

SIMON SAYS IN THE CLASSROOM: CAN IT ACCURATELY IDENTIFY  
IMPULSIVE CHILDREN?

by

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## ABSTRACT

**Background:** Impulsive children often show signs of aggressiveness, disruptive behavior, and poor test taking skills. By identifying and targeting these students early on, teachers can give them the proper help and attention needed to improve their academic learning experience and outcome. The Matching Familiar Figures Test (MFFT) is used by optometrists to determine whether a child is impulsive or reflective as well as to evaluate the efficiency of his or her information processing system. As the first scientific study to analyze how well Simon Says correlates with the MFFT, this study was designed to make it easier for grade school educators to accurately identify impulsive behavior in the classroom. **Methods:** Pre-recorded Simon Says instructions and actions were played to the third grade students at Brookside Elementary in Big Rapids, Michigan in order to minimize variability. The MFFT was then administered to the same set of students. **Results:** There was found to be no statistically significant correlation between the impulsivity of third grade students according to the MFFT and the order in which they were eliminated from a game of Simon Says. In a small sub-set of subjects where gender was recorded, males tended to lose at Simon Says earlier than females. **Conclusion:** Simon Says is not an effective way to identify impulsivity in the classroom setting as a whole. However, further studies can examine whether Simon Says could be used to determine impulsivity when gender is taken into account.

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## INTRODUCTION

Impulsive children often show signs of aggressiveness, disruptive behavior, and poor test taking skills. A 2005 study conducted in Spain found a correlation between impulsivity and academic failure.<sup>1</sup> Its findings suggest “impulsivity is not directly related to intelligence (but rather) acts as a moderator variable between individuals’ resources and their achievements.” Another study conducted a few years earlier showed that when teachers used behavior modification techniques, cognitive behavior strategies, and instructional management strategies in a classroom setting, children with attention-deficit/hyperactivity disorder (ADHD) achieved increased academic scores and displayed less impulsivity according to their parents and teachers.<sup>2</sup> While not all impulsive children have ADHD, it can be inferred from those results that by identifying and targeting students with impulsive tendencies early on, teachers can give them the proper help and attention needed to improve their academic learning experience and outcome.

The Matching Familiar Figures Test (MFFT) is used by optometrists to determine whether a child is impulsive or reflective as well as to evaluate the efficiency of his or her information processing system. A child is shown a simple picture, such as a house or ruler and is asked to find its match among six other similar looking pictures. There are a total of twelve items. The MFFT’s use in numerous studies over the years attests to its ability of accurately identifying impulsive children. For example in the past decade, the MFFT was used to evaluate impulsivity in overweight children, showing them to be more impulsive than children with a healthy, normal weight.<sup>3</sup>



Unlike the formal, methodical nature of the MFFT, Simon Says is a fun childhood pastime that has been enjoyed by many generations. It involves acting out a variety of activities that are preceded by the words “Simon says.” However, participants must be careful not to do any activity that is not preceded by “Simon says.” This game therefore requires an efficient processing system and control over impulsive behavior. A careful literature reviewed showed that no scientific study has yet been done to analyze how well Simon Says correlates with the MFFT. We hypothesize that the two would in fact show the same set of kids to be impulsive, which would enable grade school educators to accurately identify impulsive behavior in the classroom setting by playing a simple game of Simon Says. Ideally teachers would use a copy of the recording we used, but they could just play a spontaneous game of Simon Says.

A similar study was published a few months after the start of this one. It compared the behavioral performance of 9-10 year-olds in the Go/NoGo task to parent/teacher reports of inattention and impulsivity/hyperactivity.<sup>4</sup> NoGo errors correlated to descriptions of impulsivity/hyperactivity, and Go errors correlated to reports of inattention. Yet there were strong cross-correlations as well. By using the MFFT rather than parent/teacher questionnaires to identify impulsive children, our study hopefully eliminates a level of subjectivity found in this earlier study.

## METHODS

This study took place at Brookside Elementary in Big Rapids, Michigan. Prior to visiting the school, the Simon Says instructions and actions were pre-recorded on a tape cassette in order to minimize variability (Appendix A). Also prior to visiting the school, approval was received from the Human Subjects Committee at Ferris State University. In addition, a parental consent form was sent home with each of the students. It asked the parents to sign and return the form if they did not want their children to participate in the study (Appendix B).

A group of forty-six third grade students were given stick-on name tags, each with a different number on it for identification purposes. The pre-recorded instructions and activities were then played to the students over a tape player as they stood spread out in a large gymnasium. One test administer stood in front of the students acting out the actions Simon said to do. With the help of the students' two teachers, the other test administer observed which students mistakenly did the activities that were not preceded with "Simon says." The tape player was temporarily stopped as these students were called "out" and asked to sit off to the side while their numbers were recorded in the appropriate order that they erred. The tape was then resumed and game play continued until the next time a mistake was made.

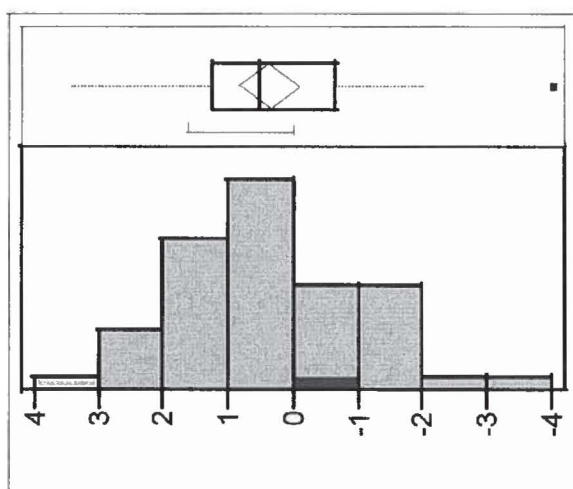
The MFFT was then administered to the same set of students, one at a time, with the exception of one student who could not participate due to lack of parental consent. All attempts were made to maintain a quiet room with minimal distraction. Every

response and the latency of the first response were recorded for each student. A sucker was given to each child after he or she finished taking the MFFT.

Each student then received a z-score for errors made and for mean latency of first response. These scores were computed using the average errors made, average latency, and their respective standard deviations based on the age of that particular student. The latency z-score was then subtracted from the error z-score to determine the impulsivity of a student. A large negative number indicated a very impulsive style and strategy; conversely, a large positive number means the child is very reflective. Each child could fall anywhere on that spectrum. Meanwhile the z-scores for errors made and latency of first response were also added together to find the child's efficiency of information processing. This spectrum includes high efficiency indicated by a large negative number and extreme inefficiency shown by a high positive number. The data was then statistically analyzed using JMP 5.0 software. A study done by Martin Bland and Douglas Altman was used to assess the correlation between the two methods of clinical measurement used, MFFT and Simon Says.<sup>5</sup> The resulting data and graphical analysis are shown below.

## RESULTS

An even distribution of impulsivity (Figure 1) of the forty-five subjects tested with the MFFT is shown in a bell curve that is slightly skewed more toward impulsivity (positive numbers) than reflectivity (negative numbers). Quantiles ranged from a maximum of +3.380 to a minimum of -3.960, and the median was +0.540 (Table 1). The standard deviation (SD) for our sample size was +1.481 with a mean of +0.358 (Table 2). The results of a bivariate fit indicate no linear relationship, and therefore no correlation ( $r = +0.0963$ ), between the impulsivity of the children on the MFFT and the order in which they sat out during the game of Simon Says (Figure 2). A best-fit line could not be established. A “Bland-Altman” test was also used to compare the results of the MFFT and the game of Simon Says (Figure 3). The t-ratio, the sampling distribution difference, is -9.62 ( $p < .001$ ). The mean impulsivity score was 0.414, and the mean loss at Simon Says was 9.5, resulting in a mean difference of -9.085 (Table 3).



**Figure 1**

**Quantiles for overall sample**

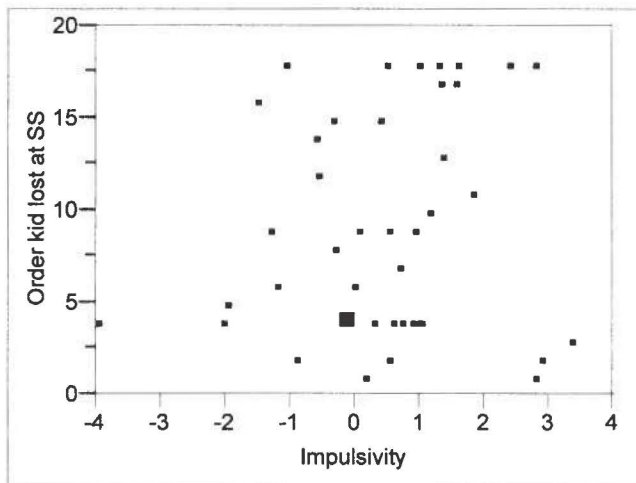
|        |          |        |
|--------|----------|--------|
| 100.0% | maximum  | 3.380  |
| 99.5%  |          | 3.380  |
| 97.5%  |          | 3.308  |
| 90.0%  |          | 2.572  |
| 75.0%  | quartile | 1.273  |
| 50.0%  | median   | 0.540  |
| 25.0%  | quartile | -0.655 |
| 10.0%  |          | -1.618 |
| 2.5%   |          | -3.670 |
| 0.5%   |          | -3.960 |
| 0.0%   | minimum  | -3.960 |

**Table 1**

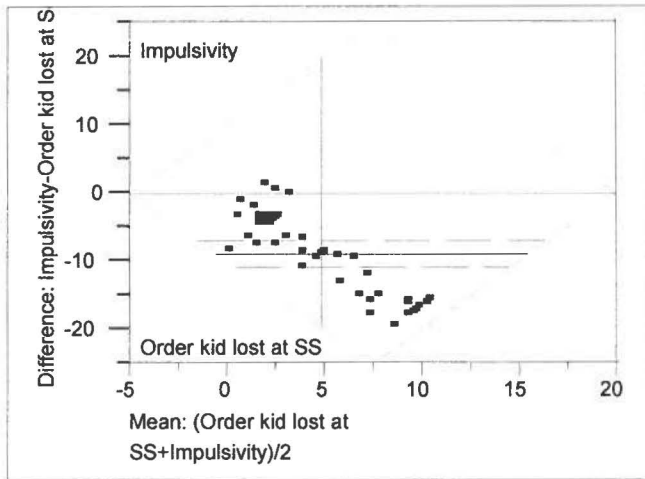
**Moments for overall sample**

|                |           |
|----------------|-----------|
| Mean           | 0.3576667 |
| Std Dev        | 1.481405  |
| Std Err Mean   | 0.2208348 |
| upper 95% Mean | 0.80273   |
| lower 95% Mean | -0.087397 |
| N              | 45        |

**Table 2**



**Figure 2**



**Figure 3**

|                      |         |           |          |
|----------------------|---------|-----------|----------|
| Impulsivity          | 0.41464 | t-Ratio   | -9.62236 |
| Order kid lost at SS | 9.5     | DF        | 41       |
| Mean Difference      | -9.0854 | Prob >  t | <.0001   |
| Std Error            | 0.94419 | Prob > t  | 1.0000   |
| Upper95%             | -7.1785 | Prob < t  | <.0001   |
| Lower95%             | -10.992 |           |          |
| N                    | 42      |           |          |
| Correlation          | 0.09627 |           |          |

**Table 3**

A small sub-study was done to compare the data of males versus females. Six females were randomly chosen along with five males. Our ranges of quantiles for females in the game of Simon Says were +14.00 as our maximum to +1.00 for our minimum and a median of +9.00 (Table 4). The SD for the female sample size was 5.046 with a mean of +8.33 (Table 5). The range was then plotted out revealing no evidence of a bell-shape curve (Figure 4). Our ranges of quantiles for males were +18.00 for our maximum to +3.00 as our minimum and a median of +17.00 (Table 6). The SD for the male sample size was +7.778 with a mean of +12.00 (Table 7). The range was then plotted out revealing no evidence of a bell-shape curve (Figure 5). The results yielded that males are two-thirds more likely to lose at Simon Says than females. The means

were 12.0 and 8.33, respectively. Likewise, the MFFT showed males to be more impulsive; males had a mean impulsivity score of +1.917 while females had a mean of +1.003.

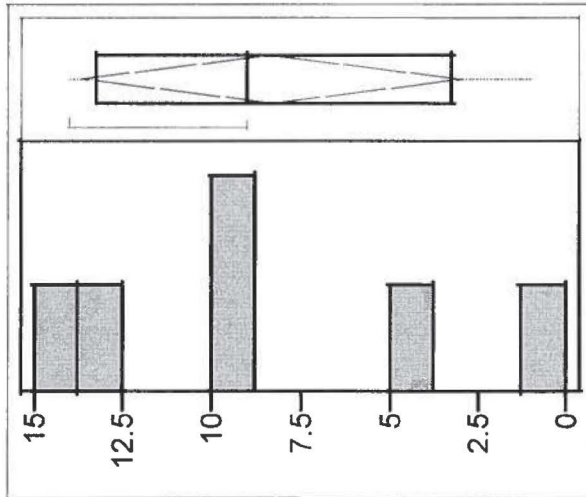


Figure 4

**Quantiles for females**

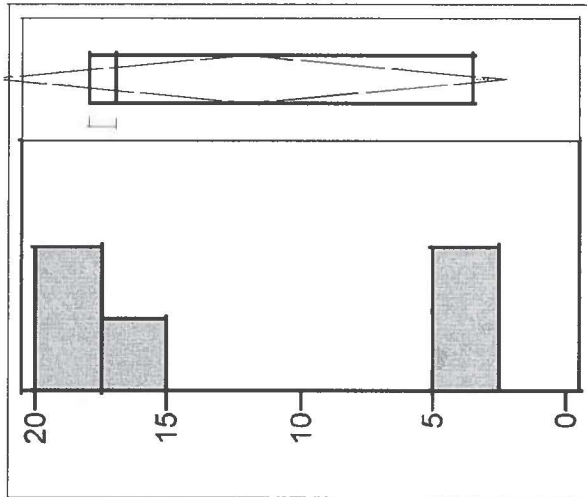
|        |          |        |
|--------|----------|--------|
| 100.0% | maximum  | 14.000 |
| 99.5%  |          | 14.000 |
| 97.5%  |          | 14.000 |
| 90.0%  |          | 14.000 |
| 75.0%  | quartile | 13.250 |
| 50.0%  | median   | 9.000  |
| 25.0%  | quartile | 3.250  |
| 10.0%  |          | 1.000  |
| 2.5%   |          | 1.000  |
| 0.5%   |          | 1.000  |
| 0.0%   | minimum  | 1.000  |

Table 4

**Moments for females**

|                |           |
|----------------|-----------|
| Mean           | 8.3333333 |
| Std Dev        | 5.0464509 |
| Std Err Mean   | 2.060205  |
| upper 95% Mean | 13.629259 |
| lower 95% Mean | 3.0374079 |
| N              | 6         |

Table 5



**Figure 5**

**Quantiles for males**

|        |          |        |
|--------|----------|--------|
| 100.0% | maximum  | 18.000 |
| 99.5%  |          | 18.000 |
| 97.5%  |          | 18.000 |
| 90.0%  |          | 18.000 |
| 75.0%  | quartile | 18.000 |
| 50.0%  | median   | 17.000 |
| 25.0%  | quartile | 3.500  |
| 10.0%  |          | 3.000  |
| 2.5%   |          | 3.000  |
| 0.5%   |          | 3.000  |
| 0.0%   | minimum  | 3.000  |

**Table 6**

**Moments for males**

|                |           |
|----------------|-----------|
| Mean           | 12        |
| Std Dev        | 7.7781746 |
| Std Err Mean   | 3.4785054 |
| upper 95% Mean | 21.657879 |
| lower 95% Mean | 2.3421206 |
| N              | 5         |

**Table 7**



## DISCUSSION

There were many factors that may have affected the validity of the data. First and foremost is human error. With only four adults watching for errors and forty-six kids, it was difficult to spot every child who did an action that was not preceded by “Simon says.” More judges spread throughout the room would have certainly been beneficial. Secondly, it is hard to be 100% accurate with the timer when recording latency of first response on the MFFT. In addition to human error, there were other factors affecting the validity of the study as well. The kids were somewhat riled up since they were taken out of their classrooms to play a game. Therefore, some could have been shown to be impulsive with Simon Says when they normally would not be. About five MFFTs were interrupted by a recess bell or overhead announcement. One girl was very reflective until an announcement was made asking those girls interested in playing basketball to meet in the gym. The MFFT data would be more reliable if the test was administered in a setting with absolutely no interruptions and all the kids were tested under the same conditions. Some kids were pulled from learning about fractions while others came in right after recess. These children may have different levels of attention and energy or different desires to succeed at matching the correct figures. There was a small but unlikely chance that some kids traded identification numbers between the game of Simon Says and administration of the MFFT. This would result in inaccurate matching of a child’s Simon Says data to his or her MFFT data.

There were also problems with the test design. Simon Says and MFFT have different criteria for determining if a kid is impulsive. Unlike the MFFT, Simon Says

does not consider every error made or his response time. Simon Says determined a child's impulsivity solely on the order in which he DID an activity that was NOT preceded by the words "Simon says." The kids who did NOT do something that WAS preceded by "Simon says" were not called out; therefore, the Simon Says data does not show all of a child's errors. Furthermore, the Simon Says data does not include a child's response time. This data therefore cannot differentiate the excessively reflective kids (high negative on MFFT) from the effectively reflective kids (low negative on MFFT) since taking too long to consider whether to do any given action did not result in being called out. Hence there may be children who did very well in Simon Says but were shown to be ineffectively reflective in MFFT. According to the Bland-Altman test, the difference is so far away from the mean that Simon Says is not comparable to the MFFT in detecting impulsivity. Next time, perhaps kids should be separated into two groups: those that were called out because they did something that Simon did NOT say to do (impulsive) and those that were called out because they did not do something Simon DID say to do (reflective).

The MFFT provides gender-specific averages for errors made and latency of first response for each age group. For example, eight and nine year old boys make more errors than females of the same age. In this study, every participant's gender was not recorded. Therefore the z-scores, and thus the scores for impulsivity and efficiency, had to be calculated using the less precise "total" numbers, rather than the more exact numbers that consider whether the participant was male or female. For further consideration, if we had tested boys against girls, data suggests there might be a correlation between boys likely sitting out sooner than girls and their impulsivity score.

In conclusion, this study found that Simon Says cannot be used in the classroom to identify impulsive children with the same accuracy as the MFFT. However, because our small recorded set of males exhibited more impulsivity in Simon Says than our small set of females, perhaps repeating this study with a larger sample size and using the gender-specific z-scores could show some correlation between the results of Simon Says and those of the MFFT. It can also be further studied whether children who are shown to be reflective on the MFFT are more likely to be called out in Simon Says for not doing an action that Simon Says to do (error of omission).

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APPENDIX A

PRE-RECORDED SIMON SA YS INSTRUCTIONS

## PRE-RECORDED SIMON SAYS INSTRUCTIONS

“We’re going to play a game called Simon Says. You have to do everything Simon Says to do. Otherwise you will be called out. Keep doing the activity until Simon says to do a new one. There will be an instructor at the front of the room demonstrating the activities that Simon Says to do. But be careful... she might try to trick you. Only do the activities that Simon Says to do! How about we try a few practice ones first?

Simon says put your hands on your head.

Simon says touch your toes.

Simon says jump up and down.

Stop

No, Simon didn’t say to stop. Remember, only do the things Simon says to do.

Ok, are you ready to begin the game? Simon says...”

And the game commences with a variety of activities, including Simon says:

Touch your head.

Touch your knees.

Touch your toes.

Pat your belly.

Jump up and down.

Jump on one foot.

Touch your shoulders.

Spin around.

Flap your arms.

Sit down.

Reach up to the sky.

Run in place.

Stop.

Wiggle.

Stomp your feet.

Stick your arms out to the side.

Clap your hands.

APPENDIX B

LETTER TO PARENTS

LETTER TO PARENTS

Dear Parents of Brookside Elementary:

We are fourth year graduate students at the Michigan College of Optometry, and we are writing this letter to inform you that we will be conducting a study on the third grade students for our senior research project.

The study will involve the children playing a game of “Simon Says” and then taking a ten-minute test that involves matching similar pictures (i.e houses, rulers, etc). We will then compare the results of the two tests to determine whether they identified the same children as being impulsive decision makers. We feel that detecting this trait early on in the classroom setting will benefit the child’s educational experience down the road.

This experiment does not involve an ocular examination nor any risk for physical harm. Each child’s specific results will be kept confidential.

Please sign below to indicate that you **do not** want your child to participate and return it to the teacher promptly because we wish to start to study very soon. If you have any questions or concerns, please contact us at xxx-xxx-xxxx (Erica) or xxx-xxx-xxxx (Sandra).

Thank you,

Sincerely,

Erica Touhill and Sandra Segerson

---

Child’s name

---

Print Parent/Guardian name

---

Sign name

---

Date