Can contrived success affect self-efficacy among junior high school students?

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It has been known that self-efficacy and scholastic achievement are closely related. For example, Shell, Colvin, and Bruning (1995) reported that self-efficacy ratings and reading and writing achievement scores among fourth grade, seventh grade, and high school students were highly correlated. Marsh, Roche, Pajares, and Miller (1997) found that self-efficacy in mathematics among junior and senior high school students had a strong effect on their actual math achievement in school. Bandura, Barbaranelli, Caprara, and Pastorelli (1996) showed that children’s self-efficacy beliefs including academic self-efficacy, social self-efficacy, and self-regulatory efficacy, were related to academic achievement either directly and via other variables such as parental academic aspirations and children’s prosocial behaviors. However, those studies were only correlational, and whether the relationship between self-efficacy and scholastic achievement is causal or not has not been properly examined experimentally. A high level of self-efficacy may well be a result of high scores in an achievement test, rather than a cause. There are even some studies that failed to find a relationship between self-efficacy and school achievement (Garduno, 2001; Norwich, 1994).

Our recent review (Uchida & Mori, 2004) revealed that, although there were more than 50 papers concerning ‘self-efficacy’ and ‘junior high school’ published in psychological journals from 1993 to 2003, according to the database PsycINFO; no research directly targeted the causative relationship experimentally. Ever since Bandura introduced the notion of self-efficacy (Bandura, 1977), almost no studies have actually demonstrated that success promotes self-efficacy in a causal way by means of an experimental approach using junior high school students. The most recent study by Bandura and his Italian colleagues (Caprara, Fida, Vecchione, Del Bove, Vecchio, Barbaranelli, & Bandura, 2008) conducted a longitudinal investigation on the developmental course of perceived efficacy for self-regulated learning and its contribution to academic achievement using 412 Italian students. However, it showed only co-relative contributions of various factors. They did not quote any single study that demonstrated the causal relationship of academic successes and self-efficacy in an experimental paradigm.
Can contrived success affect self-efficacy?

Speight, Rosenthal, Jones, and Gastenveld (1995) is one of the only few exceptions. They showed that successful experiences in Medcamp participation brought about the promotion of self-efficacy in 45 junior high school students by measuring their self-efficacy at the beginning and end of the camp activity. Hampel, Meier, and Kümmel (2008) compared the effects of a school-based universal preventive stress management training program for early and middle adolescents with a no-treatment control group using 320 adolescents (ages 10–14 years) and found that the experimental group scored higher on perceived self-efficacy compared to the control group at the follow-up assessment.

The reason why few experimental studies have been carried out to demonstrate the causal relationship between successful experience and self-efficacy seems partly to stem from the difficulty in carrying out experimental manipulation of successful experiences. Participants may experience success easily on an easy task, but success on such tasks will produce little effect. In daily life, those who experience success on relatively difficult tasks tend to have high self-efficacy, whereas those who have less chance to experience success tend to have low self-efficacy. Success and self-efficacy are so closely interrelated and mutually accumulated in such a complex way it is difficult to isolate a causal relationship by means of the psychological experimentation.

Recently Mori (2003; 2007) invented a new presentation method called the MORI (Manipulation of Overlapping Rivalrous Images by polarizing filters) technique, by which two different visual stimuli were projected onto the same screen and two groups of viewers watched them separately, each without being aware of the presence of the other. This method makes it possible to create good and bad performers in a social comparison experiment by presenting easier tasks and more difficult tasks covertly and simultaneously to naïve participants (Mori and Mori, 2008). Those subjects presented easier tasks would outperform the others who were shown more difficult ones. The MORI technique would make it unnecessary to use confederates in social comparison experiments.

The purpose of the study was to contrive success in junior high school students and to examine whether their self-efficacy can be positively affected by the experience of artificial success. In order to let the target students experience success, we presented them with easier anagram tasks surreptitiously using the MORI technique (Mori, 2003; 2007).

Method

Participants

Six classes of seventh grade junior high school students (207 in total) participated in this study. In each class, four target students were selected from the 26–50 percentile academic range as assessed by a recent achievement examination, two of whom their teacher expected would experience
enhanced self-confidence, and two randomly selected. The total number of target students was 24 (11 males and 13 females). The other 183 students participated as controls.

The fMORI technique (Mori, 2007)

The presentation technique used in the present study was named the ‘fMORI technique,’ an offshoot of the MORI technique (Mori, 2003). In an ordinary projector, the green LCD panel is perpendicular to the red and blue ones. Therefore, either the green or magenta (blue plus red) light beams can be blocked separately by polarizing filters, and two pairs of polarizing sunglasses can separate the green and magenta fragments projected onto the screen simultaneously. Thus, words printed in green or magenta can be seen on the same screen separately by two groups of viewers wearing different types of polarizing sunglasses. (For a more detailed description of the fMORI technique, see Mori, 2007.)

Anagram tasks

Thirty anagram tasks with five Japanese hiragana letters were prepared. Of these, twenty were used for each condition, and ten tasks were prepared with two levels of difficulty. An example of English equivalents would be, ‘STIPUD’ and ‘PSITDU,’ both of which could be re-arranged to make the word ‘STUPID’.

Apparatus

An LCD projector manufactured by EPSON (LP-700) was used. Presentation of the anagram tasks was done by means of a PowerPoint slide show on an Apple iBook controlled by the experimenter. The easier anagram tasks were presented in magenta (in black letters on a magenta background) while the more difficult ones were presented in green (in black letters on a green background). In order to mask the not-to-be-seen letters completely, random dot noises were added. The preparation of presentation materials was done using Adobe Photoshop. The materials were projected onto a rear screen, a pane of ground glass of 80 cm x 80 cm, from behind the participants. The actual size of a PowerPoint slide on the screen was about 75 cm in diagonal, about the same size as a 30-inch monitor. Two types of polarizing sunglasses, four pairs for the target students and about 30 for the control group, were prepared with each type suitable for watching images either in green or magenta. Those sunglasses were the same as those used in eyewitness studies using the MORI technique (French, Garry, & Mori, 2008; Garry, French, Kinzett, & Mori, 2008). To ordinary eyes they looked identical. The cover story for having participants wear sunglasses was to eliminate the glare of the rear projection.
Procedure
Participants were led by their class teacher to an experiment room set up in the junior high school. The seats for participants were arranged in front of the rear screen and participants were seated in the same configuration as in their ordinary classroom. On each seat, a pair of polarizing sunglasses was placed, so that only the target students would wear the different type of polarizing sunglasses that would allow them to view the easier anagram tasks.

After having the students sit down and put on the sunglasses, the experimenter presented 30 anagram tasks to the participants and asked them to write their answers on the answer sheet. Each anagram was presented on the screen for ten seconds at five-second intervals. After the presentation, the experimenter announced the correct answers so students could check their responses. Then, students with more than 20 correct answers were asked to raise their hands.

The same procedure was repeated consecutively for six classes within the same day.

Dependent variables
Before and after the anagram tasks, the participants predicted their own success on a 5-point scale in answer to the question: ‘How well will you perform in the word reconstruction game?’ These self-predictions were used as students’ self-efficacy scores. Additional self-efficacy measurements were done two weeks, four months, and a year later to assess how they maintained their self-efficacy after the performance.

Results
Effectiveness of the experimental manipulations
As expected, the target students with easier tasks outperformed the control students; the average numbers of correct answers were 25.79 and 19.67 respectively, a statistically significant difference ($t_{(205)} = 8.03$, $p < 0.01$). All of the target students scored above 20 and raised their hands during the self-report session at the end. Therefore, it was concluded that the experiment successfully allowed the target students to experience superiority in their performance compared with their classmates. It should be noted that post-experimental questionnaires conducted a month later revealed that no participants had noticed the presentation artifice. The effectiveness of the MORI technique had been repeatedly confirmed in previous eyewitness experiments (see, French, et al., 2008; Garry, et al., 2008).

Self-efficacy ratings
The target students experienced an enhanced sense of capability (self-efficacy) when rated on a 5-point scale after their success on the tasks (3.83...
vs. 2.89 for control students; see Figure 1) and maintained it even four months later (3.92 vs. 2.91). Although the self-efficacy ratings had declined considerably one year later (3.46 vs. 2.84), all of these differences were statistically significant ($F_{(4,652)} = 26.31$, $LSD = 0.33$, $p < 0.05$).

No significant differences were found between the self-efficacy measures for two sub-groups of target students (those whom the class teacher had chosen and those who had been randomly chosen). Just after the anagram task the results were, 3.67 vs. 4.00, for the class-teacher-chosen and the randomly-chosen, respectively; four months later, 3.75 vs. 4.08, and a year later, 3.33 vs. 3.58 (all $F_{s(1,22)} = <1.03$, ns). Even smaller differences were observed between male and female target students regardless of the measuring period (all $F_{s(1,22)} = <0.48$, ns).

**Discussion**

*Socially approved success promotes self-efficacy*

The results clearly showed that those who scored high in the anagram tasks and received approval from their classmates raised their self-efficacy and kept it high even after one year. It should be noted that the target students were chosen from the 26–50 percentile academic range as assessed by their most recent achievement examination. In Japanese junior high schools, it is rare for such low-middle range students to gain approval in ordinary class
activities related to school subjects. Therefore, the success they experienced in the anagram tasks was probably unexpected not only by themselves but also by their classmates. They might have attributed the unexpected feat to mere luck rather than to their own competence. However, it seemed they did not. That may be the reason they experienced a heightened sense of self-efficacy.

Why the effect lasted so long

The success in the anagram tasks did not result from the students’ actual competence, such as native intelligence or any other kind of general intellectual competence. The success was contrived. Therefore, even if they attributed this isolated achievement to their own competence, they should have had plenty of chances to correct their misattribution during ordinary school activities in which they must have faced various unfavorable outcomes, including the term examination. They did not perform well on the term examination (Average T-Score is 44.65) administered soon after the anagram task phase just as on their former examination (Average T-Score is 44.55). That could have undermined their confidence in the feat they had just experienced. However, the results showed that negative adjustment of their misattribution did not occur. The target students maintained their heightened self-efficacy level from the anagram tasks throughout the entire year after the contrived success.

It seemed that the target students could dissociate their success on the anagram tasks from their other general abilities. Even if they failed to perform competently during daily academic class activities, they maintained their belief in their own high ability for the specific task. They might have met with various unfavorable outcomes, but never the anagram task itself again during their ordinary school life. Without any subsequent bad experiences, they did not have to lower their self-efficacy estimation for the anagram task.

Filtering out unfavorable information

It should be noted that, for ethical reasons, the artifice was disclosed to the participants one month after the anagram session. It was explained that there were two series of anagram tasks, an easy one and a difficult one, only one of which could be observed depending on the type of sunglasses worn, although it was not disclosed who wore the easy-task sunglasses. Therefore, it might be possible for a student to guess whether he/she had worn the easy-task ones or not according to his/her own performance relative to that of classmates.

To our surprise, the self-efficacy ratings were hardly affected by this trick disclosure, as shown in Figure 1, showing no decline between the ratings two weeks and four months later. This result may be interpreted by the cognitive tendency to filter out unfavorable information. The target
students, given the trick explanation, might well have guessed that they themselves had worn the easy-task sunglasses. If it had been done, they might have corrected their erroneous attribution by properly re-attributing their success to the trick. However, they did NOT do that. This filtering-out process seems to work unconsciously. Therefore, they must have neglected the unfavorable information unconsciously and continued to attribute their success to their own ability.

If there exists an unconscious filtering-out process, it may work such that positive experiences are transferable to other areas and only negative experiences are filtered out. It is an opportunistic interpretation, though it has been known that our cognitive processes sometimes employ such convenient mechanisms (See, Gilovich, 1991, for a review). Further studies are needed to investigate whether such opportunistic filtering-out processes really exist in our cognition.

**Academic achievement: a possible sign of improvement among target students**

It should be worthwhile to note one promising result obtained in this study. Although the causal effects were not fully demonstrated, the target students showed a sign of improvement in their scholastic achievement in addition to their self-efficacy. The T-Scores of scholastic achievement of the 24 target students rose from 45.55 two months before the anagram task phase to 46.78 three months after having experienced success in the anagram tasks and even higher, 47.63, six months later. They maintained the gain after one year, 47.48.

In principle, it would be impossible to assess the improvement of the control group using norm-referenced test scores. With T scores, the average is always 50 by definition. However, it could be done as a post hoc comparison by obtaining the T scores of corresponding students from the 26–50 percentile range. There were 27 students in the same percentile range as the targets but who observed the more difficult anagram tasks. Their average T scores were 46.60 just before the anagram task phase, and remained at almost the same level, 46.58, 45.98, 46.98, for 3 months, 6 months, and one year after, respectively. A mixed design two-way analysis of variance (Targets vs. Control x four test phases) was performed on these data and revealed no significant main effects of Targets vs., Control ($F_{(1,49)} = 0.04, MS_{sub} = 111.0, ns$), the test phases ($F_{(3,147)} = 1.15, MS_{subphase} = 10.06, ns$), nor the interaction ($F_{(3,147)} = 1.56., MS_{subphase} = 10.06, ns$).

Although the post hoc analysis above degraded the significance of the results considerably, we still think it would worthwhile to report the fact that statistically more students among the targets showed an increase in their T scores. Two-thirds (16/24) of the target students eventually raised their general academic achievement T-Scores three months later (a direct calculation of the probability, $p = 0.076$). Moreover, 17 out of 24 target students showed improvement that reached statistical significance ($p = 0.032$) six months later. Meanwhile there was no such increase among the equivalent
students. (The number of students with higher T scores after the anagram task among this group was 17, 14, and 15 out of 27 for 3 months, 6 months, and one year after the anagram task performance, respectively. Even the largest number, 17, did not reach a statistical significance, $p = 0.124$).

It is only fair to mention the possibility of a regression effect. Since the targets were chosen from the 26–50 percentile range, the probability of improvement would be larger than that of deterioration, if the scores varied only by chance—the regression effect. The reason the targets had higher their academic achievement scores may have been explained at least partly by this regression effect. The fact that there were more students who showed improvement than those who declined among the finely-tuned control group may well be explained in the same way.

**Conclusion**

The present research has demonstrated with a causal experiment that even contrived success may promote the self-efficacy of lower-middle level students dramatically, and be maintained for a long time. The result would also show the possibility of improvement of academic achievement of the target students. Still, it should be safe to conclude that the causal effect of the contrived success on the scholastic performance through promotion of self-efficacy was not fully demonstrated in the present study. However, this study may shed light on educational research of some value to school teachers who are genuinely interested in learning how to promote their students’ self-efficacy and improve their scholastic performances. There has been a great deal of literature that revealed a variety of positive effects of self-efficacy (See Bandura, 1997, and Eccles and Wigfield, 2002, for the recent review). Even if the elevated self-efficacy does not improve students’ scholastic achievement immediately, it may have a variety of positive effects in their school life elsewhere, whether measurable or not.

**References**


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