HOW YOU CORRECT MATTERS

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Feedback is used in a variety of contexts to train staff and to teach individuals new skills. Despite its popularity, there is no consensus on how to deliver it. Different measures have been used to evaluate the effectiveness of feedback, such as accuracy of responses and the sequencing of feedback delivery. The purpose of this study was to compare two feedback procedures and to explore new ways to measure the effectiveness of feedback. Four undergraduate students were exposed to two conditions: feedback before + skip the opportunity to respond and feedback after an incorrect answer. Results showed that the number of correct answers and teaching time were similar in both conditions. However, session duration was lower in the feedback before + skip condition when compared to the feedback after condition. Finally, reported emotions correlated with participants' correct responding. This study demonstrates that it is more beneficial and efficient to teach learners how to engage in a correct performance, rather than to correct responses.

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Dr. Jesús Rosales-Ruiz told me at the beginning of my journey that it is about the process, not the outcome. Thank you for your mentorship and seeing something in me that I did not see in myself. I also would like to thank my amazing grandma, this process would not have been possible without her. Thank you for teaching me that it is “better to laugh than cry”—this paper is dedicated to you. Thank you to my family: late grandma and grandpa, Mom, late father, John, Jena, Matt, Ruth, Jackie, Sean and all the furry babies. I love to laugh with you and live life with all of you. Dr. Daniele Ortu, our conversations always made me smile—I was so grateful to have you on my committee. Dr. Shala Ala’i, thank you for being on my committee and showing students what an amazing leader does. Thank you to Kat Bayliss and Corinne Free, for helping me edit this document and being amazing best friends. My life would not be the same without you. “I don’t know how many years on earth I’ve got left, but I’m gonna get real weird with it.” -- Frank Reynolds. Thanks to my dear friends Emily and Colin – I heart you! To my cohort, the department, professors, and staff, I love you all and am grateful to have shared this experience. Thank you to Dr. Melinda Sota for your mentorship, guidance, and friendship. I’ve enjoyed the laughs, advice, and everything in between. Thank you to Dr. Joe Layng for all of your generosity and interesting conversations along the way. Thank you to Jennifer Clayton for creating an exciting and fun mentorship with me—I look forward to our future collaborations. Thank you to ORCA for all your camaraderie and support along the way (shout out to Andia and Scott). A special thanks to Dr. Jim Sherman (and KU DBA) who knew this journey would be good for me. I never knew my journey would completely change my life for the better.

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CHAPTER 1

INTRODUCTION

Feedback has been used as a teaching tool in many fields, including the medical field (Dohrenwend, 2002), industry (Sulzer-Azaroff & Santamaria, 1980), education (Codding, Livanis, Pace & Vaca, 2008) and business (Crowell, Anderson, Abel, & Sergio, 1988). For example, feedback has been used to improve how lifeguards clean pools (Rose & Ludwig, 2009), to improve horseback riding techniques (Kelley & Miltenberger, 2016), to reduce injury with sharp objects in a hospital (Cunningham & Austin, 2007), and to teach supervisors to give feedback (Parsons & Reid, 1995). Feedback has been shown to not only increase performance but also to better people's lives.

Even though feedback can be effective, there is no general consensus on how to deliver it. A commonly recommended feedback technique is to sequence it in the following order: positive, negative/corrective, positive (PNP). PNP is commonly called the feedback sandwich (Slowiak & Lakowske, 2017; Dohrenwend, 2002; LeBaron & Jernick, 2000, Hesketh & Laidlaw, 2000; Kimball & Jazzar, 2011). However, not all scholars agree that PNP is the best way to deliver feedback (e.g., Daniels, 2009; Henley & Reed, 2017; Von Bergen, Bressler, & Cambell, 2014). To resolve this issue, researchers have examined different ways to sequence feedback. For example, Slowiak and Lakowske (2017) compared sequences of positive-corrective-positive, corrective-positive-positive, positive-positive-corrective, and no feedback, on correctly completed data entries. They found that regardless of how feedback was delivered, the accuracy of

responses increased when any form of feedback was provided. Choi, Johnson, Moon, and Oah (2018) found the same to be true.

Other researchers have explored when to deliver feedback. For example, Aljadeff-Abergel, Peterson, Wiskirchen, Hagen, and Cole (2017) investigated the effects of providing feedback before + skip or feedback after on the implementation of error correction procedures and on the rate of specific praise. In the feedback after condition, participants received feedback after they completed the task, and they did not have an opportunity to implement the correct performance for a few days. In the feedback before, participants did not receive any feedback in the moment, but feedback was delivered 10-20 minutes before their upcoming performance. Participants had higher accuracy in the feedback before compared to the feedback after condition.

Another issue with delivering feedback is the emotional responding of participants. For example, managers fear that giving corrective feedback will offend their employees (Petty, 2009). To address this concern, some researchers have measured participants' emotional responding during feedback delivery (Schaible & Jacobs, 1975; Davies & Jacobs, 1985). For example, Choi et al. (2018) measured participants' emotional responding by using a questionnaire that listed emotions from two groups: positive (e.g., surprised, happy, excited, satisfied, comfortable, and relaxed) and negative (e.g., unsatisfied, nervous, anxious, discouraged, sad, and bored). Participants ranked each emotion from 1 (strongly disagree) to 5 (strongly agree). Rankings were then used to calculate the mean score for positive and negative emotional responding. During baseline, no feedback was provided. During treatment, participants were given feedback according to an assigned condition (i.e., negative-negative, positive-positive,

negative-positive, and positive-negative). Overall, participants reported high positive emotions in the positive-positive condition, high negative emotions in the negative-negative condition, and emotions in the middle (similar to baseline levels) in the positive-negative and negative-positive conditions. Additional research is needed to further refine how to measure emotions when giving feedback.

Metrics such as total amount of time and time to criterion have not been used previously to measure the effectiveness of feedback. However, these measures have been used in other contexts to assess efficiency (Drevon & Reynolds, 2018, Leaf, Alcalay, Kassardijan, Tsuji, Dale, Ravid, Taubman, McEachin, & Leaf, 2016). For example: Leaf, Leaf, Taubman, McEachin, and Demolino (2014) measured number of sessions, time to mastery and number of trials when comparing different types of prompting procedures. These types of metrics could be a useful tool for comparing different types of feedback.

Efficiency can be achieved in a variety of ways. One way is to teach learners to skip or tell them the correct answer if they are unsure. Research has demonstrated that utilizing a skip or telling participants the correct answers to question versus making them guess minimize errors and produces better acquisition and better memory (e.g., Baddeley & Wilson,1994). Teaching participants to skip has not been utilized in the OBM when training staff.

The present study investigated whether feedback delivered before or after a response produced differences in accuracy, emotional responding, and total teaching time. Additionally, this study wanted to exam if adding in a skip when delivering feedback before would be more efficient.

CHAPTER 2

METHOD

Participants

Four undergraduate students from the University of North Texas, two females and two males, ages ranging from 20-26, participated in this study. To recruit participants, research participation requests were distributed among the undergraduate students affiliated with the behavior analysis department. All participants had completed an undergraduate introductory course in behavior analysis. Participants earned $10 for their involvement in the study, which lasted 45-60 minutes. This study was approved by the University of North Texas's Institutional Review Board.

Setting

Sessions were conducted in a private room on the University's campus. The experimenter and participant sat across from each other at a table with a colored folder on top of the table.

Materials

The following materials were used: a folder, a bowl, ten wooden tokens (measuring 1.90 cm), a dog training clicker, headphones, a laptop, Google's™ metronome feature, and data sheets. An iPhone™ was used to film the experiment. It only captured the materials and the experimenter's and participant's hands. The stimuli consisted of twenty Chinese, Japanese, and Arabic symbols printed on laminated paper

measuring 9.52 cm x 9.52 cm) printed out on pieces of laminated paper (see appendices).

Measurement

Data were collected on the following dependent variables: trial duration, frequency of correct responses, frequency of skips, percentage of trials with incorrect responses, participants' reported emotions, and preference.

Trial duration was defined as the time between when the experimenter asked the participant to name the card to the time in which the participant gave a correct answer, gave an incorrect answer, or said "skip." The time was measured post hoc using Adobe Premiere™. The start time was scored by writing down the minute, second, and millisecond from the time stamp of the video. The ending time was scored the same way. Trial duration was measured by subtracting the end time from the start time for each trial. The trial durations for each session were added to equal the session duration. The dependent variable was session duration.

A correct response was recorded when the word said by the participant matched the assigned name for the card after the experimenter said, "What is this?" The participant had to say the exact pronunciation of the correct term word to be considered correct. The dependent variable was the number of correct responses.

A skip was recorded when the participant said "skip" after the experimenter said, "What is this?" The dependent variable was the number of skips.

An incorrect response was recorded when the word said by the participant did not match the assigned name for the card after the experimenter said, "What is this?" Then the number of incorrect trials were added up from each condition for each

participant. The number of incorrect trials were then divided by the total number of trials. The dependent variable was the percentage of trials with incorrect responses.

Participant's reported emotions was defined as what the participant wrote when asked "How Do You Feel?" at the end of each session. These answers were entered into Microsoft Excel™ along with the corresponding condition, number of corrects, number of incorrects, and number of skips. Then the number of corrects were ranked from smallest to largest. The dependent variable was the rank order (from smallest to largest) of the number of corrects and the corresponding emotion description.

Preference was defined as the participant's binary response to the question: "If you were to do another lesson, would you do blue or red?" Preference was measured by totaling the number of participants who selected blue (Feedback Before + Skip) or red (Feedback After). The dependent variable was the number of participants who picked blue or red.

Interobserver Agreement:

One additional observer collected inter-observer agreement (IOA). The additional observer was training using behavioral skills training (e.g., Miltenberger, 2004) which consisted of instruction on the scoring procedures, modeling, rehearsal, and feedback. The observer scored IOA for 40% of each condition for every participant. IOA for accuracy was calculated using the formula: A/(A+D)*100. IOA for accuracy was 100%. IOA was calculated using Total Duration IOA for session duration using the formula: Shorter Duration/Longer Duration*100. IOA for session duration was 93.75% (range 90-

100%). IOA for reported emotions was calculated using the following formula: A/(A+D)*100. IOA for reported emotions was 100%.

Procedures

General Procedures

Prior to the experiment, each participant received the following instructions: “People learn in different ways. Today you are going to have two lessons where you will learn to say a word when a symbol is presented to you. Each lesson will have a set of different instructions. After each lesson is done, write down how you felt about that lesson.” After these instructions, the experimenter began either the feedback before + skip or the feedback after condition.

Session Structure

Before each session began, a folder was placed in front of the participant (red for feedback after and blue for feedback before + skip). Each session (called lessons for the participants) consisted of 10 trials and each symbol was presented one time during each session. Each condition had a separate set of ten symbols, before each condition the experimenter shuffled all ten cards and presented them in a random order. Each symbol had a term associated with it. The experimenter used words from Elfish (JRR Tolkien language), Dothraki (Game of Thrones language), and Spanish. After a session was completed, the experimenter told the participant to fill out the “How Do You Feel?” section on their data sheet (see Appendix C*)*. The experiment consisted of 20 sessions in total.

Feedback After

The experimenter delivered the following instructions: “In this lesson I will show you a card and ask you ‘What is this?’ You will have to guess the correct answer. If you are correct, I will immediately click and give you a token. If you are not, I will immediately correct you. After I correct you, repeat the word that I have just told you.”

The trial began when the experimenter held up a card and said, “What is this?” If the participant responded correctly, the participant would hear a click and receive a wooden token. If the participant responded incorrectly, the experimenter said, “Nope. This is [correct term]” The participant would then repeat the correct term. If the participant mispronounced the word, then the experimenter would say the correct pronunciation. Then the participant would repeat the correct pronunciation (see Appendix D).

Feedback Before plus Skip (Feedback Before + Skip)

The experimenter delivered the following instructions: “In this lesson I will show you a card and ask you ‘What is this?’ If you don’t know the answer you can say skip. But if you know the answer, tell me what it is. Try not to guess. If you are correct, I will immediately click and give you a token. If you are not correct or say skip, I won’t say anything, and I will tell you the correct answer later on.”

The trial began when the experimenter held up a card and said, “What is this?” If the participant did not respond or hesitated, the experimenter would prompt the participant and say, “You can say skip.” Prompts were provided every 2-4 s. If the participant was correct, the experimenter clicked and delivered a wooden token.

However, if the participant was incorrect or said skip, the experimenter said nothing. After each trial the cards were sorted into piles of corrects, incorrects, and skips. The skips and incorrects were reviewed before the following session began.

During the review the experimenter held up a card and said, “This is [correct term]”. The participant would then would repeat the correct term. If the participant responded correctly, the experimenter would click and give them a token. However, if the participant repeated the word incorrectly, the experimenter would provide another model, and the participant would then repeat the word. Afterwards, the experimenter would click and deliver a token. The review ended once all the cards that were previously missed or skipped were reviewed (See Appendix E). In addition, the experimenter went through this review procedure with all 10 cards during the participant’s first feedback before + skip session.

Preference Assessment

At the end of the experiment, the experimenter asked the participant, “If you were to do another lesson, would you do blue or red?” After the participant responded, the experimenter ended the experiment.

Experimental Design

Feedback before + skip was considered the A condition and feedback after was considered the B condition. The design used was an A-B-A-B or a B-A-B-A reversal design. The conditions were counterbalanced across participants.

CHAPTER 3

RESULTS

Figures 1, 2, 3, and 4 show the session duration for each participant. The session numbers are graphed along the x-axis, and seconds are graphed along the y-axis. The open bars represent the feedback after, and the closed bars represent the feedback before + skip. At the top of each condition, the total time spent during the condition is displayed.

Figure 1 shows Leslie's session duration times. Leslie's session duration ranged from 9.74 to 19.63 s during the first feedback before + skip condition. The total time spent in this condition was 63.54 s. During the second feedback before + skip condition, session duration ranged from 7.23 to 11.9 s. The total time spent during this condition was 61.41 s. In the first feedback after condition, Leslie's session duration ranged from 27.95 to 35.09 s. The total time spent time spent in this condition was 158.52 s. Leslie's session duration during the second feedback after condition ranged from 9.68 to 25.26 s. The total time spent in this condition was 87.11 s

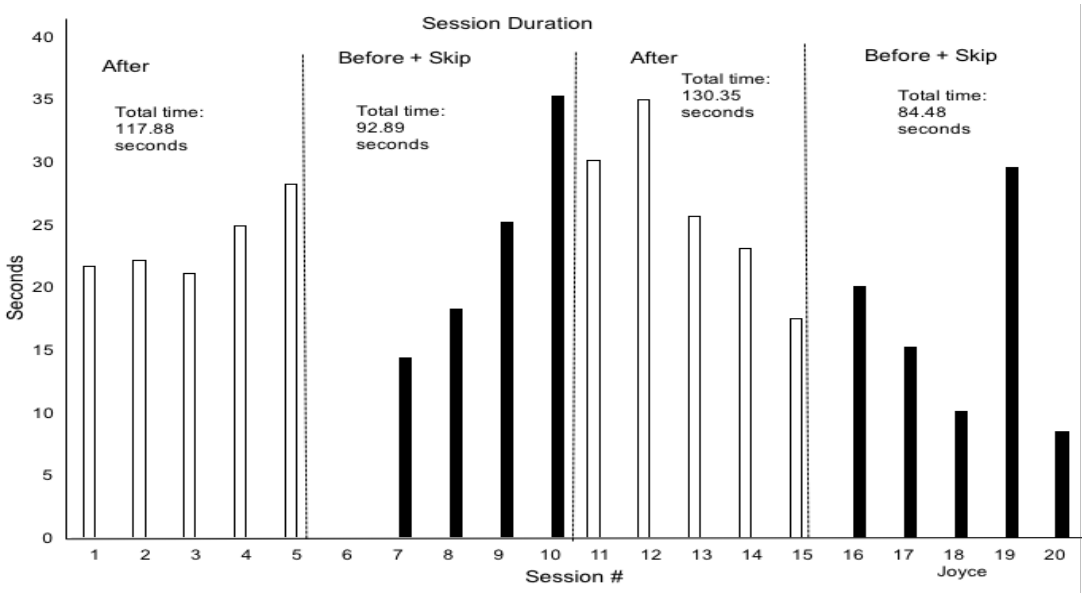


Figure 1. Leslie's session duration is displayed on this graph.

Figure 2 displays Joyce's results for session duration. During the first feedback after condition, Joyce's session duration ranged from 21.06 to 28.16 s. Joyce spent a total time of 117.88 s in this condition. In the second feedback after condition, Joyce's session duration ranged from 17.46 to 34.16 s. In the second feedback after condition, the total time spent was 130.35 s. During the first feedback before + skip condition, session duration ranged from 14.33 to 35.17 s. The total time spent in this condition was 92.89 s. In the second feedback before + skip condition, session duration ranged from 8.52 to 29.53 s. The total time spent in this condition was 84.48 s.

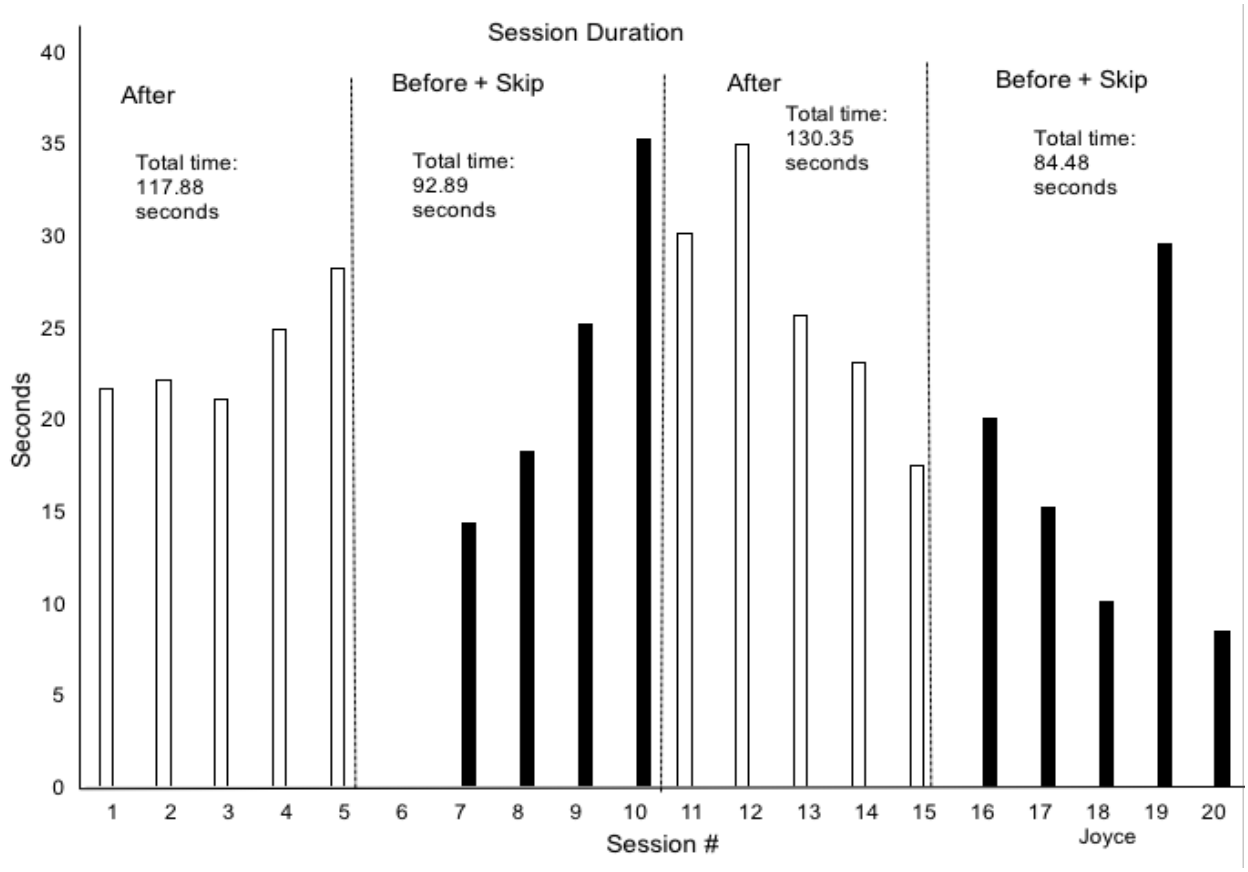


Figure 2. Joyce's session duration is displayed on this graph.

Figure 3 shows the results for Frank's session duration. In the first feedback after condition, Frank's session duration ranged from 35.82 to 119.42 s. The total time spent

in this condition was 348 s. During the second feedback after condition, session duration ranged from 8.41 to 27.01 s. The total time spent in this condition was 81.57 s. In the first feedback before + skip condition, session duration ranged from 12.86 to 15.11 s. The total time spent in this condition was 56.12 s. During the second feedback before + skip condition, session duration ranged from 11.95 to 6.11 s. The total time spent in this condition was 45.39 s.

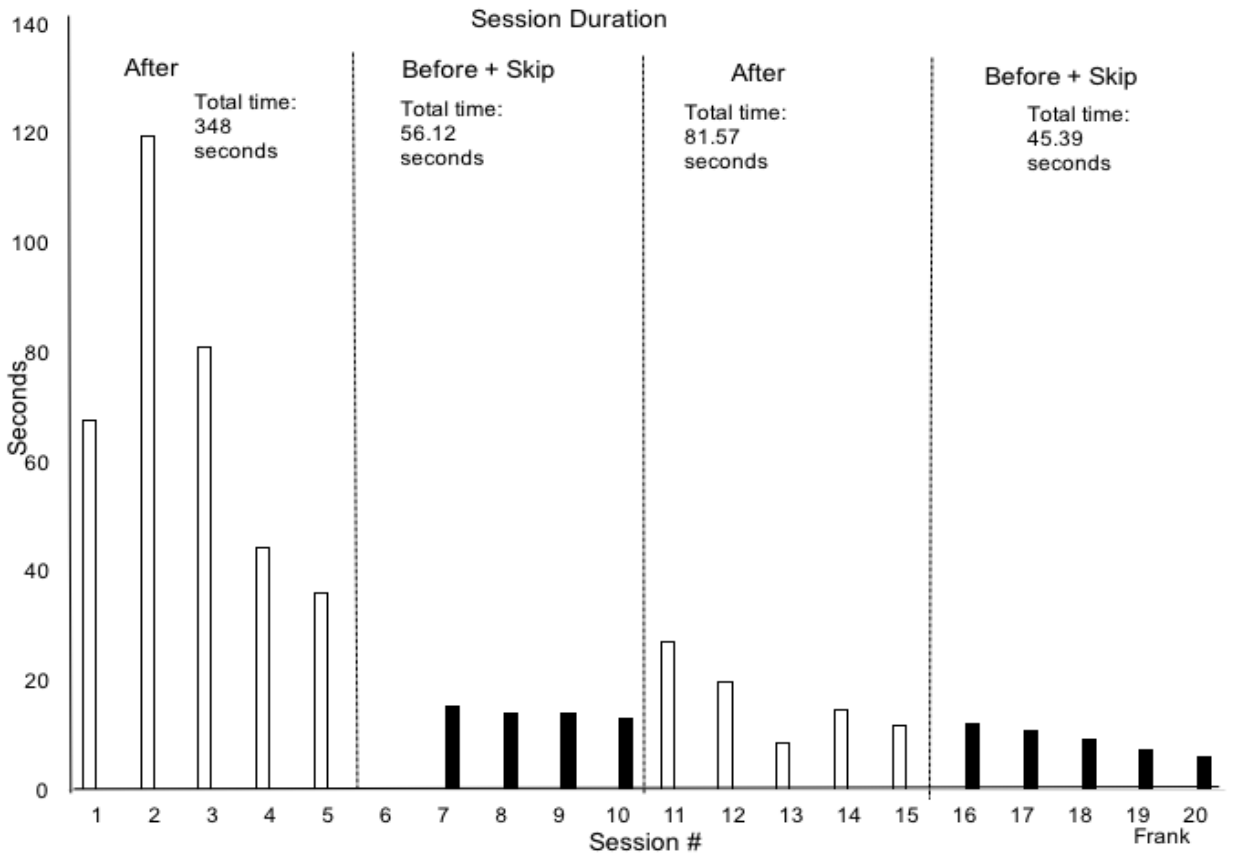


Figure 3. Frank's session duration is displayed on this graph.

Figure 4 shows the results for Ron's session duration. During the feedback before + skip condition, Ron's session duration ranged from 16.32 to 37.71 s. The total time spent in the first feedback before + skip condition was 93.75 s. In the second feedback before + skip condition, Ron's session duration ranged from 9.47 to 19.19 s.

The total time spent in this condition was 74.61 s. During the first feedback after condition, session duration ranged from 24.50 to 68.11 s. The total time spent in this condition was 208.88 s. During the second feedback after condition, session duration ranged from 19.61 to 38.13 s. The total time spent during the second feedback after condition was 144.39 s.

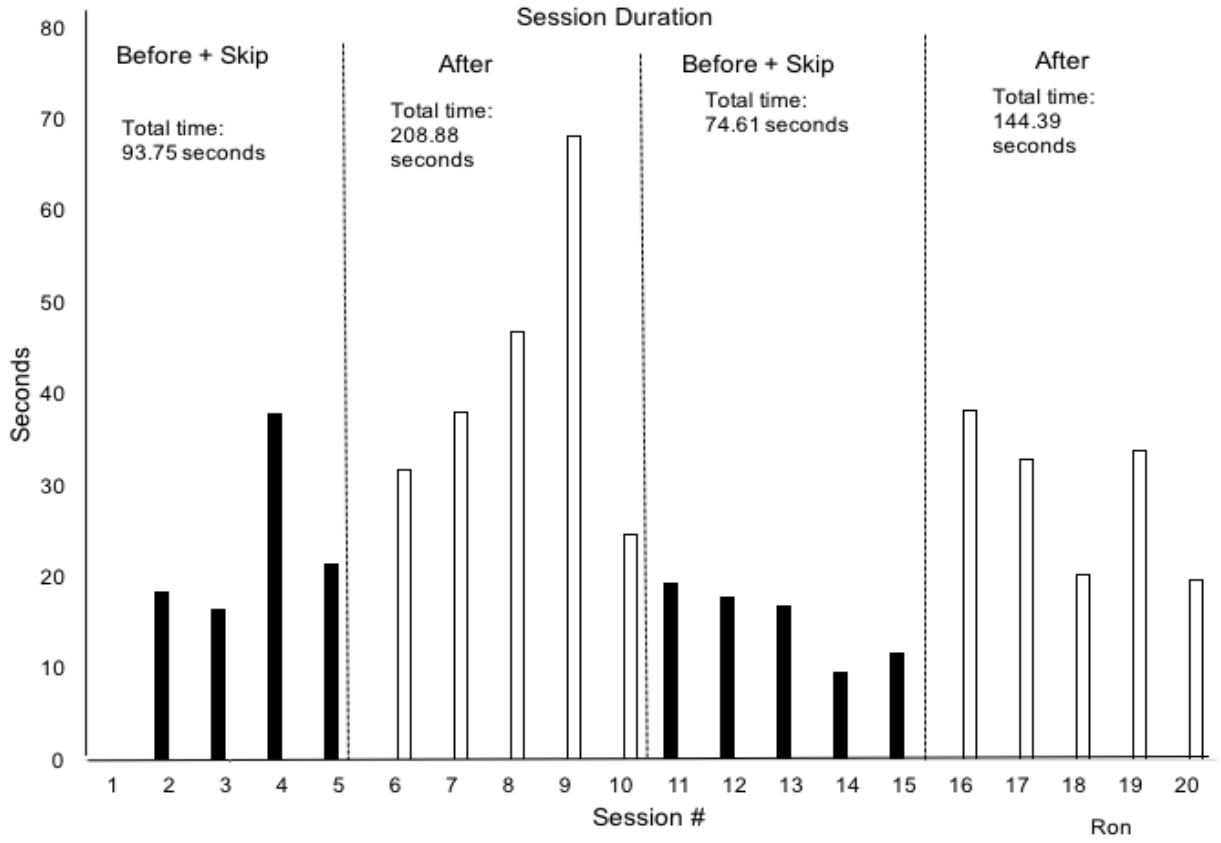


Figure 4. Ron's session duration is displayed on this graph.

Overall, participants spent less time in feedback before + skip and more time in feedback after. Session duration for all participants was 1.5 times or more in feedback after. The total time spent in feedback before + skip decreased for all participants from the first feedback before + skip condition to the second feedback before + skip condition. The total time spent in feedback after decreased for three out of the four

participants from the first feedback after condition to the second feedback after condition, and for the other participant it increased.

Figures 5, 6, 7, and 8 show the accuracy of responding for all participants. The session numbers are graphed along the *x*-axis, and the frequencies are graphed along the *y*-axis. The closed diamonds are the skips, and the open circles are the corrects. The first feedback before + skip session for each participant shows 0 corrects and 0 skips. This is because this session just consisted of a review of the 10 cards.

Figure 5 shows the results for Leslie's accuracy. During the first feedback before + skip condition, the number of corrects increased from 0 to 6. Upon returning to feedback before + skip, correct responses started at 5 corrects, and then increased to 10. During the first feedback after condition, correct responding increased from 0 to 5. During the following feedback after, Leslie's correct responses ranged from 6 to 10.

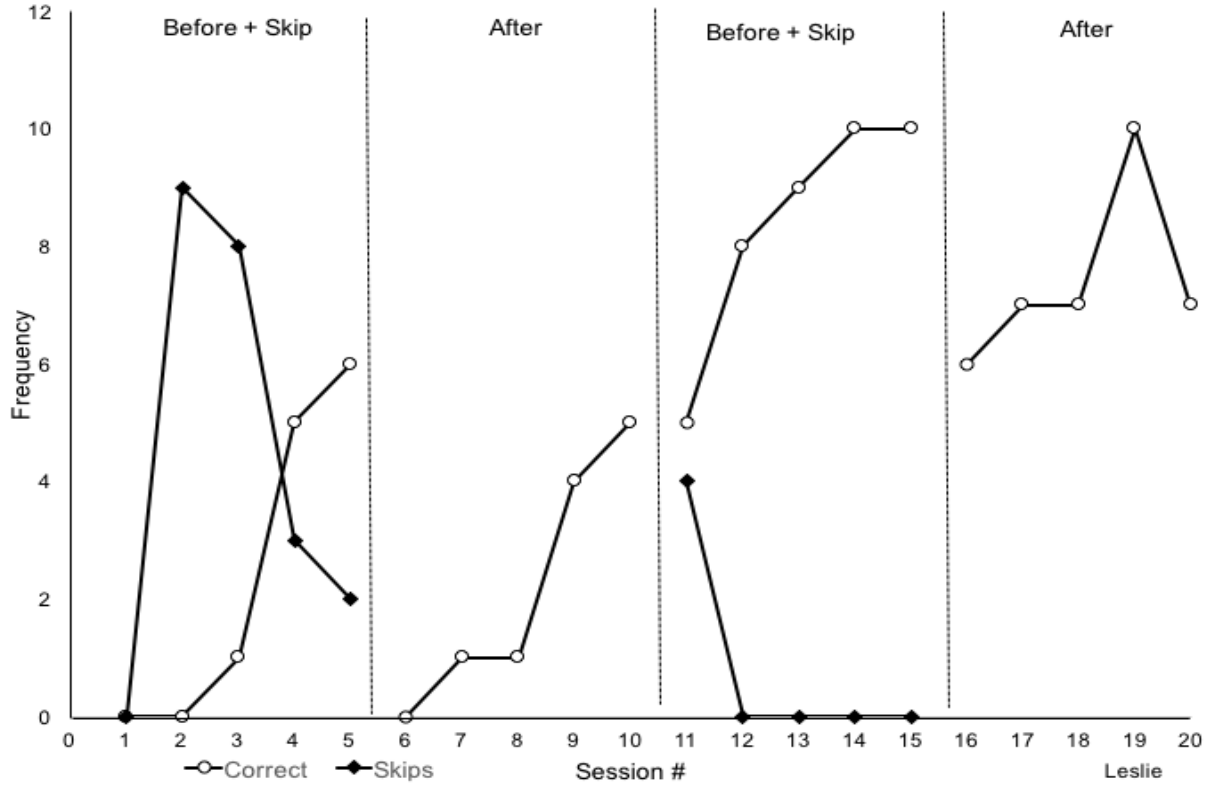


Figure 5. Leslie's frequency of corrects and skips are displayed on this graph.

Figure 6 shows the results for Joyce's accuracy. During the first feedback after condition, number of corrects increased to 5. Upon returning to feedback after, correct responses decreased to 2, but then increased to 7 by the end of the condition. During the first feedback before + skip condition, number of corrects ranged from 0 to 4. Upon returning to feedback before + skip the number of corrects started at 3 and then increased to 10.

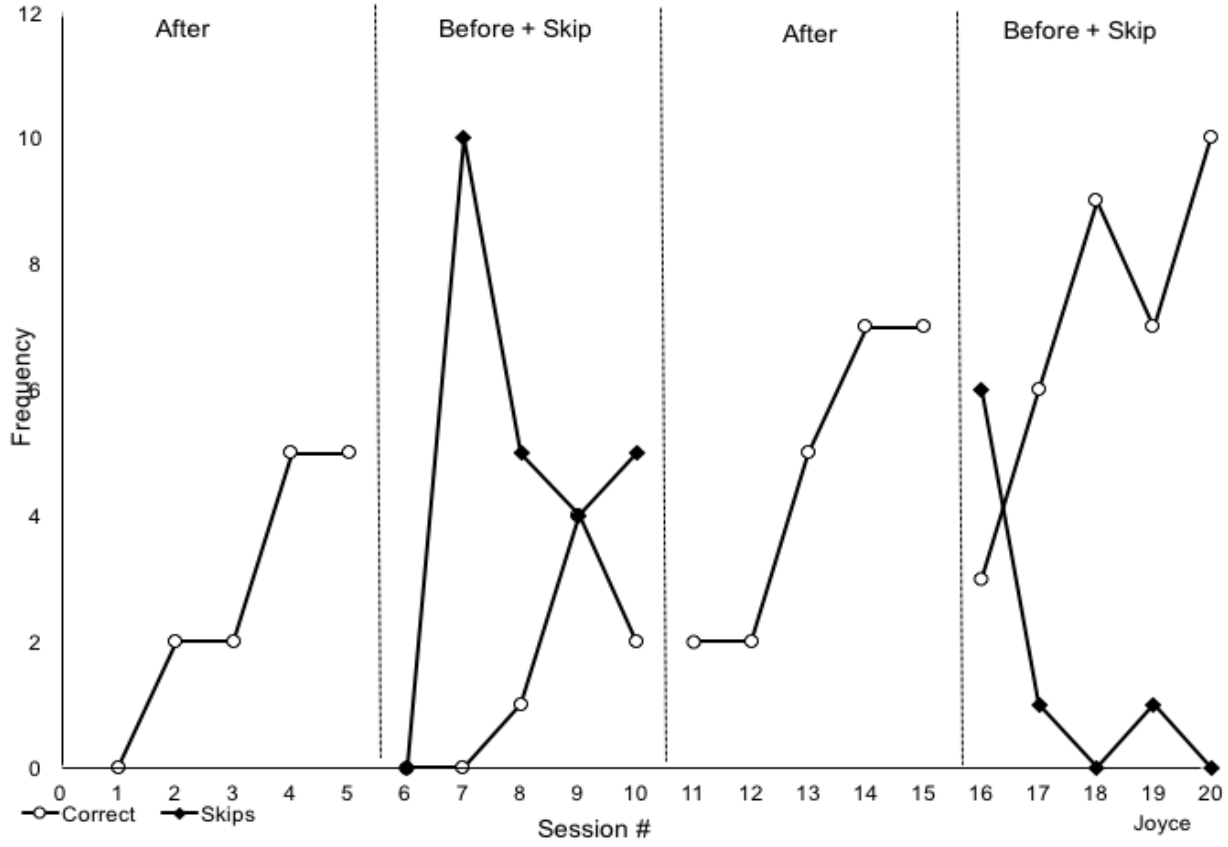


Figure 6. Joyce's frequency of corrects and skips are displayed on this graph.

Figure 7 shows the results for Frank's accuracy. During the first feedback after condition, number of corrects increased from 0 to 7. In the second feedback after condition, number of corrects increased from 5 to 10. During the first feedback before +

skip condition, number of corrects increased to 5. Upon returning to feedback before + skip, correct responses increased from 6 to 10.

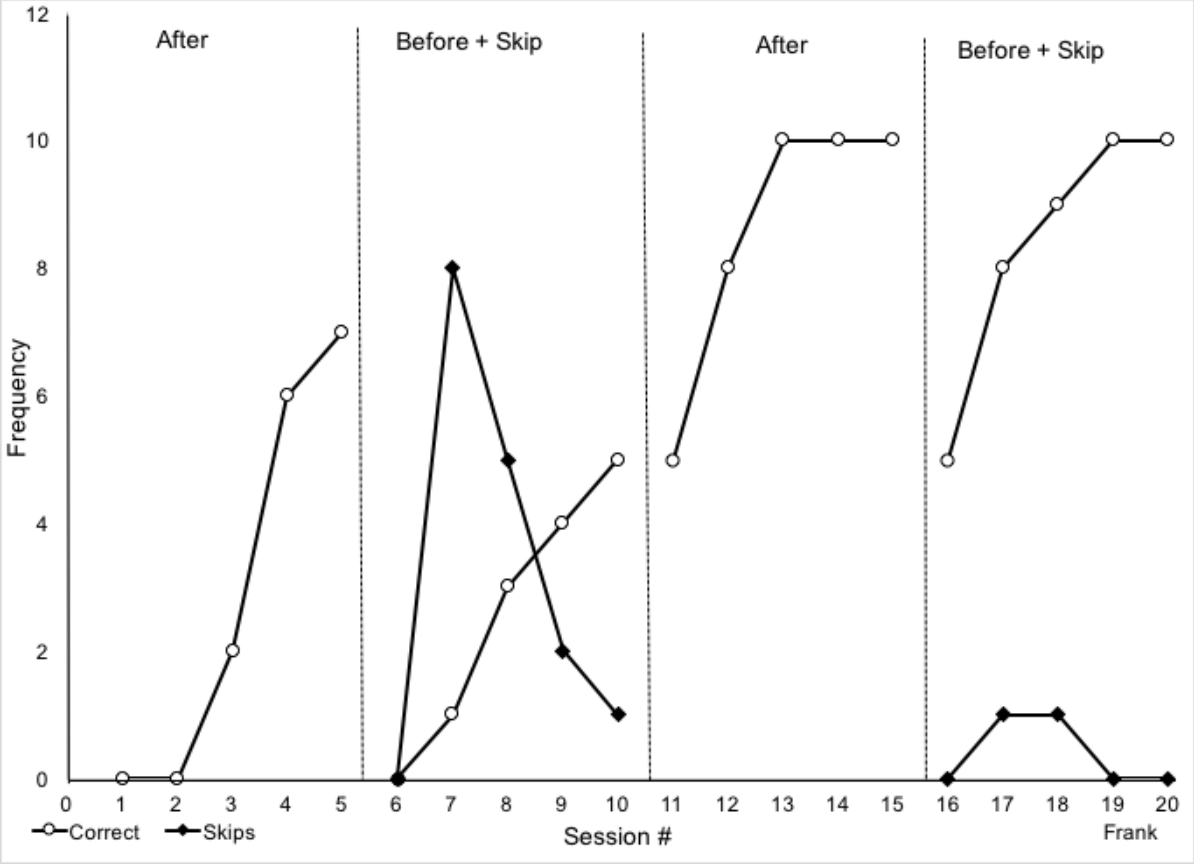


Figure 7. Frank's frequency of corrects and skips are displayed on this graph.

Figure 8 shows the results for Ron's accuracy. During the first feedback before + skip condition, number of corrects increased to 4. During the second feedback before + skip condition, correct responding increased from 5 to 10. In the first feedback after condition, number of corrects increased from 0 to 5. During Session 9, due to experimenter error, there were only 8 trials instead of 10. During the following feedback after condition, number of corrects increased from 2 to 9.

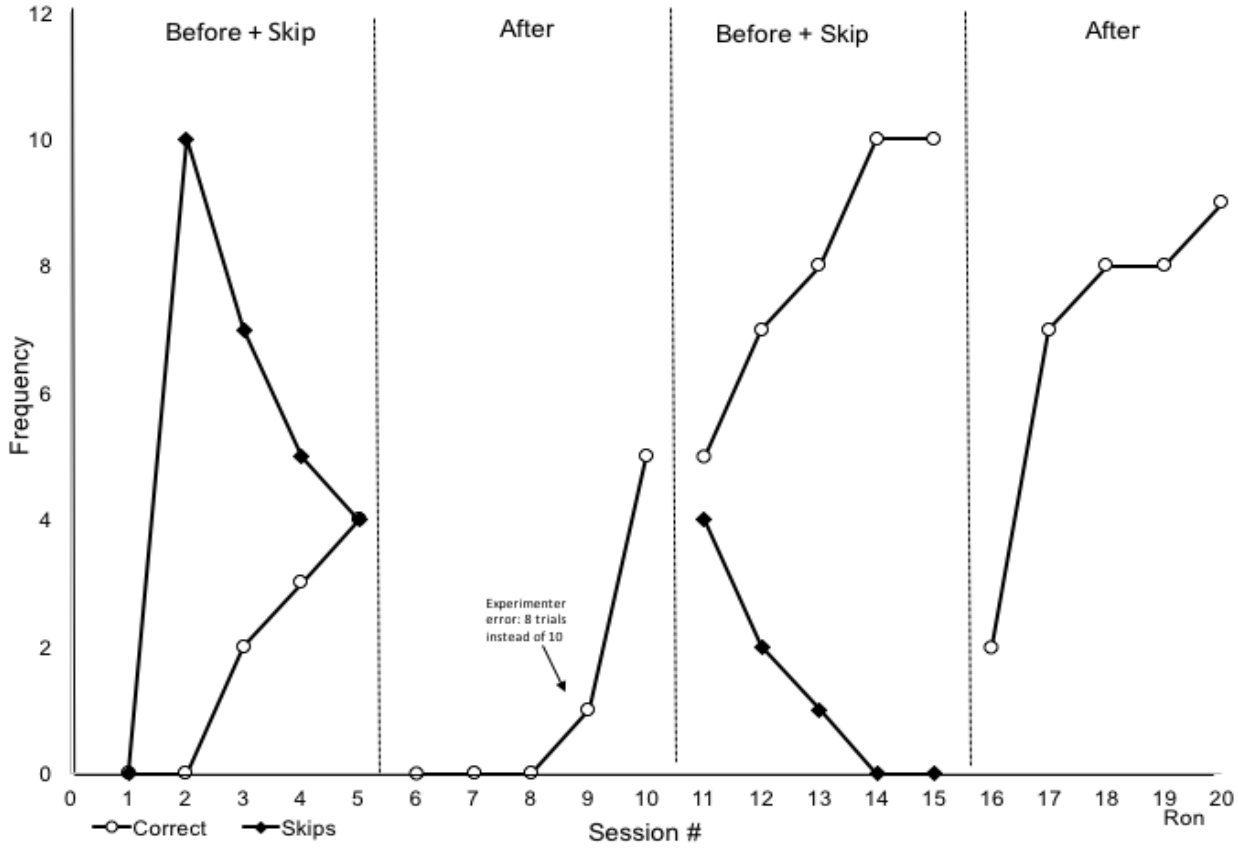


Figure 8. Ron's frequency of corrects and skips are displayed on this graph.

In summary, in feedback before + skip, all participants reached 100% accuracy. However, in the Feedback After, only two participants reached 100% accuracy. Three of the four participants' accuracy declined when returning to feedback after, and one participant's accuracy increased. Two of the four participants' accuracy increased when returning back to feedback before + skip, one participant's accuracy stayed the same, and the other participant's accuracy declined.

Figure 9 shows the percentage of trials with incorrect responses. The percentage of each trial is graphed along the y-axis, and each participant is listed along the x-axis. The open bars represent feedback before + skip and the closed bars represent feedback after. Leslie had 44% incorrect responses in feedback before + skip, but 52%

incorrect responses in feedback after. Joyce had 53% incorrects in feedback before + skip, and 63% incorrects in feedback after. Frank had 30% incorrects in feedback before + skip, but 43% incorrects in feedback after. Finally, Ron had 51% incorrects in feedback before + skip and 58 incorrects in feedback after.

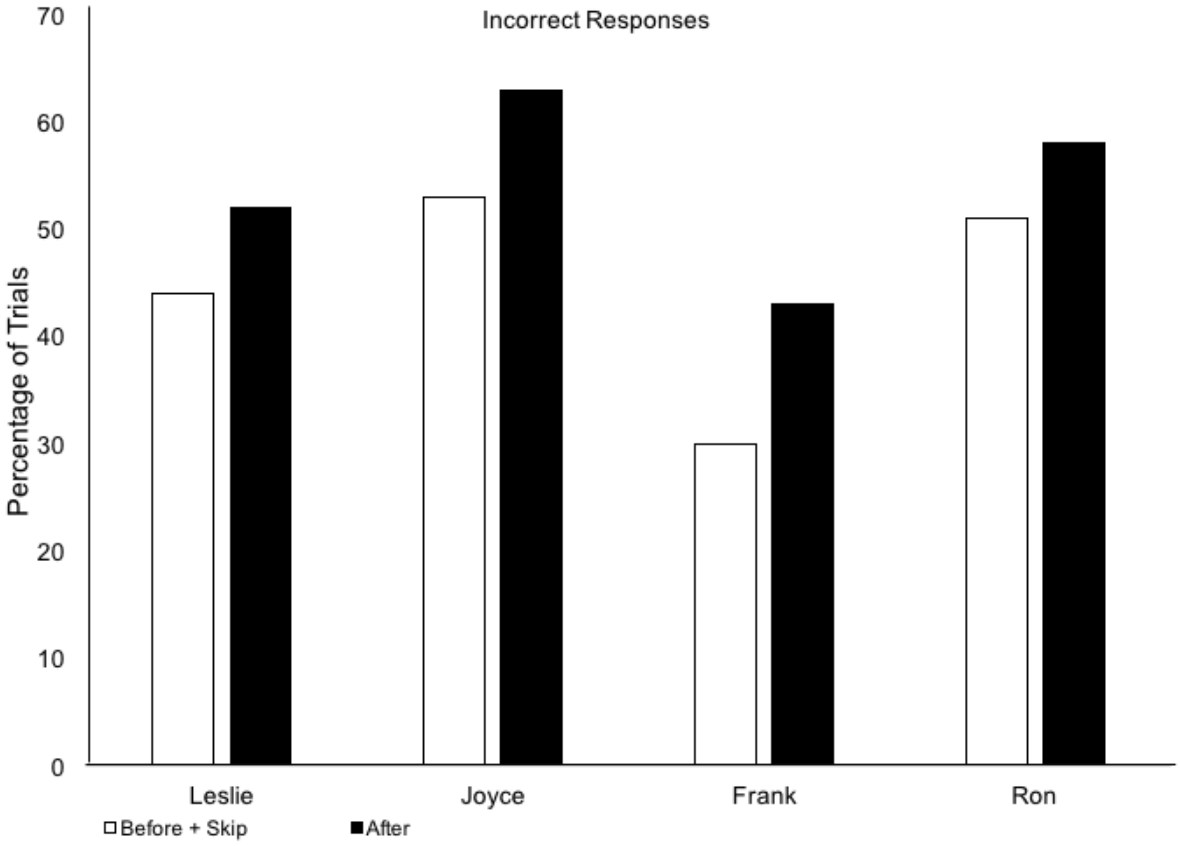


Figure 9. This graph displays the total number of incorrect responses.

Figure 10 shows the preference of lesson reported by participants. The condition is graphed along the *x*-axis and the number of participants is graphed along the *y*-axis. The open bars represent feedback before + skip and the closed bars represent feedback after. Three of the participants preferred feedback before + skip and one preferred feedback after. Frank was the only participant to prefer the feedback after.

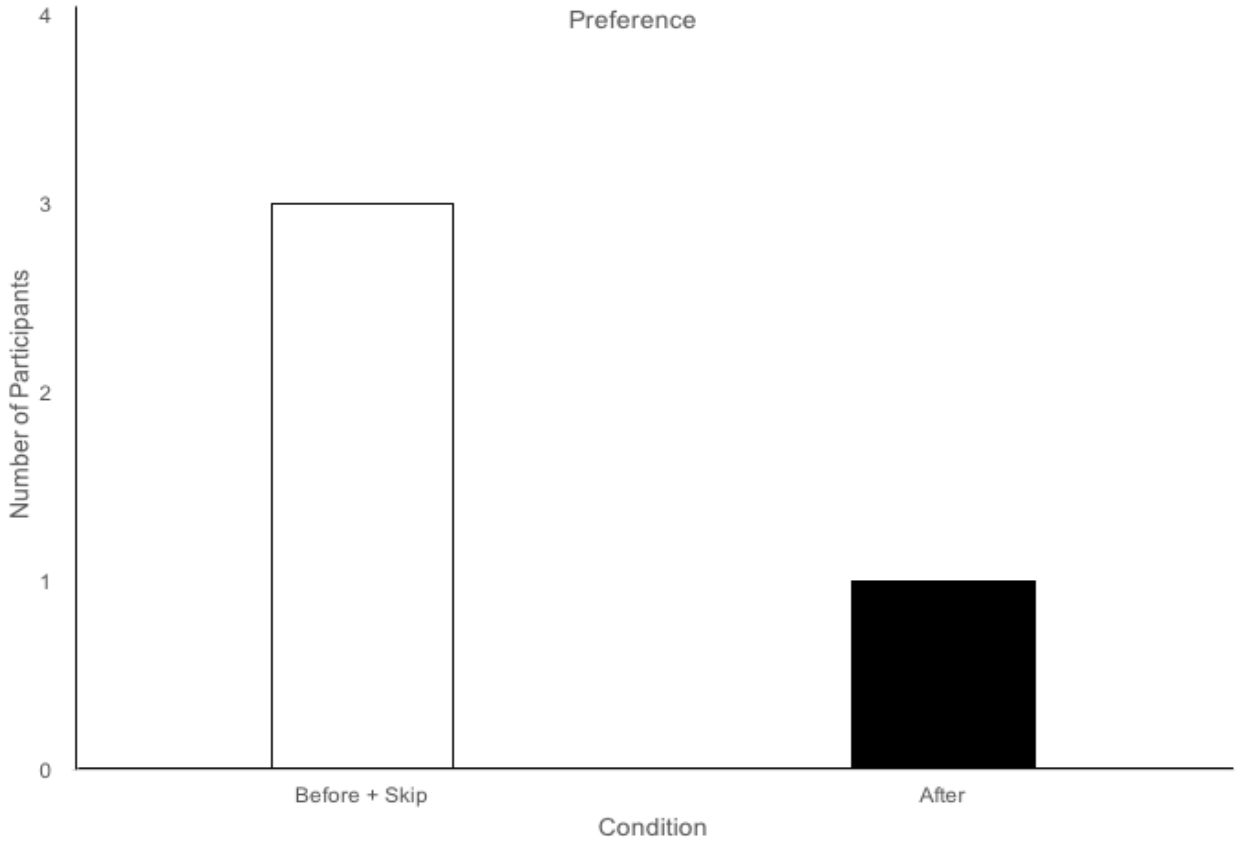


Figure 10. Results from the preference are displayed on this graph.

Tables 1, 2, 3, and 4 show the emotions reported by each participant. The first column of the table shows the condition, the next column is the number of corrects for that session, the next column is the number of misses for that session, the following column is the number of skips for that session, and the last column shows the participant's written response to "How do you feel?" after each session. The rows in each table are sorted by number of corrects from smallest to largest.

Table 1 displays Leslie's reported emotions. When Leslie got 0 to 1 corrects, she reported feeling bad. However, once she got 4 corrects she reported feeling better. She started feeling better first in Feedback After. After this point, she generally reported

positive emotions. The exceptions were when she reported feeling confused when she got 6 correct and when she reported feeling upset when she got 9 correct.

Table 1

Leslie's Reported Emotions

Condition	# Correct	# Incorrect	#Skips	Emotion
Before + Skip*	0	0	0	Overwhelmed
Before + Skip	0	1	9	Did not know anything…. bad
After	0	10	[redacted]	Lost
Before + Skip	1	1	8	Bad
After	1	9	[redacted]	Confused
After	1	9		Bad, Forgot one
After	4	6	[redacted]	Better
Before + Skip	5	1	4	Good
Before + Skip	6	2	2	Still confused
After	6	4		Ok
After	7	3	[redacted]	Okay, amused
After	7	3		Good
After	7	3	[redacted]	Okay, pronunciation
Before + Skip	8	2	0	Much better
Before + Skip	9	1	0	Upset, almost
Before + Skip	10	0	0	Really good, finally
Before	10	0	0	Good, super
After	10	0		Super, finally

Table 2 displays Joyce's reported emotions. When she got 1 to 2 correct she wanted more and was wishful to earn more tokens. Once she reached 3 correct she felt good, and this was during the Feedback Before + Skip. As she progressed she

continued to feel better. However, in one session she got 7 correct after previously getting 10 correct, so she reported feeling bummed.

Table 2

Joyce's Reported Emotions

Condition	# Correct	# Incorrect	#Skips	Emotion
After	0	10	[redacted]	Lost
Before + Skip*	0	0	0	Good
Before + Skip	0	0	10	Disappointed
Before + Skip	1	4	5	Feel a little better
After	2	8	[redacted]	Got two yay! Nervous
After	2	8		Want to get more, sad I didn't
Before	2	3	5	Feel worse, wish I could get more
After	2	8		Did better, but wish I could get more
After	2	8	[redacted]	Confident on the two, but want more
Before	3	1	5	Feel good
Before	4	2	4	Feel a little more confident
After	5	5		Feel better. Hopeful.
After	5	5	[redacted]	Learned a little bit, but sad I couldn't get more
After	5	5		Feeling a little bit better
Before	6	3	1	Feel a lot better! More confident!
After	7	3		Feel great! I am actually learning
After	7	3	[redacted]	More confident
Before	7	2	1	Am confident on the 7, but bummed I did worse
Before	9	1	0	Wow! Feeling a lot more confident!
Before	10	0	0	Wow! I got all of them! I feel great!

Table 3 displays Frank's reported emotions. When Frank got 0 to 2 correct he reported feeling frustrated or nervous. Once he got 3 correct he started to feel less frustrated, which happened in the Feedback Before + Skip. Overall, he continued to feel better as he got more correct. There was a point where he got frustrated when he got 8, but it was because he got cards wrong that he previously got right.

Table 3

Frank's Reported Emotions

Condition	# Correct	# Incorrect	# Skips	Emotion
After	0	10		Confused
After	0	10		Slowly starting to understand
Before + Skip *	0	0	0	Didn't feel accomplished
Before + Skip	1	1	8	Very frustrated
After	2	8		Less confused, nervous
Before + Skip	3	2	5	Felt less frustrated, more confident
Before + Skip	4	4	2	Felt more confident
Before + Skip	5	4	1	Beginning to get frustrated with some cards
After	5	5		Very confident
After	6	4		More confident, less stressed
After	6	4	0	Less frustrated. A bit more confident
After	7	3		Felt more confident
Before + Skip	8	1	1	A bit frustrated, because I couldn't remember recently studied ones.
Before	9	1	1	Relieved and confident
After	10	0		Pretty accomplished
After	10	0		Confident and accomplished
After	10	0		Confident

Condition	# Correct	# Incorrect	# Skips	Emotion
Before	10	0	0	Happy and accomplished
Before	10	0	0	Accomplished

Table 4 displays Ron's reported emotions. When Ron got 0 to 4 correct he reported having trouble or feeling unsure. Once he got 5 correct he said he was "starting to get it." As he continued to get more correct, he would report that he was remembering or getting closer.

Table 4

Ron's Reported Emotions

Condition	# Correct	# Incorrect	# Skips	Emotion
Before + Skip *	0	0	0	Normal
Before + Skip	0	0	10	Couldn't remember
After	0	10	[redacted]	Not sure
After	0	10		More unsure
After	0	10	[redacted]	Not sure
After	1	7		Still not drawing connections
Before + Skip	2	1	7	Lost
Before + Skip	3	2	5	Having trouble
Before + Skip	4	2	4	Felt I had learned some, but some unsure about
After	5	5		Starting to get it
Before	5	1	4	Remembered, but still unsure
Before	7	1	2	Remembered, but still missing a few
After	7	3	[redacted]	Starting to get more comfortable
Before + Skip	8	1	1	Getting closer
After	8	2	[redacted]	Got most correct, still struggling
After	8	2		Mixing myself up

Condition	# Correct	# Incorrect	# Skips	Emotion
After	9	1	[redacted]	A few more runs, and I think I'd have it down
Before + Skip	10	0	0	Got all of them
Before + Skip	10	0	0	Feel like I know all of them

Overall, in the beginning when participants had very few corrects, all participants reported feeling bad. However, once they got approximately two or more correct, they reported that they were feeling better. An exception to this was when participants did extremely well, and then had fewer corrects in the next session.

CHAPTER 4

DISCUSSION

The results of this study showed that three out of four participants had slightly better accuracy in the Feedback Before + Skip condition. The fourth participant performed similarly in both conditions. In terms of reported emotions, there was no difference across conditions. However, reported emotions correlated with accuracy of responding. As accuracy increased, participants reported feeling better. Teaching time took longer in Feedback After. Participants spent 1.5 times more time in this condition. Finally, three out of the four participants indicated that they preferred the Feedback Before + Skip condition.

These results lend some support to the results reported by Aljadeff-Abergel et al. (2017), who found that feedback delivered before a performance increased accuracy when compared to feedback delivered after. One potential explanation for the much larger difference between the two conditions in the Aljadeff-Abergel et al. (2017) results was that their feedback after was not immediately useful because participants could not engage in the response again for several days. In contrast in both conditions in the present study, participants were able to use the information gained from feedback fairly quickly (see Tosti, 1978 for a discussion of the importance of feedback being immediately useful). However, our study did not find great differences in accuracy when comparing different types of feedback, which is consistent with what has been reported in other studies (e.g., Slowiak & Lakowske, 2017; Choi et al., 2018).

In the present study, the type of feedback produced dramatic results in terms of teaching time. During Feedback Before + Skip, participants spent 10.43 minutes

answering questions. In contrast, participants spent 21.86 minutes answering questions in Feedback After. This could be because participants were taught a skip response in the Feedback Before + Skip condition, which encouraged participants not to guess. In contrast, participants were required to respond in the Feedback After condition. This led to participants spending time thinking and guessing.

Saving time is an important aspect of training because it reduces cost. As Ben Franklin argued that (as cited in https://founders.archives.gov/documents/Franklin/01-03-02-0130, 2018), “time is money.” Interestingly, training time has been used very little as a dependent variable in studies on feedback. There are some exceptions to this in the autism literature (Drevon & Reynolds, 2018, Leaf et al. 2016; Leaf et al. 2014) and in OBM research where speed of performance has been measured (Wikoff, 1963; Tittelbach, Fields, & Alvero, 2008). The present study demonstrated that teaching time can be a useful measure when comparing feedback procedures. Future research in organizational behavior management (OBM) should examine how to incorporate ways to measure teaching time when providing feedback to employees.

In addition to producing faster teaching time, teaching participants to skip may have other benefits such as faster acquisition and better retention. For example, Baddeley and Wilson (1994) found that amnesic participants had higher accuracy at a memory test when they were told the correct answer before the trial, as opposed to having to make a guess. Similarly, Árnadóttir (2003) found that when participants had to guess it produced more errors, whereas in the skip condition participants acquired the material faster (see also Lindsley, 1996). In the present study, it is not clear if the skip response accelerated learning. There were slightly fewer errors in the feedback before

condition than in the feedback after condition. However it is clear that the skip response saved training time (see, Lindsley, 1996).

A common concern regarding the delivery of feedback is the emotional effects on the receiver or deliverer. According to Choi, et. al (2018) negative feedback can elicit negative emotional responses, which in turn can serve as an “emotional motivating operation” – either conditioned or unconditioned, and evoke undesirable behaviors such as aggressiveness, or combativeness. Choi, et. al (2018) also suggested that the function of feedback may depend on how it was experienced by receivers in the past. For example, “nice work” or “excellent” has been frequently been paired with verbal and social reinforcers. Whereas, words such as “not as good” or “poor job” has been paired with social punishers and a rise in threats. These pairing histories can lead certain words to elicit positive or negative states. Overall, this research suggests that providing negative feedback presents a problem and supervisors are less likely to deliver negative feedback (i.e., “Sally you need to turn your report in on time”), than positive feedback (i.e., “Ruth you did a nice job on your report”) (Larson, 1986). Dohrenwend (2002) reported that negative feedback is often avoided because supervisors feel that giving negative feedback will hurt their relationships with staff.

Supervisors often use the positive-negative-positive (PNP) method to deliver feedback to avoid the consequences of negative feedback (Slowiak & Lakowske, 2017; Dohrenwend, 2002; LeBaron & Jernick, 2000, Hesketh & Laidlaw, 2000; Kimball & Jazzar, 2011). According to Schwarz (2013) the first positive statement is used to relax the receiver, the negative statement is the purpose behind the feedback, and the last positive statement is used to help ease the receiver's disappointment. It is suggested

that PNP builds trust (Dohrenwend, 2002), reduces discomfort and anxiety (Von Bergen et al., 2014), and helps recipients recognize their value (Shread, 2012). In addition, managers reported that PNP method relieved pressure when delivering feedback and beginning with a positive statement relaxed them (Slowiak & Lakowske, 2017). Despite its usage, however, there is no evidence that the PNP method actually produces the intended effect, or that it improves performance (Daniels, 2009).

Interestingly, other researchers suggest abandoning PNP (Henley & Reed, 2017; Von Bergen et. al, 2014). Henley and Reed (2017) argued that supervisors may unintentionally reduce the benefits of PNP if the first initial positive statement becomes a conditioned aversive statement because it signals corrective feedback, which can become aversive for the receiver. Similarly, Petty (2009) suggested that PNP may confuse the receiver and destroy the value of positive feedback by linking it to negative feedback. That is, employees may learn to anticipate criticism when they hear a positive statement (Daniels, 2009). To avoid destroying the value of positive feedback, Von Bergen et. al (2014) suggested delivering negative and positive feedback separately. Similar to this, Choi et al. (2018) argued that if the goal is to change work performance, give negative or positive feedback in isolation. On the other hand, if the goal is to minimize emotional responses, then pair negative feedback with positive feedback. However, when negative feedback is paired with positive feedback it not only minimizes negative emotional responses, but positive emotional responses as well. Finally, Schwarz (2013) proposed that receivers of feedback prefer criticism over PNP. However, these arguments still require further investigation.

Interestingly, in the present study, emotions were not differentially affected by the two different feedback conditions. During the Feedback Before + Skip condition, positive reinforcement was delivered for correct responses, but incorrect responses were ignored. Participants reported feeling bad at first in this condition, even though they were not receiving any feedback after the incorrect response. During the Feedback After condition, positive feedback was delivered for correct responses. In addition, incorrect responses were corrected immediately. In the beginning, participants also reported feeling bad during this condition, similar to the verbal reports of the Feedback Before + Skip condition. This suggests that rather than the particular type of feedback (e.g. positive or negative), it is the overall contingency of success that drives the emotions. These results are in accord with Goldiamond's (1978) view that emotions change as the contingency changes (Schwartz & Goldiamond, 1975).

Overall, these results suggest that corrective feedback should be provided when it is immediately useful for the learner. Ideally, deliver it right before the performance occurs. This saves time and reduces negative emotions. Future research should focus on developing ways to implement this type of feedback in applied settings.

APPENDIX A

MATERIALS FROM FEEDBACK BEFORE + SKIP

Items used in the feedback before + skip condition, including the 10 flashcards, 10 tokens, and clicker. Each flashcard was associated with a term (Top row L-R: Indoo, Beme, Tela. Second row: Malo, Glina, Eket. Third row: Kaivatt, Que. Bottom row: Aglar, Collo).

APPENDIX B

MATERIALS FROM FEEDBACK AFTER

Items used in the feedback after condition, including the 10 flashcards, 10 tokens, and clicker. Each flashcard was associated with a term (Top row L-R: Googlyboc, Nessa, Echor. Second row: Alqual, Rana, Delena. Third row: Falma, Vala. Bottom row: Kadbax, Lanat).

APPENDIX C

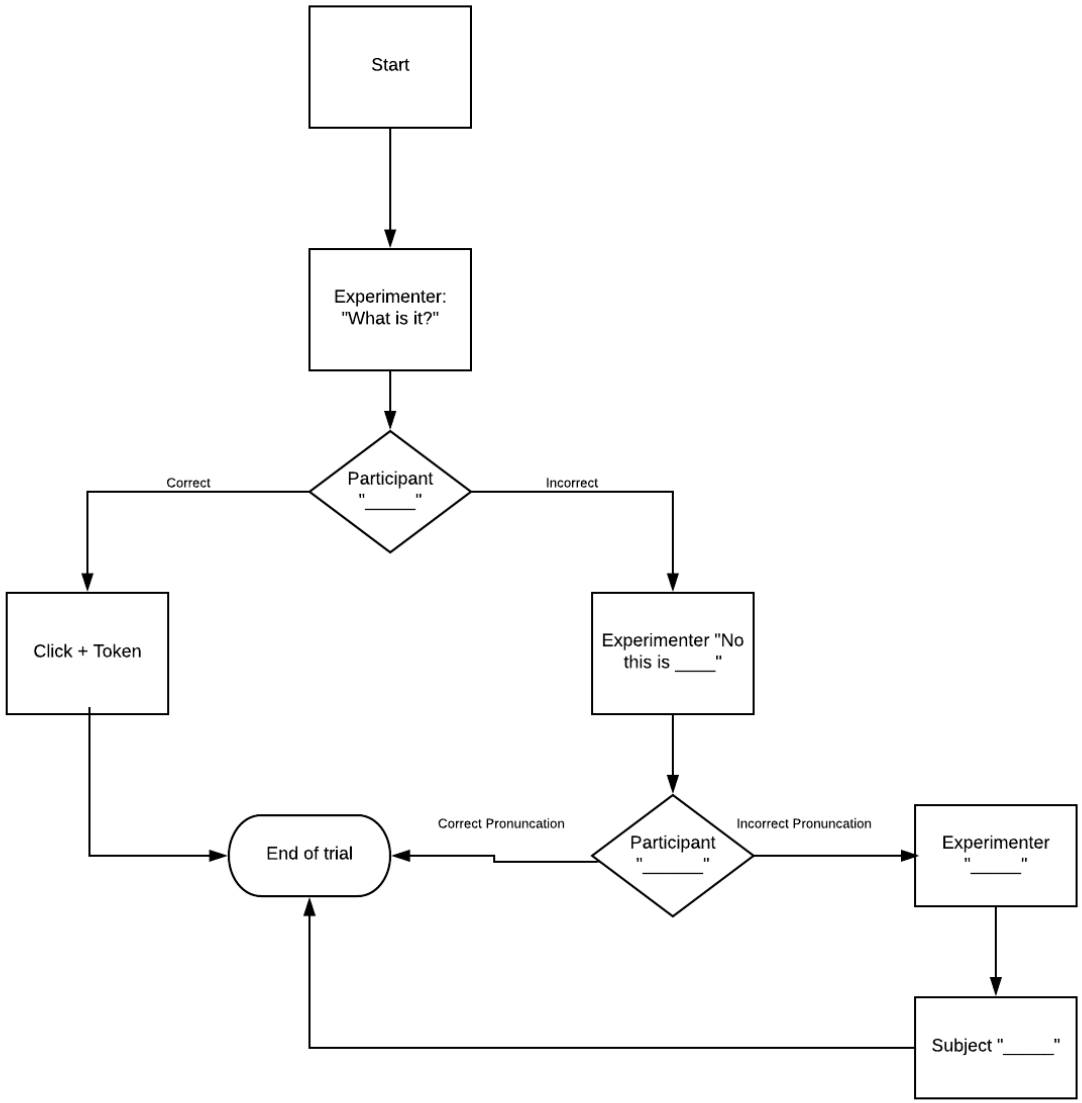
DATA SHEETS

Lesson	How do you feel?

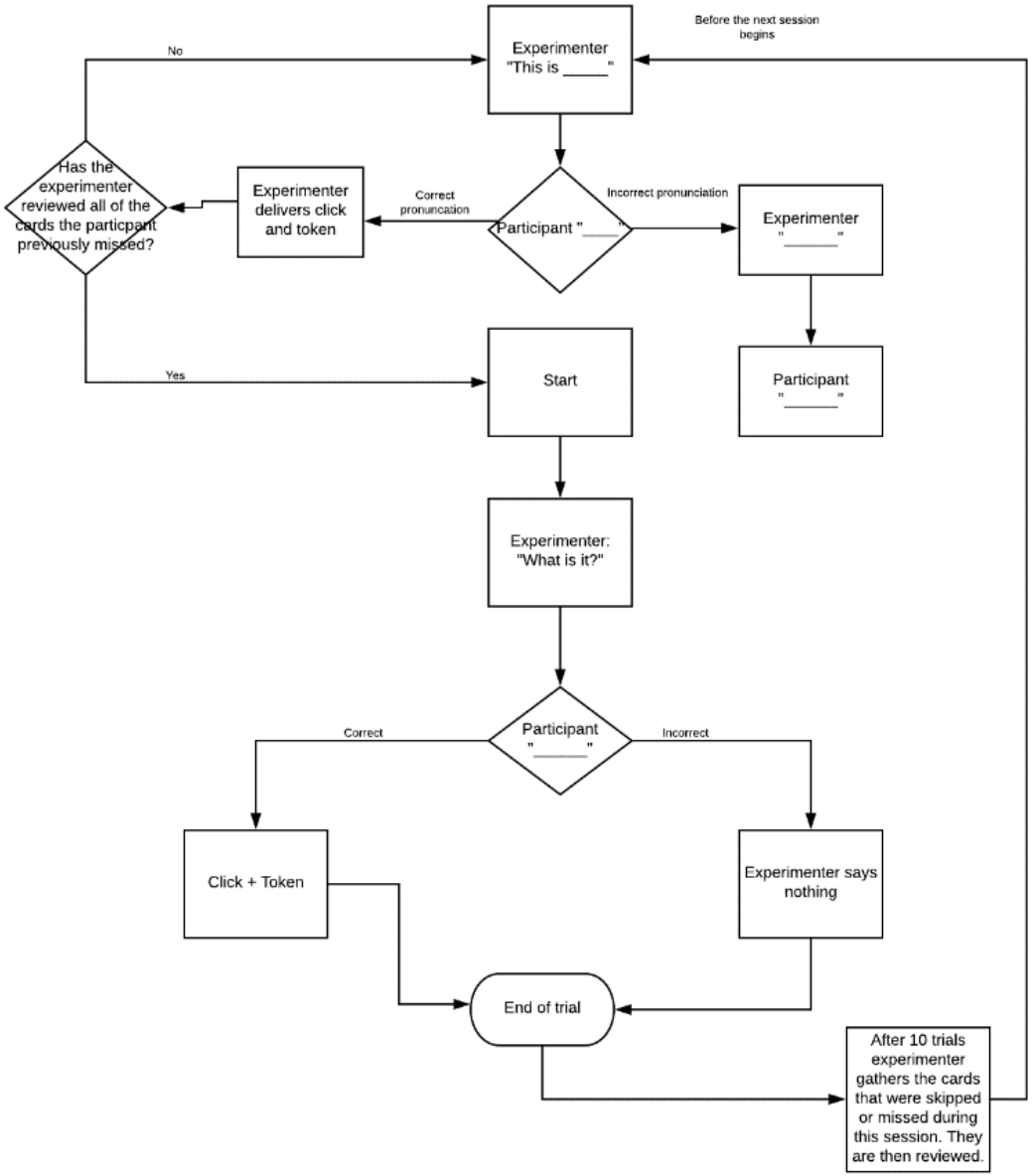
This is a copy of the data sheet used during sessions. The experimenter would fill out the “Lesson.” The participant filled out the “How Do You Feel” column.”

APPENDIX D

FLOWCHART FOR FEEDBACK AFTER AND FEEDBACK + SKIP



This flowchart shows the decision making process for the feedback before + skip condition.



This flowchart shows the decision making process for the feedback after condition.

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