

University of Nevada, Reno

Conjugate Reinforcement: The Effects of Stimulus Clarity

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Arts in
Psychology

by

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Abstract

Schedules receiving little attention in the scientific literature are schedules of covariation, specifically conjugate reinforcement. While less studied, conjugate reinforcement schedules have been used predominately in basic studies examining a variety of phenomena. Recent research (MacAleese et al., 2015) is beginning to examine the schedule, and its parameters, as subject matter in its own right. The present study examined conjugate reinforcement as a function of the change in the clarity of a stimulus when responding falls below a certain rate. A six component MULT schedule was used. Each component was associated with self-selected visual displays that diminished in clarity at different rates when responding fell below a pre-determined response rate. Response rates were analyzed from two aspects of the conjugate preparation, positive (or the “run up to stimulus clarity”) and negative (or “pressing that prevents the stimulus from fading) reinforcement, response patterns suggest that little overall differentiation in average frequencies was evidenced during the negative reinforcement component of the conjugate contingency with larger differences in average response frequencies observed during the positive reinforcement component. Participants’ latency of responding was also examined.

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Conjugate Reinforcement: The Effects of Stimulus Clarity

Schedules of reinforcement are fundamental to the analysis of behavior and have thus been the focus of a tremendous amount of basic and applied research (e.g., Cooper, Heron & Heward, 2007; Ferster & Skinner, 1957). The most extensively studied are fixed and variable ratio and interval schedules. Far less familiar and far less researched schedules are what behavior analysts term “schedules of covariation.” The most prominent schedule of covariation is the conjugate schedule of reinforcement.

A conjugate schedule is one in which the intensity of the reinforcer is directly proportional to the rate, amplitude, or magnitude of the response that produces it (Rovee-Collier & Capatides, 1979). Changes in ongoing responding, in other words, produce corresponding changes in the reinforcer. We hear a distant sound by cupping our hands to our ears. We attenuate bright sunlight by shading our eyes with our hands. We put on a shirt over our sunburned shoulders with great care. What these and countless other examples illustrate is how thoroughly intimate the relation is between reinforcement and responding in a conjugate schedule. These examples also illustrate the fact that the individual, not the experimenter, controls the covariation between responses and reinforcers.

This relation between responses and reinforcements defines the conjugate schedule and distinguishes it from other schedules. The typical ratio and interval schedules are “episodic” in that each treats responses and reinforcers as separate, discrete events (Williams & Johnston, 1992). A fixed ratio schedule, for example, delivers a discrete consequence such as a food pellet to a rat after it makes a set number of a discrete response such as a lever press. A conjugate schedule, in contrast, does not

involve discrete responses and reinforcers but instead combines the two events into one, inseparable event.

All conjugate schedules are continuous schedules, but not all continuous schedules are conjugate schedules. An FR 1 schedule reinforces each response and is thereby continuous in that sense. Nevertheless, the relation between a reinforcer and the response that produces it can be an episodic event; in fact, the relation is often studied in that way, as when a food pellet is delivered shortly after a rat presses a lever. With a conjugate schedule, reinforcement is a continuous function of the response, and the response is a continuous function of the reinforcer. Moreover, because the response and reinforcer co-vary in a conjugate schedule, the individual can select and thereby control the amount, duration and other features of a reinforcer relative to the response cost of obtaining it.

All conjugate reinforcement is automatic, but not all automatic reinforcement is conjugate. Consider the child holding a music box with a play button on it. When the child holds down the button, the music plays, and when the child lets up on the button, the music stops. The contingency would qualify as automatic, but not conjugate, because the response produces the reinforcer at maximum intensity. With a conjugate contingency, a change in some dimension of the response produces a corresponding change in some dimension of the reinforcer.

All conjugate schedules provide immediate reinforcement, but not all schedules that provide reinforcers immediately are conjugate. Immediacy of reinforcement, according to Lattal (2010), refers to the temporal delay between a response that produces a reinforcer and its subsequent delivery. The time it takes for a lever press to produce a

pellet of food may range from milliseconds to minutes; the time it takes a response to produce a reinforcer in a conjugate schedule is instantaneous.

The originator of the conjugate schedule, Ogden Lindsley, maintained that conjugate reinforcement closely resembles the contingencies that prevail in the natural environment (1962; see Rovee-Collier & Gekoski, 1979). An organism's perception of the world, according to Lindsley, centers on stimuli that change in a continuous and graded manner. Gradual increases and decreases in stimulation occurring as a function of the movement of the organism. When a moth flies toward a flame, for example, the brightness and heat of the flame is proportionate to the speed and angle of its flight. This relationship is significant for the individual moth and the species of which it is a member: moths with a greater capacity to navigate this peril successfully have a clear advantage over moths that perish or suffer injury by flying too close to the flame. Indeed, the response systems that enable an organism to move about in its environment in the first place undoubtedly evolved a capacity for conjugate reinforcement to alter its movements. Various taxes, kinesis and tropisms, on this view, constitute examples of movements of this sort.

Distinctions between positive and negative conjugate reinforcement and between positive and negative conjugate punishment are both possible in theory and desirable in research and practice. It is instructive, given the aims of the present study, to make these distinctions in terms of how the different types of contingencies are studied in the laboratory.

Consider conjugate positive reinforcement. A person views an opaque picture on a computer monitor that increases in clarity with each press on a keyboard. As reinforcement, the effect is an increase in the frequency of pressing.

Consider conjugate negative reinforcement. A person views a picture at maximum clarity. The picture remains at maximum clarity so long as the person maintains a given frequency of key pressing. A negative reinforcement contingency comes into play, however, when pressing falls below the given frequency: the picture starts to fade. Responses now restore the picture to clarity and once restored, responses maintain clarity until they fall below the given frequency.

A rat in a nondiscriminated “Sidman” avoidance study faces a similar situation: lever pressing prevents shock from occurring so long as pressing meets the response requirements of the schedule, i.e., the R-S interval. When pressing does not meet the requirement, shocks are delivered accordingly, i.e., the S-S interval. In this case, as well as in the case involving picture clarity and conjugate negative reinforcement, a response that prevents unpleasant events such as electric shocks and favorite pictures from fading increases in frequency.

Consider conjugate negative punishment. A person views a picture at maximum clarity that fades with each key press. As punishment, the effect is a decrease in the frequency of pressing.

In the case of conjugate positive punishment, a person views a picture at maximum clarity, however, key presses add, for instance, brightness (lumens) to the picture, making it difficult or impossible to see or look at for any length of time. As punishment, the effect is a decrease in the frequency of pressing.

These four types of conjugate schedules parallel the four types of reinforcement and punishment in every way. This is a desirable feature in behavior theory, which seeks to apply a unified and consistent set of principles to understanding, controlling and predicting behavior.

We turn next to research on conjugate reinforcement and punishment. We are not concerned with reviewing this entire literature but instead wish to reveal an under-studied area and to arrive at the purpose of the present study.

Modern research using conjugate schedules employs mostly visual and auditory reinforcers with normally developing infants and toddlers as subjects (Rapp, 2008). The majority of this work involves conjugate positive reinforcement. The prototype procedure involves a researcher tying a string to an infant's foot and attaching it to an overhead mobile such that movements of the foot produce corresponding movements in the mobile. This so-called "mobile conjugate reinforcement procedure" normally produces a response that is rapidly acquired and that extinguishes and re-conditions quickly with very little pre-training. Less often studied responses such as foot kicking, paddle pressing, and "non-nutritive sucking" are acquired, extinguished and re-conditioned with the same ease in conjugate positive reinforcement preparations (see Weisberg & Rovee-Collier, 1998 for a recent review).

Turning to negative conjugate reinforcement, it was Lindsley and his colleagues who first showed how to analyze a person's sleep patterns (Lindsley, 1957) with a conjugate schedule. Participants wore a helmet that played a continuous tone. With steady and continuous responding, the tone remained moderate. If responding increased, the tone's volume gradually decreased. When responding fell to a slower rate or ceased,

then the volume gradually increased. Lindsley found a relationship between the hours of sleep deprivation and the response frequency.

Lindsley studied similar contingencies with a patient's recovery from anesthesia (Lindsley, Hobika & Etsten, 1961) and electroshock treatment (Lindsley & Conron, 1962) with a conjugate schedule. The patients in each study wore headphones that played a moderately loud (60 db.) and continuous tone. A patient could continue listening to the moderate tone by pressing a hand switch at 50 responses per minute (rpm). Once hand-switching fell below that frequency, the tone grew louder, to 90 db. The patient could escape the tone by raising the frequency of pressing to above 100 responses per minute (rpm). Patients in both studies showed appropriately high frequencies of pressing before the administration of anesthesia or shock. While the patients were under anesthesia or in treatment, pressing fell steadily to zero and remained at that level for some time. As the effects of these events dissipated, the frequency of pressing gradually returned to pre-anesthesia or pre-treatment levels

The significance of these early experiments by Lindsley and his colleagues is that they are the first and still only published studies to examine conjugate negative reinforcement. Conjugate negative punishment, on the other hand, has been the subject of at least five published studies. We examine this small literature below.

Lovitt (1967) conducted the first published study on conjugate negative punishment. Boys of varying ages listened to a narrative form such as, a story or a poem as long as they maintained a frequency of 60 rpm on a hand-held switch. This positive reinforcement contingency gave way to a negative punishment contingency such that pressing decreased the volume gradually and unavoidably with each press. The positive

reinforcement contingency produced high and steady response frequencies. Responding stopped during the punishment contingency.

In another study of conjugate negative punishment (Edwards & Peek, 1970), adults first listened to music from a favorite radio station with headphones by pressing a hand-switch at a frequency equal to or greater than 90 rpm. In this conjugate positive reinforcement phase, responding was at a high and steady frequency. In the subsequent punishment phase, each response gradually and unavoidably reduced the volume of the music. In this phase, pressing fell quickly and remained at near-zero levels for each participant.

A third study of conjugate negative punishment, by Switzky and Haywood (1973), arranged experimental conditions wherein adolescents and adults viewed a favorite movie at maximum clarity as long as they sat still. When a person started to move in their chair, the clarity of the picture diminished unavoidably with each movement. The contingency produced low rates of movement for each participant.

MacAleese, Ghezzi, and Rapp (2015) conducted two experiments on conjugate positive reinforcement. In a positive reinforcement phase of one experiment, college students could increase the clarity of a picture by 5% each time they pressed a key on a laptop computer. A conjugate negative punishment phase followed in which each key press now decreased the clarity of a picture by 5%. The results showed first, that key pressing was high and steady throughout the reinforcement phase and second, that key pressing decreased quickly to near-zero levels and remained there throughout the punishment phase. These results affirm the findings of previous studies on conjugate positive reinforcement and conjugate negative punishment.

MacAleese and his colleagues (2015) conducted a second experiment that required a participant to press a key at or above one press per second to clarify and maintain the clarity of a picture. If the frequency fell below the mark, the picture would immediately return to opacity and the contingency would begin anew. The variable of interest was how much each button press increased the clarity of the picture and how this, in turn, affected the frequency of key pressing. Percentage clarity values constituted the components of six-ply multiple schedule, as follows: 1%, 2%, 5%, 10%, 20%, 25% and 50%. The frequency of button pressing was highest when each press produced the smallest increment in clarity and was lowest when each press produced the largest increment in clarity.

In summary, conjugate positive reinforcement dominates the literature on conjugate reinforcement. Indeed, studies on conjugate punishment, as with most every study of punishment, starts with a baseline of positively reinforced responding on which a punishment contingency is super-imposed. As to conjugate punishment, the negative case has been the topic of at least five published studies; to our knowledge, there are no published studies on conjugate positive punishment. As to conjugate negative reinforcement, the data are limited to three studies by Lindsley and his colleagues in the 1960s and earlier.

Purpose

The present study seeks to examine how the contingencies of conjugate negative reinforcement and conjugate positive reinforcement interact with one another. Specifically, the experiment is a variation on the conjugate positive reinforcement procedure used by MacAleese et al. (2015) in their parametric study on picture clarity.

Instead of starting with an opaque picture that increases in clarity by a given percentage with each button press that stays at or above a given frequency, participants in the present study viewed a picture at maximum clarity that diminished in clarity by a given percentage whenever responding fell below a given frequency.

The question of interest is how various percent fade-out values change the frequency of key pressing and whether or not the change is opposite to what a conjugate positive reinforcement contingency produces, namely, high response frequencies when clarity fades out by relatively large percentages and low frequencies when clarity fades out by relatively small percentages. We compare the frequency of responding when responses prevent a picture from fading (conjugate negative reinforcement) and when responses restore the clarity of the picture (conjugate positive reinforcement). We also examine the latency of key pressing following a decrement in clarity in order to answer the question whether higher fade-out rates produce shorter or longer latencies compared to lower fade-out rates.

Method

Participants, Setting, and Apparatus

The participants in this study were nine undergraduate students enrolled at the University of Nevada, Reno (UNR). Participants were recruited through UNR's SONA recruitment system. Each participant was at least 18 years of age and was excluded if they did not have normal hearing and sight.

Experimental sessions were conducted in a small room in the basement of the Warren Nelson Building, located off the main campus of the University of Nevada, Reno. The room was equipped with a desk, chair, and laptop computer.

The experiment was conducted on a MacBook laptop computer with a conjugate reinforcement web application developed using JavaScript, HTML5, and CSS3 for the front-end. The back-end is written in C# using ASP.NET framework. The application is hosted on Microsoft Azure and is accessed through Apple Safari web browser using Wi-Fi provided by the University of Nevada, Reno.

The computer monitor displayed one picture at a time from a category of pictures selected by the participant. The computer displayed all pictures, recorded and time-stamped all responses and stored all of the raw data for later analysis.

Response Measurement

A participant responded on the laptop's keyboard. While the program was running, the only functional key was the "A" key, which when pressed altered picture clarity in different ways depending on the experimental condition. Data were collected on the number of presses made to the "A" key by each participant. These data were collected in two ways: the "A" key responses made that prevented the clarity of the picture from diminishing (conjugate negative reinforcement) and the number of presses made to the "A" key that restored the clarity of the picture once it had faded (conjugate positive reinforcement). Data were also collected on the latency to press the "A" key once the picture started to fade. (Note that the picture never faded during the 0% stimulus fade-out component.)

Procedure

Participant instructions. Upon arriving for an experimental session, the participant was read an information sheet describing the experiment (see Appendix A). Once read, the participant was asked whether they had any questions about the study.

With these preliminaries completed, the participant was asked to leave their personal belongings with the experimenter for the duration of the study. This included watches, cell phones, computers, and purses.

Preference assessment. A participant received a menu naming seven categories of pictures (see Appendix B). Each category included a title and a representative picture. The participant was asked to rank order the seven picture categories, with the most preferred ranked “1”, the least preferred ranked “7”, and the remaining ranked in-between the two extremes. The ranked categories then were used in a modified paired-choice preference assessment (Fisher et al., 1992).

For the preference assessment, the experimenter sat across the participant at a table and presented two representative pictures from each of the seven ranked picture categories. The participant was asked, “Would you prefer to look at pictures from (category A) or (category B)?” (The experimenter laid a representative picture from categories A and B in front of the participant on the table.) Each picture was presented with every other category’s picture until all possible pairings were shown.

The results from the modified paired-choice preference assessment yielded a rank order of the picture categories for each participant on the basis of the number of times the pictures representing each category were selected relative to pictures from the other categories. Pictures from the most highly preferred category were used in the experiment.

Once the preference assessment was complete, the experimenter escorted the participant to the experimental setting. The experimenter entered the participant’s category preference into the software program at this time and asked the participant to

take a seat at the desk in front of the computer. The experimenter oriented the participant to the laptop's track pad (used by the participant to start the experiment) and exited the room after answering questions the participant asked about the study.

Multiple schedule. A six component multiple (MULT) schedule was used. Each component had a different color frame. Each frame was associated with one of the following six fade-out percentage values: 0%, 1%, 5%, 10%, 25%, and 100%. Each value represented the percentage decrease in clarity relative to maximum picture clarity when responding fell below one response per second (the same value was used by MacAleese et al, 2015).

Each component of the six-ply MULT schedule lasted one minute, and each participant was exposed to each component four times during the session. The duration of session was 24 min per participant. A three second "blackout" period separated each component change, and a new picture was present at maximum clarity at the start of each component. The order of the components was random with the exception that no two identical components occurred in sequence.

Conjugate negative reinforcement. The experiment began with a brief reminder displayed on the computer monitor that pressing the "A" key changes picture clarity. The participant used the track pad on the laptop's keyboard to click the button that read "START," which was displayed on the monitor, when they were ready to begin. When the participant clicked the "START" button, the monitor displayed a picture at maximum clarity. The picture was in the middle of the screen and surrounded by a 2.25 cm colored border. Presses to the "A" key maintained the clarity of the picture so long as one press occurred per second.

If “A” key presses fell below one per second, an immediate decrement in picture clarity occurred. The decrement depended on which percentage fade-out component of the MULT schedule was in effect at the time. For every one second the participant did not press the “A” key, the picture continued to diminish in clarity, per the MULT component in effect. For example, if the participant was responding in the 5% decrement component and did not respond for 3 seconds, the clarity of the picture diminished to 85% (3 seconds x 5% = 15% reduction). At this point, the participant was required to press the “A” key 15 times to see the picture at maximum clarity (1% clarity increase x 15 presses = 15% increase in clarity).

This contingency qualifies as conjugate negative reinforcement because presses to the “A” key at the required frequency of one press per second prevented a clear picture from fading. If the participant failed to respond at the required frequency, the picture faded according to the condition in affect at the time. The participant could restore the clarity in the picture, however, by pressing at the required frequency. In this case, the contingency became conjugate positive reinforcement.

When the experimental session was completed, a brief message appeared on the computer monitor to alert the participant that they are finished.

Exit Questionnaire. Upon completion of the experiment, participants completed a short questionnaire (see Appendix C). The questions pertained to their interest in the pictures.

Results

Average frequencies of responding in each of the six multiple schedule components are shown in figures 1-9 for participants 99, 105, 118, 201, 24, 54, 606, 628,

and 19 respectively. Blue bars indicate average response frequencies to the “A” key during the conjugate negative reinforcement contingency (“A” key responses preventing a picture from fading) and orange bars represent the average response frequencies of the “A” key during conjugate positive reinforcement (“A” key responses restoring the clarity of the picture). Average response frequencies were calculated by summing the total number of responses within an individual component and dividing that total by the four minutes of exposure to that component. This was done separately for responses that prevented the picture from fading and responses that restored the clarity of the picture once it had faded.

A consistently positive relationship between percent picture fade-out and the frequency of responding that restored a picture once it had faded -- the positive reinforcement contingency -- was found with six out of the nine participants (P99, P105, P118, P201, P24, and P54 in Figures 1 – 6). For these six, responding rose steadily as the percentage fade-out increased from 0% to 100%. The exception to this finding included P606 (Figure 7), who made slightly fewer responses in the 25% condition than in the 10% condition. Despite this, P606 still showed the relation at the other values. P628 (Figure 8) made more responses in the 25% condition than the 100% condition but the relation resumed at 0%, 1%, 5%, and 10%. P19 (Figure 9) is the other exception. The relation also held at 0%, 1%, 5%, and 10% for P19 but was not present at the 25% and 100% values.

Shown in Figure 10 (orange bars) are the aggregate response frequency data under the positive reinforcement contingency. Overall, higher fade-out rate produced higher average frequencies of responding and lower fade-out rate produced lower average

frequencies of responding. More specifically, average frequencies of responding steadily increased as fade-out percentages increased from 0% to 100%.

Responses that prevented the picture from fading – the negative reinforcement contingency – occurred infrequently and inconsistently across the nine participants (Figures 1-9). All nine responded the least during the 0% fade-out component in which the picture never faded and responses therefore had no programmed consequences. Aside from that commonality, the participants showed relatively low response frequencies across all fade-out values.

Shown in Figure 10 (blue bars) are the aggregate response frequency data under the negative reinforcement contingency. As mentioned, frequency of responding was lowest in the 0% condition for all participants. These data illustrate that as a whole, participants responded at low and steady frequencies across all other conditions when responses prevented the picture from fading.

Shown in Figure 11 are the results of MacAleese et al. (2015) study on conjugate positive reinforcement. These data showed a relation showing that frequency of responding decreased as percentages to reach maximum clarity increased.

Turning next to the response latency data, the green bars in Figures 12-20 show the results for P99 – P19, respectively. The most consistent finding was that participants showed the longest latencies in the 0% component in which the picture never faded and responses produced no programmed consequences. P105 in Figure 13 represents the effect and represents as well the inconsistent effects of the five other fade-out values on the response latencies.

Shown in Figure 21 are the aggregate response latency data under the negative reinforcement contingency, i.e. how long it took a participant to respond following any decrement in clarity. These data illustrate that the participants' latency to respond were longest in the 0% fade-out condition. Similar response latencies were obtained in the 1% and 100% components and the 5% and 25% components, respectively.

The results of the exit interview showed that each participant enjoyed viewing the pictures and had no regrets in selecting the category from which they were drawn.

Discussion

The purpose of the present study was to investigate the two-fold effects of manipulating the clarity of a picture in a conjugate reinforcement preparation. One effect centers on responses that prevent a picture from fading, and the second effect centers on responses that restore the clarity of a picture once it has faded. The two contingencies appear as negative conjugate reinforcement and positive conjugate reinforcement, respectively.

The impetus for this study was the finding reported by MacAleese et al. (2015) that the frequency of responding in a conjugate schedule of positive reinforcement increased as a function of the percentage clarity in the picture produced by each response. When a response added 5% to the clarity of a more or less opaque picture in the MacAleese et al. study, for instance, responding was consistently higher than when a response added 25% clarity to the picture. A picture in the current study, in contrast, was present at maximum clarity for as long as the participant made at least one response per second. When responding fell below that frequency, the picture began fading as opposed to clarifying.

The results of the present study compare favorably to the findings reported by MacAleese (2015) et al. The frequency of responding increased for the majority of participants in the present study as a function of the percentage fade-out, just as it increased for the majority of participants in the MacAleese et al. study as a function of the percentage fade-in. The symmetry between responses that prevent a clear picture from fading and responses that add clarity to an unclear picture bears on the question as to whether or not the distinction between positive and negative reinforcement is worth preserving. After all, the strengthening effect of reinforcers is what matters most in a functional account of behavior and it is this fact alone, according to Baron and Galizio (2005), which militates against the distinction. Reinforcers reinforce, punishers punish and for Baron and Galizio that is all there is to say. Nevertheless, the present data show there is a difference when one contingency calls for responses that prevent a picture from fading and the other calls for responses that restore a picture once it has faded.

The published literature on conjugate reinforcement and punishment contain no measures of response latency. That said, the data collected in the present study show no consistent relation between fade-out values and response latencies. The expectation was that latencies would be long for the smallest fade-out (at 0%) and small for the largest fade-out (at 100%). This was not the case, however, and it is unclear why the response latencies were insensitive to the fade-out values. In addition to exploring this matter further in the context of pictures that fade-out, response latencies for pictures that fade-in would be a welcome measure for future research.

The findings of this study contribute to the literature on conjugate reinforcement primarily by showing that responses that restore a picture once it has faded are similar to

responses that prevent a picture from fading in the first place. Significant, too, is that both processes can be studied simultaneously with the same individual participant. Future research might take advantage of this feature for purposes of examining more closely the relation between positive and negative reinforcement.

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Appendix A

Information Sheet

The purpose of this experiment is to examine how key pressing on the keyboard changes while viewing various pictures displayed on the computer monitor.

During this experiment you will view pictures from a category of your choosing, from a provided list and via a preference assessment conducted by the research investigator. You will press the “A” key to change the clarity of the picture.

Any questions?

Appendix B

Instructions: Please rank order the picture categories listed below in the box next to the picture category title. Use “1” for your first rank (most preferred) and “7” for your last rank (least preferred).



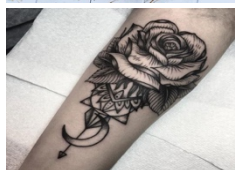
Animals



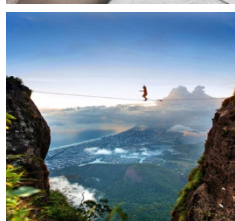
Celebrities on the Red Carpet



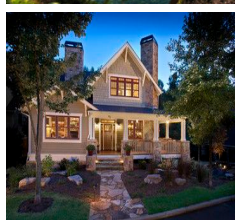
Food



Tattoos



Extreme Sports



Real Estate



Nature

Appendix C

Exit Questionnaire

1. **What did you think of the pictures?**

2. **Did you enjoy looking at the pictures?**

3. **Were the pictures what you expected?**

4. **Do you wish you chose a different category to view?**

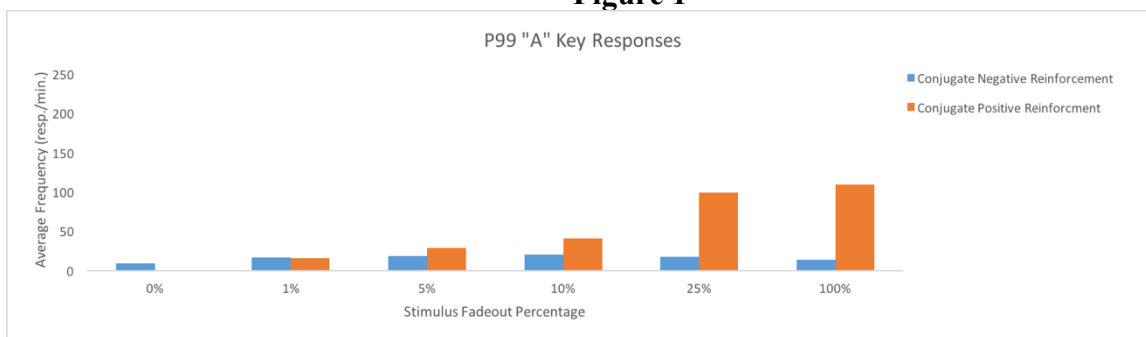
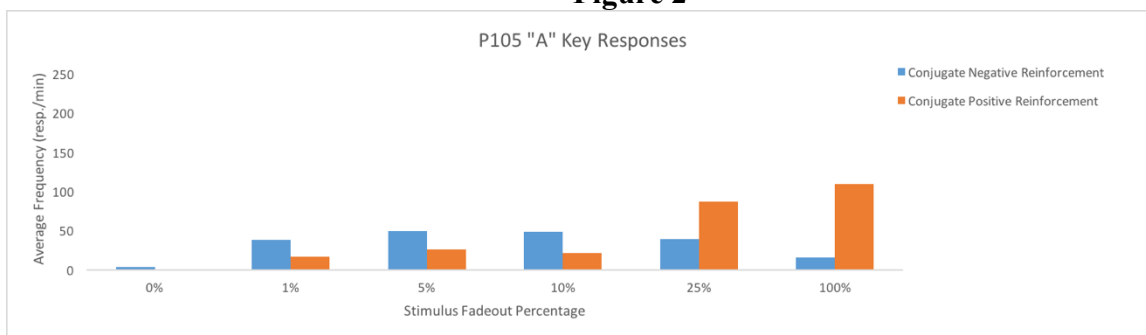
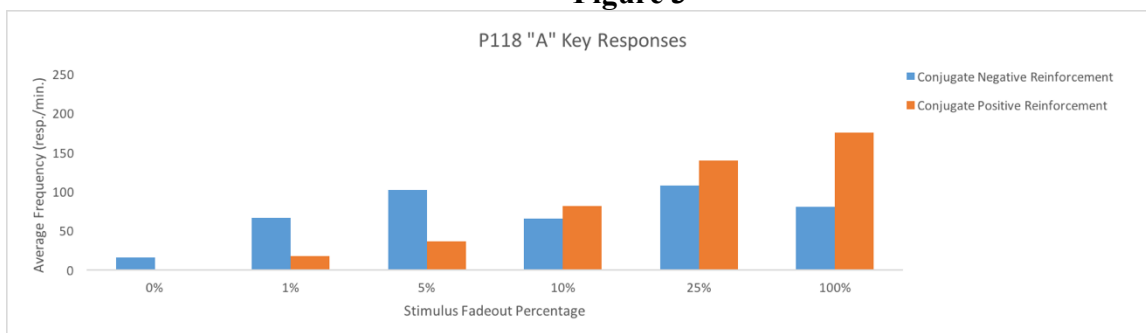
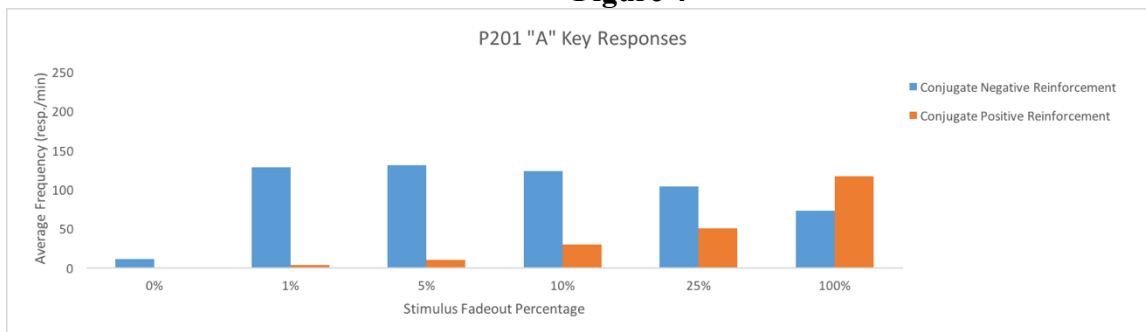
Figure 1**Figure 2****Figure 3****Figure 4**

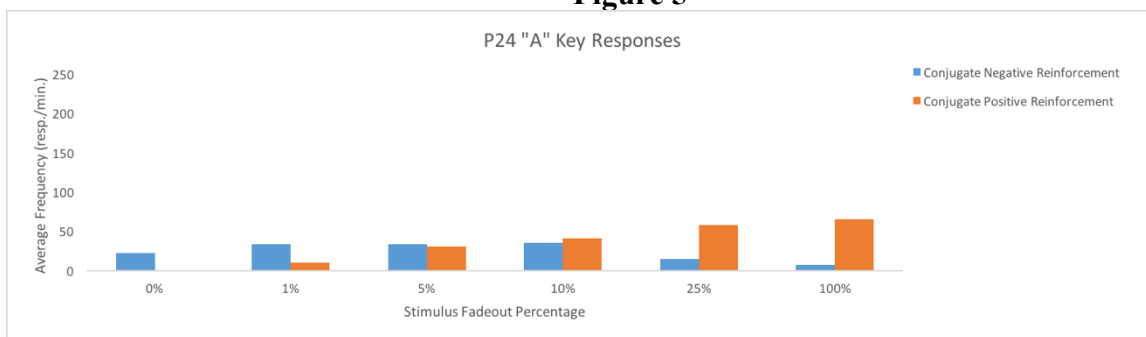
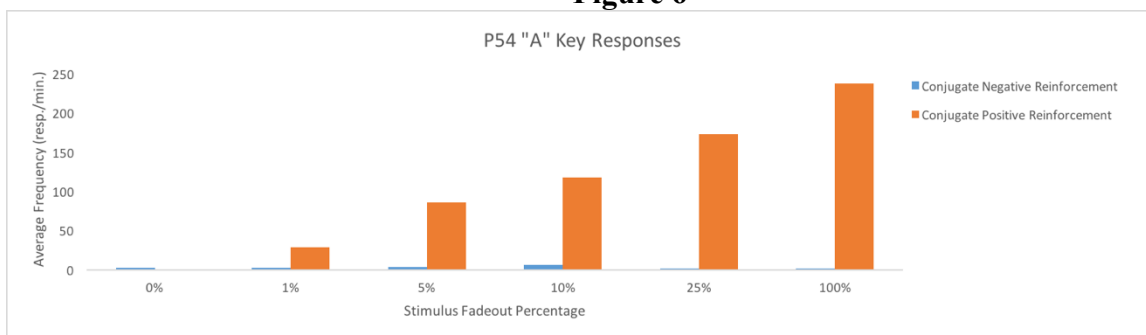
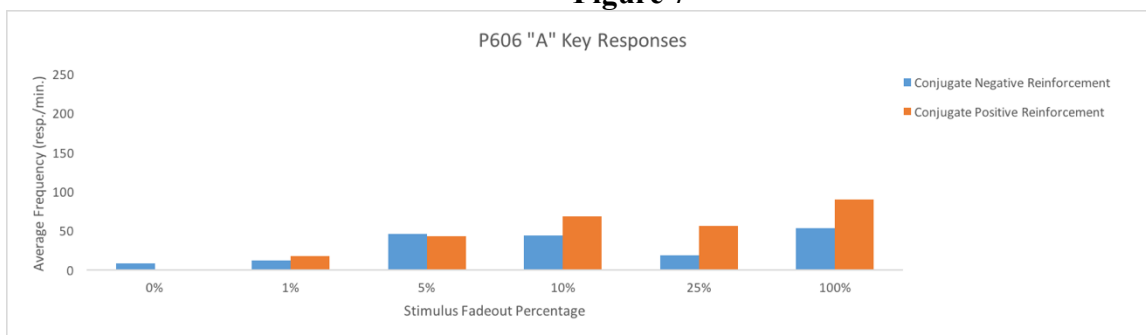
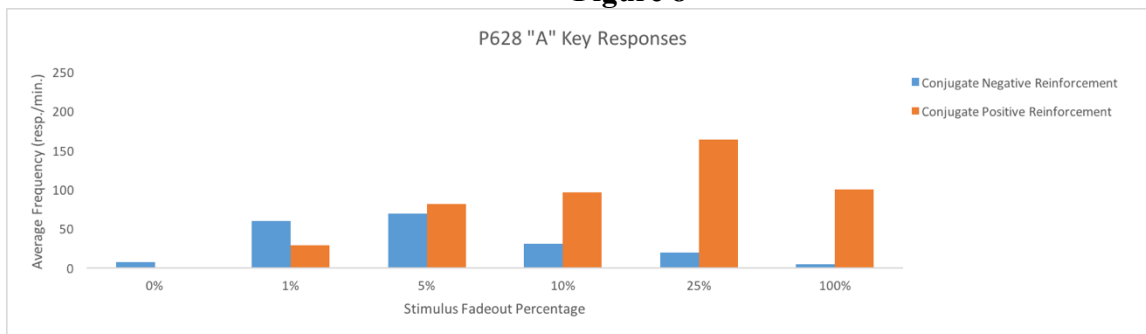
Figure 5**Figure 6****Figure 7****Figure 8**

Figure 9

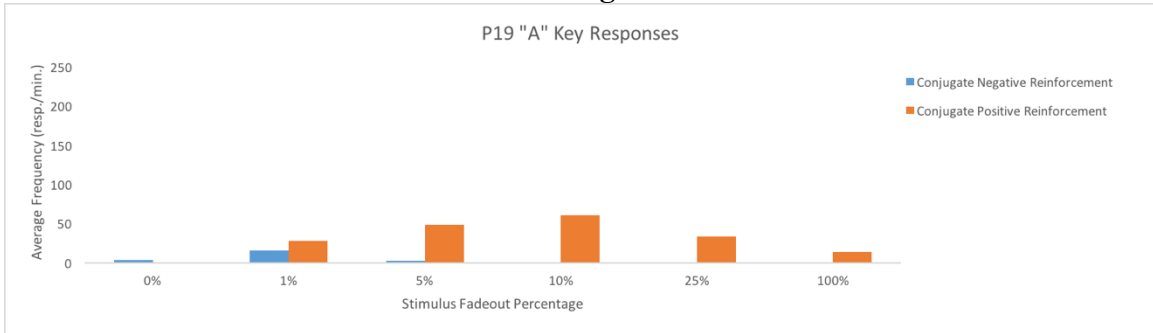


Figure 10

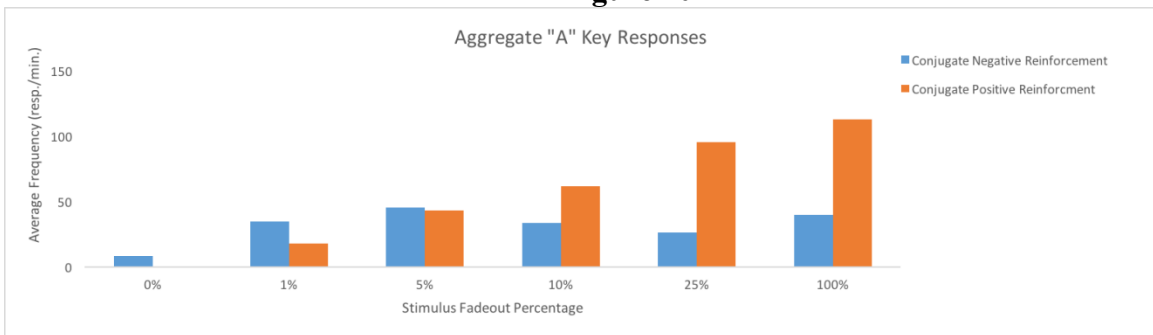


Figure 11

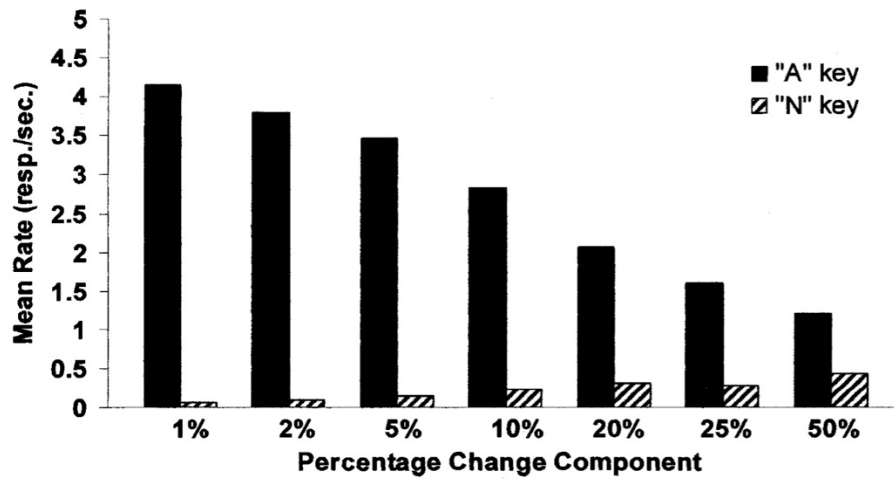


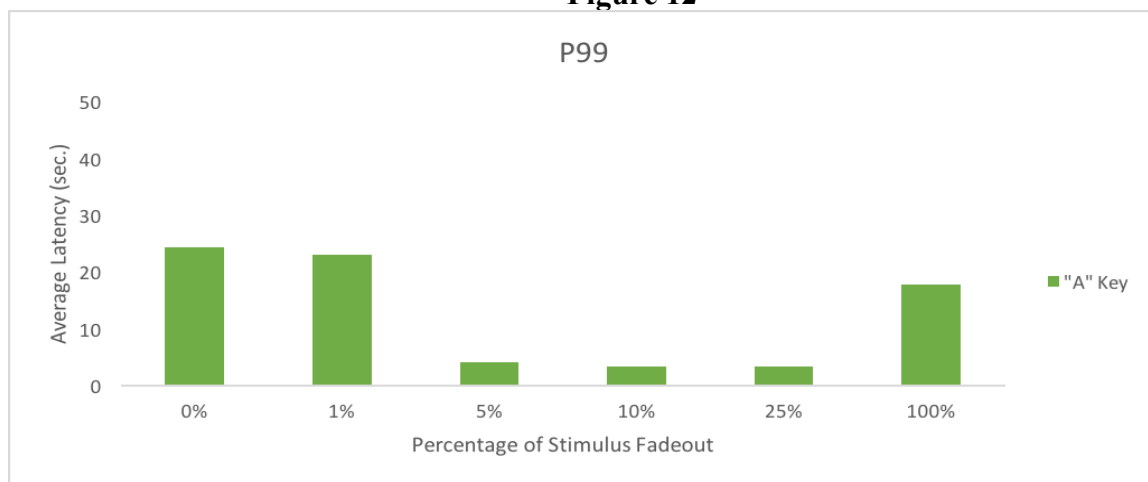
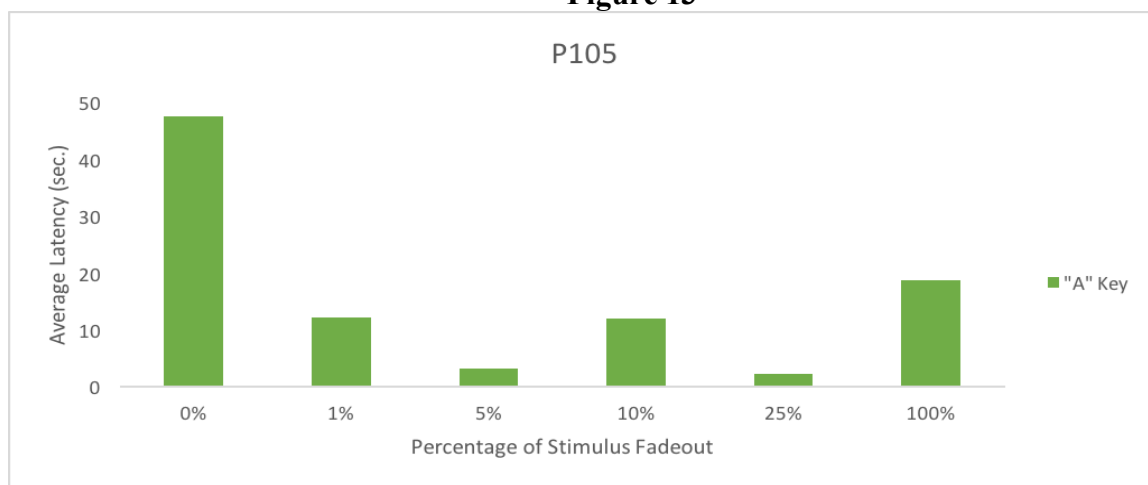
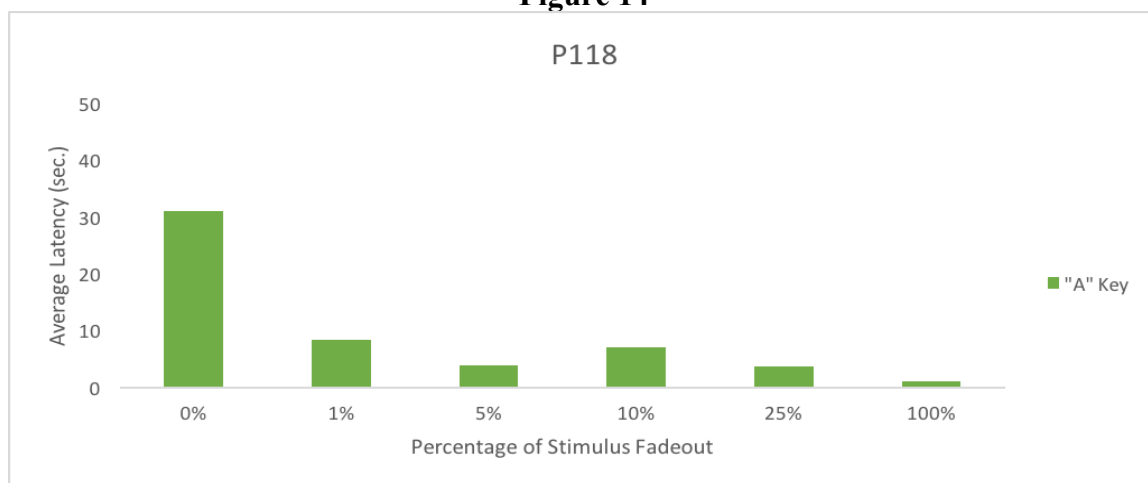
Figure 12**Figure 13****Figure 14**

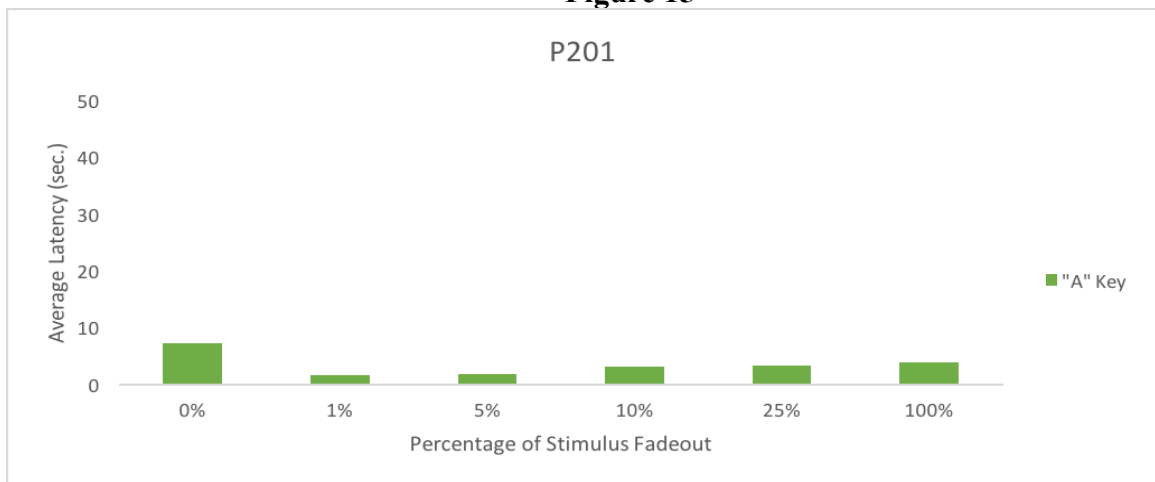
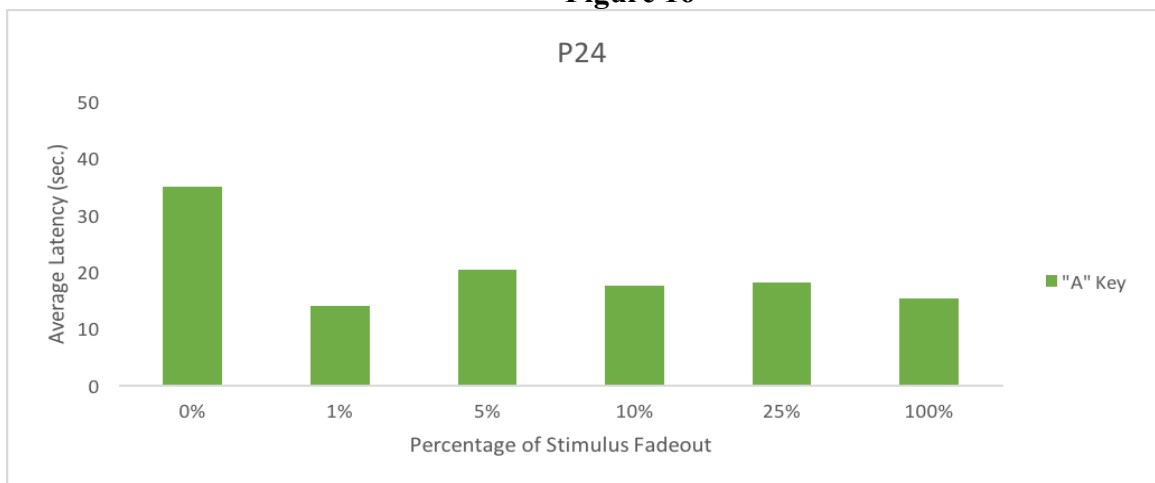
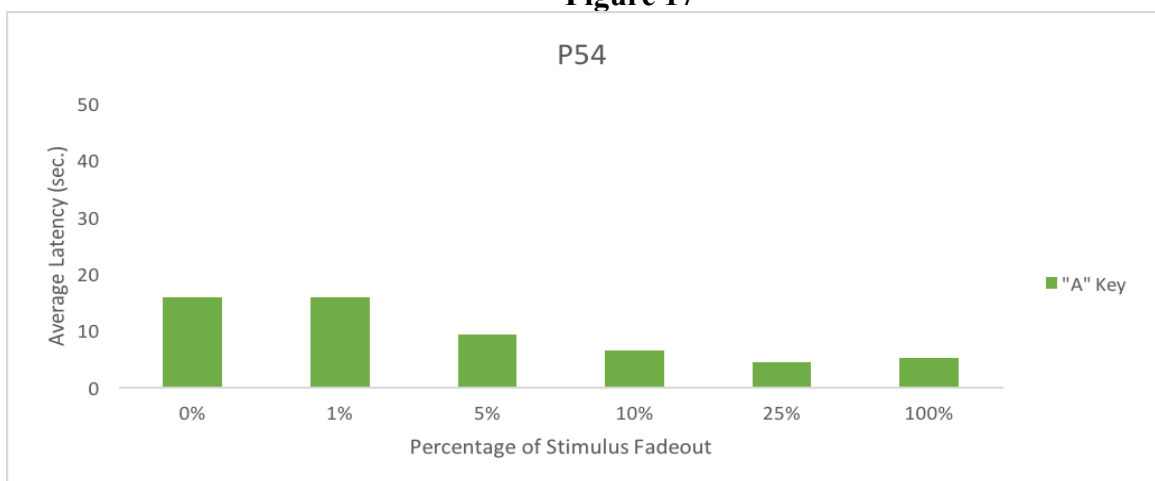
Figure 15**Figure 16****Figure 17**

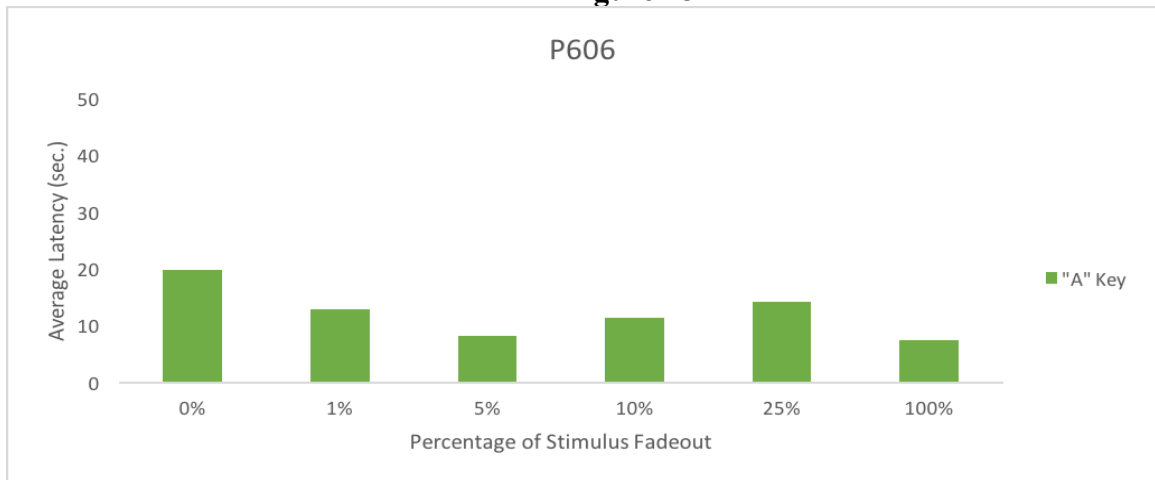
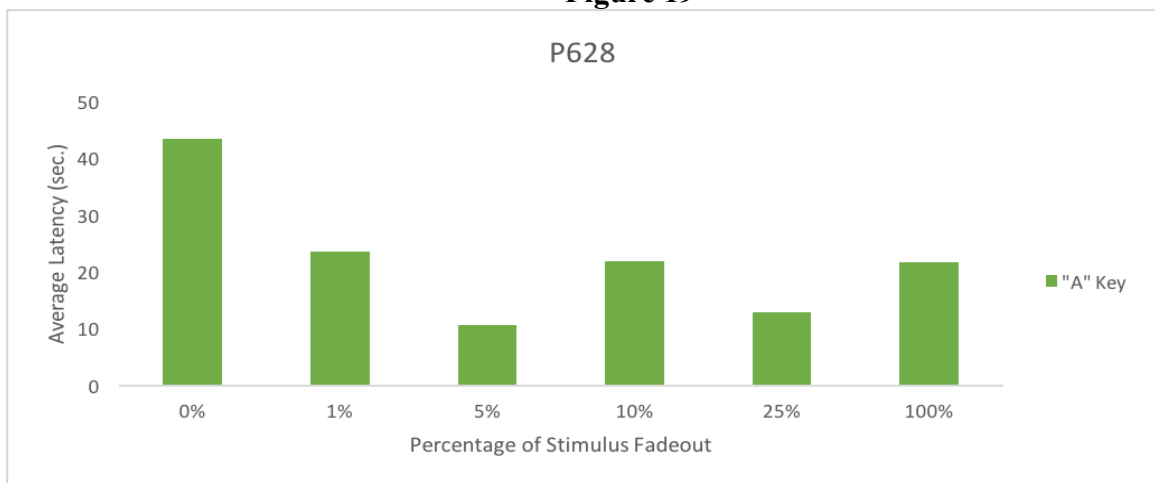
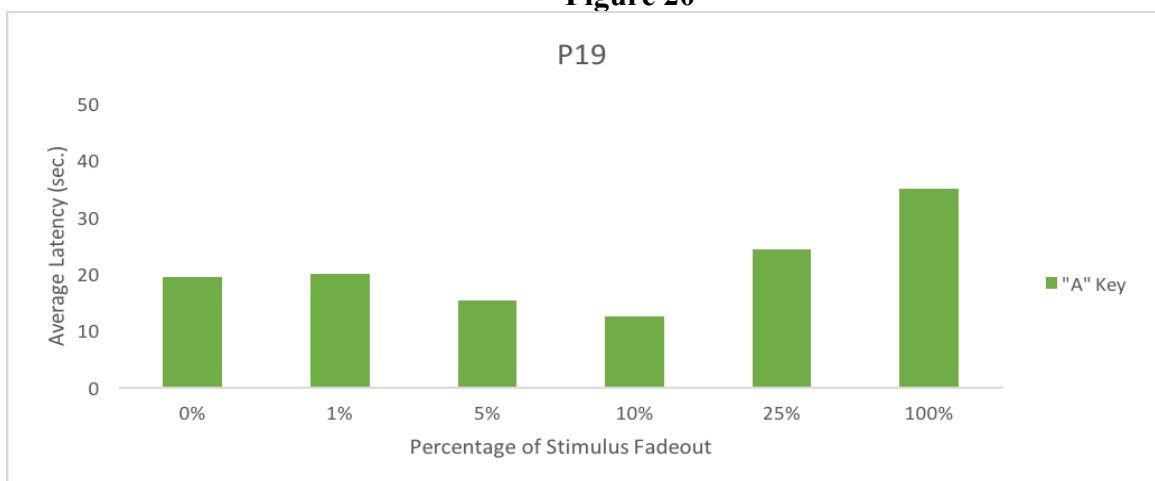
Figure 18**Figure 19****Figure 20**

Figure 21