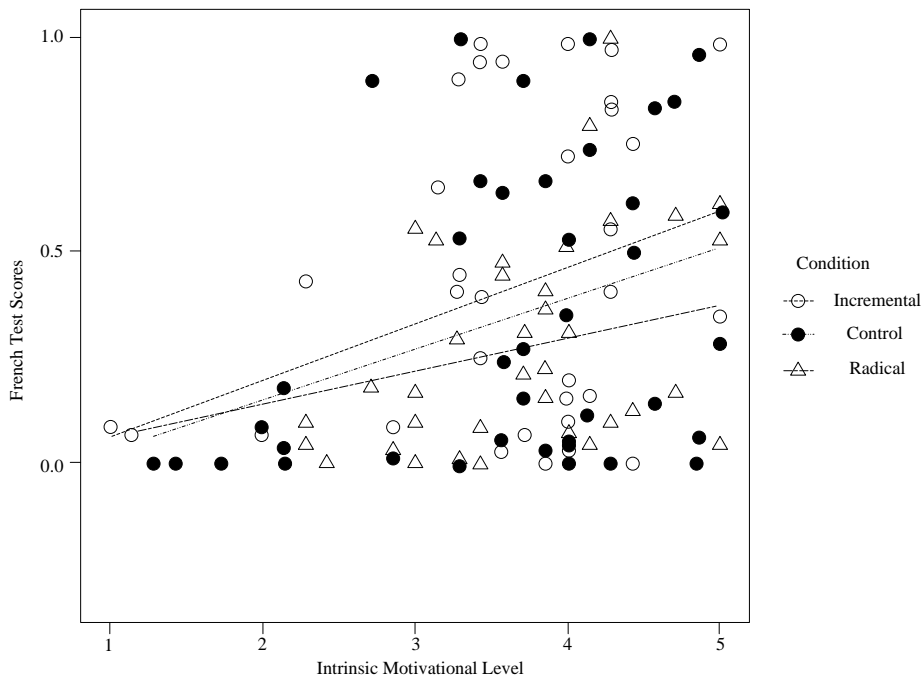


Figure 2. Interaction between intrinsic motivation and condition on French test scores.

4. Discussion

In this study, there was not enough evidence to show that intrinsic motivation moderates the relationship between people’s preferences of behavior change and their task performance. Participants who were persuaded that incremental change was good showed better performance

when their interest in learning French was low. However, there was only marginal statistical support for this effect. For participants who were interested in learning French, their beliefs of which behavior change trajectory was more beneficial did not influence their subjective French improvement or French test scores.

Our finding that participants who were less interested in learning French performed better when they prefer incremental change is consistent with results of previous studies in which proximal goals are positively correlated with mastery of task, perceived self-efficacy, and interest when initial interest is low. Manderlink and Harackiewicz replicated the results and further expanded the research to tasks with high interest. Their results showed that proximal goals enhance task performance to a lesser degree compared to distal goals when initial interest is high. However, we did not identify a positive effect of preference for radical change on performance for the high intrinsically motivated task. Our findings suggest that participants' performance did not differ across different change trajectory preferences when their initial interest was high.

Our results are also consistent with past research regarding the effect of intrinsic motivation. Intrinsic motivation is positively correlated to performance measures such as persistence. Recent research also replicated the results that high intrinsic motivation predicts better psychological well-being and academic performance. This pattern of results indicates a positive effect of intrinsic motivation on task performance, and our findings show that participants who were intrinsically interested in learning French scored higher than those who were less interested. However, there is also a contradiction that we found participants who were intrinsically interested in learning French actually reported less improvement in French skills when they were persuaded to adopt incremental change strategy.

The absence of a significant interactive effect may be due to multiple reasons. For example, the vocabulary test may not be sensitive to the improvement in French skills. When examining participants' performance using the French vocabulary test score, advanced learners who reported higher subjective French skills did much better than the beginners. Controlling for their initial French level, we found that more skilled learners didn't perform particularly better than beginners. Thus, we hypothesize that the French vocabulary test might not be a good measurement for participants' French improvement. As some participants remarked, the vocabulary test did not include the particular words they learned throughout the week, so the test scores might not reflect the actual improvement of their French skills.

The process of recruitment filtered out those who were not interested in learning French, resulting in only few observations at the lower end of the intrinsic motivation spectrum. Although we found a marginally significant effect such that participants performed better using an incremental change strategy when they were less intrinsically motivated, this effect appears to be largely determined by the limited data. Such an effect may not be reliable due to the lack of sample size at the low end of

the intrinsic motivation scale. Also, the interactive effect we identified was based on participants' self-reported French improvement. Participants may not be good at assessing their French level, and it is likely that they over- or under-estimate their improvement. In future studies, we would like to add other means to objectively measure participants' task performance.

Our study proposes a new construct of change preferences and examines its effect on task performance. However, little evidence was found to support the influence of change preferences on people's performance is moderated by how much they are intrinsically interested in the task. Although there was only limited statistical support for the promoting effect of incremental change trajectory on less intrinsically motivated tasks, it suggests that starting slow might be a better strategy when the task is not interesting. These findings may be of use in applied settings. For example, if we are not willing to get up early, incremental change like getting up 5 minutes earlier every day might be a practical strategy. For things we are really interested in like exercise, our beliefs of which change trajectory is better do not appear to influence our improvement as long as we get started.

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