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# THE MODERATING EFFECT OF FLOW BETWEEN COMPETENCE FEEDBACK AND INTRINSIC MOTIVATION

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THE MODERATING EFFECT OF FLOW BETWEEN COMPETENCE  
FEEDBACK AND INTRINSIC MOTIVATION

By

Kayla Marie England

THESIS

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Title of Thesis: The moderating effect of flow between competence feedback and intrinsic motivation.

This thesis by Kayla England is recommended for approval by the student's Thesis Committee and Department Head in the Department of Psychology and by the Assistant Provost of Graduate Education and Research.

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## ABSTRACT

### THE MODERATING EFFECT OF FLOW BETWEEN COMPETENCE FEEDBACK AND INTRINSIC MOTIVATION

By

Kayla M. England

The intrinsic motivation after competence feedback between participants scoring high or low in dispositional flow was investigated. Participants included 30 female and 29 male college-aged students. Participants completed the Dispositional Flow Scale – 2, performed a puzzle solving task, and were given feedback. Intrinsic motivation was defined as the length of time spent playing with a puzzle during a free-choice period. Participants who were low in dispositional flow displayed greater intrinsic motivation after hearing incompetence feedback than participants who heard competence feedback. The results indicate that individuals who are low in dispositional flow might be more motivated to gain competence than individuals who are high in dispositional flow.

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## INTRODUCTION

### **The Effect of Feedback on Intrinsic Motivation**

Intrinsic motivation is defined as engagement in an activity for an interest and sense of enjoyment without an external reward (Deci, 1975). Deci (1971) found that when external monetary rewards are induced during a puzzle solving task, intrinsic motivation decreases compared to subjects in a non-rewarded group and compared to prior unrewarded trials. This effect was also replicated in a field study using money to reward newspaper writers for headlines. In a third study, Deci (1975) used social rewards, in the form of verbal praise, and found that verbal rewards increased intrinsic motivation. Researchers now agree that motivation is determined, not by the type of the reward, but by the degree that it satisfies our need to feel competent, related, and autonomous (Ryan & Deci, 2000). According to the Self Determination Theory, people have an ultimate need to grow which becomes satisfied through feeling competent, related, and autonomous (Deci & Ryan, 2002). Satisfying these needs causes intrinsic motivation, because behavior is self-determined or motivated from within (Deci & Ryan, 2002). The present study was conducted to determine how the interpretation of feedback affects intrinsic motivation.

### **Competency and Control**

Unlike some forms of intangible rewards, tangible rewards are more likely to shift the locus of causality to the external source (Deci, 1975). However, when

intangible forms of feedback are perceived as controlling, the intangible feedback can also become the locus of causality, and violate needs to feel autonomous. In a study by Deci (1972), participants were told that in order to avoid a loud noise they needed to solve a puzzle. Ultimately, participants given the threat were less intrinsically motivated to play with the puzzle during a free-choice period where they had the option to play with other puzzles or read magazines. Furthermore, Deci, Cascio, and Krusell (1973) found that when the participant was in control of administering the negative verbal feedback, intrinsic motivation still decreased. Although self-administered feedback did not violate the need for control, the negative feedback violated the participant's need to feel competent (Deci, Cascio, & Krusell, 1973). Furthermore, positive performance feedback that illustrates competence has shown to increase value of competence and increase intrinsic motivation (Harackiewicz, Sansone, & Manderlink, 1985).

In addition to negative intangible forms of feedback, Deci and Ryan (2002) found that positive intangible feedback also decreased intrinsic motivation when autonomy needs were violated. In a meta-analytic review of 128 studies, Ryan, Koestner, & Deci (1999) examined studies that included both tangible and intangible rewards that were either controlling or not controlling. The researchers found that all tangible rewards decreased intrinsic motivation. More importantly, the researchers found that across studies involving positive intangible rewards that were also controlling (i.e. task contingent rewards, completion contingent rewards, and engagement contingent rewards); positive rewards also lead to decreases in intrinsic

motivation. Therefore, even positive reinforcement can lead to decreased intrinsic motivation if it violates the need to feel autonomous.

Verbal feedback promotes feelings of competence and autonomy, by providing information about the quality of performance. In a study conducted by Koestner, Zuckerman, and Koestner (1987), participants were asked to complete a hidden figure search task in either an ego involved condition where the task was described as a test, or a task involved condition where the task was described as a game. In addition the researchers manipulated the type of feedback that the two groups received. The two groups heard one of three types of feedback: praise for their ability, praise for their effort, or no praise. What they found was ability praise lead to more intrinsic motivation than effort praise or no praise. They also found that participants displayed more intrinsic motivation when the task was described as game (task involved) than when it was described as a test (ego involved). Additionally they found that participants chose more challenging tasks when they were in the task-involved condition as well as the ability praised condition. Therefore, the researchers concluded that ability praise provided information about competence. They also concluded that promoting the task as a game satisfied the need of autonomy.

Reeves, Olson and Cole (1986) found that competitive situations that have a clear winner and a clear loser can provide information about competence without explicit verbal praise or tangible rewards. In order to determine that winning or losing provided competence feedback, they investigated the level of intrinsic motivation after winning or losing three trials of a puzzle solving game with a confederate. The first two trials were for practice, although it was still fixed so that the participant

always won the first trial and the confederate always won the second trial. The manipulation occurred when the confederate either won the last three trials or lost the last three trials. After the competition, the experimenter told the participant and the confederate that they would each be interviewed about the experiment. The confederate was always chosen first for the interview in order to leave the participant in the room for a free-choice period. The purpose of the study was to determine if a participant was intrinsically interested in the puzzle after either winning or losing the competition. What they found was that when a participant won, he or she was significantly more interested in the puzzle during the free-choice period. Therefore winning was sufficient to promote feelings of competence without a physical or verbal reward for winning. Their study also supported that feeling competent predicted intrinsic motivation.

In further exploration of the role that experiencing losing at a competitive task plays in an individual's perceptions of competence and subsequent intrinsic motivation, Vansteenkiste and Deci (2003) found that the effects of losing on intrinsic motivation can be mediated by verbal praise. When losers were praised meeting a normative standard of performance despite losing, they displayed more intrinsic motivation than losers who did not receive praise for reaching the normative standard. What Vansteenkiste and Deci adds is that people reference others performance to decide how competent they feel they are at the task. If their perception was only based on their performance it would have not been affected by the normative information.

## **Flow in Challenge**

A specific kind of experience called “flow” is an example of a need to feel competent, be in control, and experience intrinsic motivation. Csikzentmihalyi (1975) defines flow as an enjoyable experience where mental energy is fully consumed in attaining an achievable goal. In the flow state, there is a balance between perceived opportunities or demands with perceived capabilities or skills (Csikzentmihalyi, 1975). Balance is essential in the flow experience, because if there are too many opportunities or challenges, combined with fewer options for action or skills to meet the demands, a person will might feel overwhelmed and anxious (Csikzentmihalyi, 1975). On the other hand if there are too many options, or a person is too skilled to meet a simple demand, the person will feel overwhelmed or bored and anxious (Csikzentmihalyi, 1975). Simultaneously, the balance of challenge and skill creates enjoyment from knowing what should be done to meet the demands.

## **The Components of Flow**

Csikzentmihalyi (1971) conducted an anthropological study to determine which characteristics of play may make it enjoyable and attractive. Csikzentmihalyi found that all forms of play across cultures included challenges of strategy, chance, or skill. He concluded that enjoyment must come from finding the right challenges to test skills. Furthermore, Csikzentmihalyi (1975) conducted a series of interviews with rock climbers, basketball players, modern dancers, chess players, and composers of music. During these interviews Csikzentmihalyi asked open-ended questions about why they enjoyed their activity, as well as what it felt like to be intrinsically motivated during the activity. After the interviews he determined that there were nine

elements conceptualized in the experiences that they were describing. He also determined that the experience was a conceptually different experience than experiences such as creativity or play. The nine elements that he found in their descriptions were (1) a balance between perceived challenge and perceived skill, (2) merging of action and awareness, (3) clear goals, (4) unambiguous feedback, (5) total concentration on task, (6) sense of control, (7) loss of self consciousness, (8) transformation of time, and (9) an autotelic experience. Autotelic experience is defined as an experience when attention is focused on the activity without concern for the consequence (Csikzentmihalyi, 1990).

Csikzentmihalyi (1990) argued that the balance of challenge and skill facilitates the experience of the additional eight factors. Descriptions of the merging of action and awareness included a climber who does not perceive themselves as a separate entity than the mountain. Descriptions of clear goals and immediate feedback included the climbers who had a main goal of reaching the top, continuously using information along the way to determine if they are getting closer to reaching their main goal. Descriptions of concentration on the task at hand included a climber who forgot all other forces that were acting on them except any information that led them to their goal. Perception of control was conceptualized as the enjoyable feeling of exercising personal control by navigating possibilities. Loss of self-consciousness resembles becoming so absorbed in the task that no attention is spent worrying about others judgments of their personality. Descriptions of time transformation included becoming so engaged in an activity that time passed without notice. The autotelic experience included engaging in an activity for the sake of enjoying the activity.

## **Measuring Flow**

Once the experience of flow was fully defined by the nine factors, Csikzentmihalyi and Larson (1987) developed a method to measure mental states called the Experienced Sampling Method (ESM). During the ESM, participants carried with them pagers and a series of forms throughout their normal routine. When they were notified on the pagers, they were instructed to answer a series of open ended and scaled questions on the forms. The questions pertained to characteristics of the activity as well as how they felt in that moment. Csikzentmihalyi and Lefevre (1989) used the ESM to measure the frequency that people experience flow, as well as during what types of activities and contexts that people experience flow. They found that enjoyment was not dependant on the type of activity, but similar amounts of challenges and skills. People preferred engaging in work over leisure when their work included a challenge and skill balance. Although, people preferred leisure over work when their leisure time was spent doing activities that included a balance of challenge and skill. They also discovered that there were some personality differences in flow experiences. Some people preferred, sought out, or valued flow experiences significantly more than others. Csikzentmihalyi refers to this person as an “autotelic person” (Csikzentmihalyi, 1990).

Less intrusive methods of measuring flow include the Flow State Scale -2 (FSS-2) and the Dispositional Flow Scale – 2 (DFS-2) (Jackson & Eklund, 2002). Rather than disrupting the participant with a beeper, participants answer a series of questions about an activity that they felt was engaging.

## **Flow and Competence**

Sine the creation of the ESM, researchers have found a relationship between flow experiences and self-esteem (Csikzentmihalyi, 1988). In a sample of working married mothers, researchers found that indications of challenge and skill balance measured using the ESM were positively correlated with scores on Rosenberg's Self-Esteem Scale (Rosenberg, 1965; Rosenberg, 1979) as well as Gilbaud-Walliston and Wandersman's Parenting Sense Competence Scale (Gilbaud-Walliston & Wandersman, (1978). Furthermore, Kowal and Fortier (2000) used the Flow State Scale to conduct a time-lagged study using swimmers and found that measures of perceived situational competence predicted situational motivation, which in turn predicted flow experiences. There is supporting evidence that the reverse relationship might also exist. Abuhamdeh and Csikzentmihalyi (2012) sampled college students using the ESM and found that attentional involvement mediated the relationship between challenge and skill balance and feelings of competence.

While Reeves, Olson, and Cole (1986) found that competition fosters intrinsic motivation through a unique form of competent feedback, flow experiences might also provide a unique form of feedback. In addition to challenge and skill balance, the flow construct might explain why some games of challenge and skill are intrinsically motivating and persist despite incompetency. In other words, competence feedback might be interpreted differently during the flow experience.

It is important to note that focusing on a competitive outcome is not associated with performing well (Jackson & Robers, 1992). Jackson and Roberts

(1992) found after asking athletes about their best and worst performances that athletes' best performances were not during times that they were focused on the outcome, but experiencing the flow process. Therefore, perceiving oneself as competent should not be confused with striving towards competence. In fact, focusing on experiencing the flow process is related to being competent.

The difficulty with studying the flow experience is that the flow state cannot be independently verified. Given that flow states include complete concentration and loss of self-consciousness, asking a person if they are in a flow state disrupts the experience. Therefore, experimentally manipulating flow is difficult to do. However, differences in dispositional flow are measurable using the DFS-2. Therefore by measuring dispositional flow as an individual difference, it becomes possible to examine the role that it plays in the effect of competence feedback on intrinsic motivation. Accordingly, the purpose of the present study was to determine if having a propensity to experience flow will promote feelings of competence and preserve intrinsic motivation even in the face of hearing feedback suggesting task incompetence. This study tested the hypothesis that people who score high in dispositional flow will display greater intrinsic motivation than participants who score low in dispositional flow after hearing incompetence feedback.

## **Method**

### **Sample**

Fifty-nine college-age students (30 males and 29 females) from an introductory psychology course were recruited for this. Participants were

compensated with course credit. Compensation was approved by the Institutional Review Board at Northern Michigan University.

## **Materials**

Dispositional flow was measured using the DFS-2 (Jackson & Eklund, 2002). The participants were asked to write an activity in a space that was provided on the questionnaire. They were asked to answer 36 questions rated using an 11- point Likert-type scale ranging from “Extremely Uncharacteristic” to “Extremely Characteristic” in reference to how they feel during the chosen activity. The measure contained nine factors: challenge skill balance, merging of action and awareness, clear goals, unambiguous feedback, concentration on task, sense of control, loss of self-consciousness, time transformation, and autotelic experience. There were four questions pertaining to each of the nine factors. Each of the four questions were averaged and then summed to obtain a flow score.

Examples of items measuring challenge skill balance were “My abilities match the challenge of what I am doing” and “I feel I am competent enough to meet the demands of the situation.” Examples of items measuring the merging of action and awareness were “I am aware of how well I am doing” and “I have a good idea about how well I am doing while I am involved in the task/activity.” Examples of items measuring clear goals included “I know what I want to achieve” and “My goals are clearly defined.” Examples of items measuring unambiguous feedback included “I have a good idea about how well I am doing while I am involved in the task/activity” and “I have a good idea about how well I am doing while I am involved in the

task/activity.” Examples of items measuring concentration on task included “I have total concentration” and “It is no effort to keep my mind on what is happening.” Examples of items measuring sense of control included “I feel like I can control what I am doing” and “I have a feeling of total control over what I am doing.” Examples of items measuring loss of self-consciousness included “I am not worried about what others may be thinking of me” and “I am not concerned with how I am presenting myself.” Examples of items measuring time transformation included “It feels like time goes by quickly” and “The way time passes seems to be different than normal.” Examples of items measuring autotelic experience included “The experience leaves me feeling great” and “I really enjoy the experience of what I am doing.”

Additional items included a script (see appendix C), two stop watches, a clipboard, a lab coat, a hinged puzzle piece, wooden shapes, and illustrations of the wooden shapes. There also were various placed in the room for the participants to use during the free-choice period such as magazines, newspapers, and books. A post-questionnaire was used to check the effect of the manipulation, as well as to measure interest and enjoyment in the activity (see appendix D). Participants indicated how competent they felt, how interesting they found the task, and how much they enjoyed the task using an 11-point Likert-type scale ranging from “Not at all” to “Extremely.”

### **Procedure**

A link to the DFS-questionnaire was emailed to the students by their instructor prior to signing up for the experiment. For the experiment, participants were recruited using a sign up form posted inside the classroom. The study was described on the signup form as a puzzle solving task that would take approximately 30 minutes. The

form included an email address for the participants to use if they had any questions about the experiment. The form also included the room number where the experiment was held. Participants wrote their name and email address next to their chosen time. Emails were sent out the night before the experiment to remind the participants of the room number and the time that they chose.

When participants arrived at the experimental laboratory a researcher welcomed them to the puzzle solving experiment and kindly asked them to leave their phones and books outside the door. Next the researcher asked them to take a seat in a chair that sat in view of a two-way mirror. Another researcher sat on the other side of the mirror to observe during the measurement period. After the participant sat down, the researcher asked the participant to read and sign an informed-consent form. Then the researcher took their seat by at a nearby table. The researcher was oriented perpendicular to the participant in order to prevent feelings of competition. After the researcher took their seat they read the participant a script which detailed the procedure of the puzzle solving task (see appendix C). Next, the researcher asked the participant if he or she was ready to begin the experiment. Then the experimenter selected the first shape from a separate table, placed it in front of the participant, and returned to their seat. The experimenter instructed the participant to open the first folder containing an illustration of the shape and begin when he or she was ready. The first two trials were untimed practice trials. After the participant was through completing the practice trials the experimenter reminded the participant that the next three trials would be timed. The experimenter placed the third figure in front of the subject, returned to their seat, and instructed them to open the third folder and begin.

Once the participant touched the puzzle piece the experimenter started the stopwatch and continued until the participant said “done.” Then the experimenter recorded the time on a clipboard and proceeded with the fourth and fifth trials. If the participant asked any questions, the experimenter was instructed to tell them to solve the puzzle to the best of their ability. After the fifth trial, the experimenter averaged out the three scores and gave the participant predetermined competence feedback. The experimenter told the participant to wait for a few minutes while they entered the data into the data system.

Once the researcher shut the door, the second researcher behind the two-way mirror began timing the duration of the free-choice period. A third stop watch was used to record the total length of time that the participant touched the puzzle piece. After the eight minutes elapsed, the researcher from behind the two-way mirror entered the room, distributed the post-experiment questionnaire and debriefed the subject.

After the experiment, the data were analyzed. Gathered from the DFS-2 questionnaire, the average score was 62 (with a low score of 24 and a high score of 87), standard error of the mean was 1.50, and the standard deviation was 12. The 36 item questionnaire consisted of an 11-point Likert-type scale, therefore the highest possible highest was 396. The Cronbach’s alpha for the DFS-2 was .94. The data gathered from the DFS-2 and the experiment were analyzed using a two way between groups analysis of variance (ANOVA) to determine if dispositional flow moderated the effect of competence feedback on intrinsic motivation. Gender was blocked to make sure there was not an effect of gender on intrinsic motivation between

competence feedback conditions. Additionally, nine unplanned two-way between groups ANOVAs were performed to determine if each factor of the flow construct moderated the effect of competence feedback on intrinsic motivation.

## **Results**

### **Manipulation Check**

A one way between groups analysis of variance (ANOVA) was conducted to determine if the manipulation of competence feedback had an effect on perceived competence indicated on the post experiment questionnaire. Competence feedback had a significant effect on perceived competence,  $F(1,57) = 8.84, p = .004, \eta^2 = 0.13$ , a medium effect, accounting for 13% of the variance in perceived competence. Thus there was a significant difference between incompetent feedback ( $M = 5.78, SD = 1.93$ ) and competent feedback ( $M = 166.32, SD = 1.88$ ) conditions.

### **Gender**

A two way between groups ANOVA was conducted to determine if gender had an effect on intrinsic motivation. The main effect of gender was not significant  $F(1,55) = 0.19, p = .67, \eta^2 = 0.00$ , a weak effect, accounting for 0% of the variance in intrinsic motivation.

### **Dispositional Flow and Competence Feedback**

A two way between groups ANOVA was conducted to determine if dispositional flow moderated the effect of competence feedback on intrinsic

motivation. The main effect of competence feedback was not significant,  $F(1,55) = 1.20, p = .28, \eta^2 = 0.01$ , a weak effect, accounting for 1% of the variance in intrinsic motivation. Thus, there was not a significant difference between incompetent feedback ( $M = 166.32, SD = 150.35$ ) and competent feedback ( $M = 123.39, SD = 141.76$ ) conditions. The main effect of dispositional flow was not significant,  $F(1,55) = 0.12, p = .73, \eta^2 = 0.01$ , a weak effect, accounting for 1% of the variance in intrinsic motivation. Thus, there was not a significant difference between high dispositional flow ( $M = 151.24, SD = 143.11$ ) and low dispositional flow ( $M = 140.83, SD = 152.33$ ). The interaction between competence feedback and dispositional flow was significant,  $F(1,55) = 5.60, p = .02, \eta^2 = 0.05$ , a small effect accounting for 5% of the variance in intrinsic motivation. A Tukey test was also conducted to determine where significant differences occurred between the simple-effect means. For subjects low in dispositional flow, intrinsic motivation in the incompetent condition ( $M = 205, SD = 145$ ) was significantly greater than in the competent condition ( $M = 77, SD = 135$ ). Participants who were low in dispositional flow displayed greater intrinsic motivation when they were given incompetent feedback than when they were given competent feedback (see appendix A).

### **Interest and Enjoyment**

Using the post-questionnaire to dissect the unexpected interaction, a one-way between groups ANOVA was used to determine if ratings of interest had an effect on intrinsic motivation. Main effects for interest were not significant,  $p > .05$ . A one-way

ANOVA was also used to determine if ratings of enjoyment had an effect on intrinsic motivation. Main effects for enjoyment were not significant,  $p > .05$ .

### **Flow Factors**

Using each of the nine factors to help dissect the unexpected interaction, nine two-way between groups ANOVAs were conducted for each of the nine factors in the flow construct. All main effects and interactions were not significant except for the main effect of the competence feedback manipulation on intrinsic motivation when paired with the DFS subscales (1) feelings of control and (2) unambiguous feedback (see table 1).

A two-way between groups ANOVA was conducted to determine if there were significant effects of feelings of control and competence feedback on intrinsic motivation. Main effects for feelings of control were not significant,  $p > .05$ . There was a significant main effect of competence feedback on intrinsic motivation,  $F(1,55) = 4.11$ ,  $p = 0.05$ ,  $\eta^2 = 0.03$ , a medium effect accounting for 3% of the variance in intrinsic motivation. Thus, intrinsic motivation was significantly greater ( $M = 123$ ,  $SD = 142$ ) in the competent feedback condition than in the incompetent feedback condition ( $M = 166$ ,  $SD = 150$ ). The interaction between control and competence feedback was not significant,  $p > .05$ .

A two-way between groups ANOVA was conducted to determine if there were significant effects of unambiguous feedback and competence feedback on intrinsic motivation. The main effect of unambiguous feedback was not significant,  $p > .05$ . There was a significant main effect of competence feedback on intrinsic motivation,  $F(1,55)$ ,  $p = .04$ ,  $\eta^2 = 0.04$ , a medium effect accounting for 4% of the

variance in intrinsic motivation. Thus, intrinsic motivation in the incompetent feedback was significantly greater ( $M = 166, SD = 150$ ) than the competent condition ( $M = 123, SD = 142$ ). The interaction between unambiguous feedback and competence feedback was not significant,  $p > .05$ .

## Discussion

The results found did not support the hypothesis in the predicted direction. As predicted, there was a significant interaction between flow and competence feedback. However, participants who were low in dispositional flow displayed greater intrinsic motivation after hearing incompetence feedback than hearing competence feedback. Although the results did not support the predicted hypothesis, they might suggest that flow is a motivational experience. Csikzentmihalyi (1990) argues that since it is uncomfortable to experience boredom or anxiety, people either create challenges or select easier tasks to get back into the flow channel. Therefore, the results might suggest that people who are low in flow are playing with the puzzle during the free time to experience a flow state.

Before it is accepted that people who are low in dispositional flow are motivated by incompetence feedback, an important finding about the sample should be highlighted. Contrary Deci and Ryan's (1999) meta-analysis of research using both the free choice method and self reports of interest, participants who played with the puzzle the longest did not report being significantly more interested in the puzzle. Another finding that should be highlighted was the sample did not show a difference in intrinsic motivation between competence feedback conditions. Although this

finding contradicts Deci, Ryan, and Koestner's (1999) meta-analysis, it is not entirely unusual. Out of the 21 studies examined in the meta-analysis, 10 yielded small effect sizes. It is possible that some of the participants would have played with the puzzle regardless of the condition, still there were no outliers that could have influenced the average score (see table 2). Looking at the intrinsic motivation scores above one standard deviation, the incompetent condition contained seven participants and the competent condition contained three participants. Both conditions contained no subjects below one standard deviation. Therefore, the mean for the incompetent condition was not skewed towards an outlying score. It should be noted that the entire sample was on average less intrinsically motivated, although similarly distributed, than previously found by Reeve, Olson, and Cole (1985). Participants' average amount of seconds playing with the toy was 146 with a standard deviation of 147.

Although the competence feedback did not have an effect on the behavioral measure of intrinsic motivation, or the self report measures of interest and enjoyment, it did have a significant effect on the self report measure of perception of competency. The additional nine unplanned ANOVAs using the individual factors of the flow construct, illustrated a different pattern than the primary analysis. Competence feedback had an effect on both high and low unambiguous feedback and control factors. Unlike the main interaction effect, people low in these personalities did not play with the puzzle longer during the free choice period in the incompetent condition than in the competent condition. However, further tests should be conducted using larger sample sizes to confirm the effects.

A possible limitation of the current study might have been the task type. Knowl and Fortier (2000), measured the intrinsic motivation of elite swimmers by measuring their persistence. Using their method, the swimmers might have been more motivated in general because they selected the task prior to the study was conducted. The present study used a novel task. Therefore findings from the current study suit contexts involving novel tasks. Knowl and Fortier's (2000) study also used a time lagged method to measure intrinsic motivation. The present study measured intrinsic motivation immediately after the incompetence feedback.

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## Appendix A

### Interaction between Competence Feedback and Flow

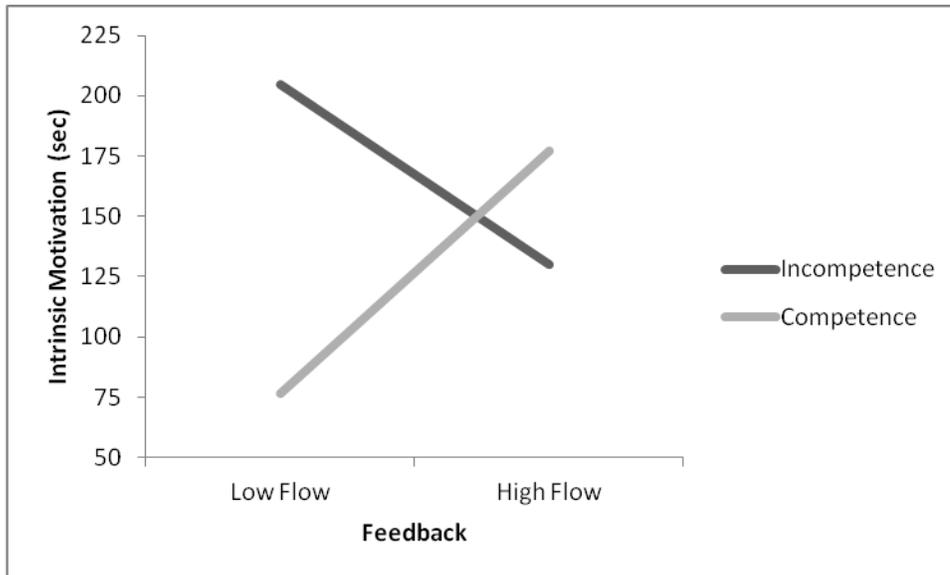


Figure 1. Interaction between competence feedback and dispositional flow. Differences between means in the incompetent and competent conditions were significant for low dispositional flow.

## Appendix B

Table 1  
Flow Factors Analysis of Variance

Factor	<i>F</i>	<i>p</i>
1. Autotelic Experience	0.67	0.52
Feedback	1.37	0.25
Interaction	-	-
2. Clear Goals	0.92	0.34
Feedback	0.19	0.67
Interaction	0.22	0.64
3. Concentration	0.69	0.41
Feedback	2.07	0.16
Interaction	0.88	0.35
4. Control	2.28	0.14
Feedback	4.11*	0.05
Interaction	2.58	0.11
5. Challenge Skill Balance	3.80	0.06
Feedback	1.52	0.22
Interaction	3.50	0.07
6. Loss of Self Consciousness	0.19	0.83
Feedback	1.28	0.26
Interaction	0.33	0.57
7. Merging Action and Awareness	0.00	0.97
Feedback	0.98	0.33
Interaction	0.21	0.65
8. Time Transformation	1.00	0.32
Feedback	3.71	0.06
Interaction	2.33	0.13
9. Unambiguous Feedback	2.37	0.13
Feedback	4.77*	0.04
Interaction	3.16	0.08

\*  $p < .05$

## Appendix C

Table 2  
Number of Extreme Subjects

Condition	No Play	Max Play	Below 1 <i>SD</i>	Above 1 <i>SD</i>
Incompetent	5	1	0	7
Competent	6	1	0	3

## Experimenter Script

Thank you for participating in the conjunctive puzzle solving experiment. Today you will solve five puzzles. The first two puzzles will be practice. The next three puzzles will be timed. Your objective is to solve the puzzles as quickly as possible. Once you are done I will average your timed scores together and compare your average score to other student's scores.

Are you ready to begin?

First we will begin the two practice untimed trials. I will place a wooden figure in front of you. Then I will ask you to open the folder that matches the trial number. The folder will contain a picture of the wooden figure. Your job will be to form the gold puzzle piece into the shape of the wooden figure and the illustration in the picture in the folder.

*The experimenter places figure number one from a nearby table in front of the subject, and returns to their seat.*

You may open folder one and begin.

*Experimenter repeats for figure number two.*

Now we will begin the timed trials. This time when you are finished solving the puzzle say "done" so I will know when to stop the stopwatch. If you cannot create the exact shape of the wooden figure, get as close to the shape as possible and say "done".

*The experimenter places figure number three in front of the subject, sits down, and holds the stopwatch.*

You may open folder three and begin.

*The experimenter starts the stop watch when the participant first touches the puzzle and stops the stop watch when the subject tells the experimenter that they are done.*

*When they are done with trial three the experimenter records the time on the clip board and continues with trials four and five. When they have finished the three timed trials the experimenter takes a few moments to average out their score.*

According to this chart you performed better than \_\_\_\_\_ (10 or 90) % of other students at Northern.

Give me a few minutes while I record your scores in my data system.

Appendix D

Post-Questionnaire

How interesting did you find the task?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How competent were you at the task?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How important was it for you to do well at this task?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

Would you be willing to do this experiment in the near future with the same opponent?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

Would you be willing to do this experiment in the near future with another opponent?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How enjoyable was this task for you?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

I tried very hard at this task.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How friendly was the other person?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

I felt very pressured while doing this activity?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How competitive was the atmosphere during the experiment?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How attractive was the experimenter ?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

I tried to do as well as I could at this activity?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How competent was the experimenter?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How trustworthy was the experimenter?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

How much tension did you feel during the experiment?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Not at all Extremely

The experimenter had a good personality.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

After doing this activity for a while, I felt very competent.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

While I was doing the puzzles, I found myself enjoying the task.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

The presence of the experimenter affected my performance.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

I am very satisfied with my performance.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

The experimenter was organized.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

The experiment was very difficult for me.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

I enjoyed conversing with the experimenter.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

Compared to other students, I think I did very well at this task.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

I did not put much energy into this experiment.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

I think I am pretty good at this task.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

I felt very relaxed while doing this task.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

I put a lot of effort into this task.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
Disagree Agree

Did you play with the puzzle while you were left in the room?

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10  
No, not Yes, very  
at all much

**Memorandum**

**TO:** Kayla (Bopp) England  
Psychology Department

**CC:** Bradley Olson  
Psychology Department

**DATE:** April 16, 2013

**FROM:** Brian Cherry, Ph.D.  
Assistant Provost/IRB Administrator

**SUBJECT: IRB Proposal HS13-523**

**IRB Approval Dates: 4/9/2013-4/9/2014\*\***

Proposed Project Dates: 1/1/2012-12/31/2012

“Intrinsic Motivation after Competence Feedback Moderated  
by Dispositional Flow and Anxiety”

The Institutional Review Board (IRB) has reviewed your proposal and has given it final approval. To maintain permission from the Federal government to use human subjects in research, certain reporting processes are required.

- A. You must include the statement "Approved by IRB: Project # HS13-523" on all research materials you distribute, as well as on any correspondence concerning this project.
- B. If a subject suffers an injury during research, or if there is an incident of non-compliance with IRB policies and procedures, you must take immediate action to assist the subject and notify the IRB chair ([dereande@nmu.edu](mailto:dereande@nmu.edu)) and NMU's IRB administrator ([bcherry@nmu.edu](mailto:bcherry@nmu.edu)) within 48 hours. Additionally, you must complete an Unanticipated Problem or Adverse Event Form for Research Involving Human Subjects
- C. If you find that modifications of methods or procedures are necessary, you must submit a Project Modification Form for Research Involving Human Subjects before collecting data.

- D. \*\*If you do not complete your project within 12 months from the date of your approval notification, you must submit a Project Renewal Form for Research Involving Human Subjects. You may apply for a one-year project renewal up to four times.

All forms can be found at the NMU Grants and Research website: <http://www.nmu.edu/grantsandresearch/node/102>

ljc