

# FollowMe: A Game-Based Approach to Self-Regulation

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**Abstract:** Self-regulation is linked to success in both academics and interpersonal relations. In order to facilitate increases in self-regulation, a web-based game was developed based on the Head-Toes-Knees-Shoulders task by Cameron-Ponitz et al. (2008; 2009). The game functions similarly to the popular game Simon Says, where one repeats patterns on a screen. However, instead of exactly following the pattern displayed, one follows a pattern based on a predefined set of rules. Similar to the Head-Toes-Knees-Shoulders game, where one must touch one's head when told to touch one's toes, when one sees blue on the screen, one must touch red. The game provides both a fun and challenging environment (Morgan, Sibthorp, & Wells, 2014) to develop self-regulatory capabilities of children.

## Overview

Staying focused on a task is challenging for many people, especially younger children. One way to help students focus for longer periods of time, is for them to develop their self-regulation skills. More specifically, self-regulation, the controlled inhibition of automatic impulses, is often linked to success in both academics (Baumeister & Vohs, 2004; Pianta & Rimm-Kaufman, 2006) and interpersonal relations (Blair, 2002; Dobbs, Doctoroff, Fisher, & Arnold, 2006; Eisenberg, Smith, Sadovsky, & Spinrad, 2004). Using a game based approach, the *Head-Toes-Knees-Shoulders* task helps develop self-regulation behaviors (Cameron-Ponitz et al., 2008; Cameron-Ponitz, McClelland, Matthews, & Morrison, 2009). In this exercise, both the instructor and students must follow a set of rules. For example, the teacher might state that when he/she says "touch your toes," students must always touch their head. The purpose of these exercises is to help develop attention, working memory, and inhibitory control. This activity requires students to listen and focus on what the teacher is instructing and doing. Research has shown that

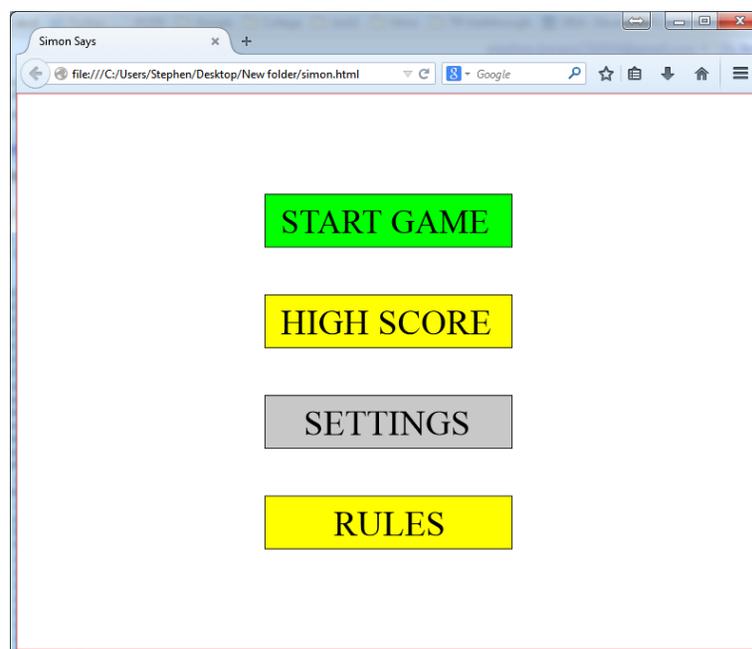
practicing these cognitive skills helped students develop stronger attention skills, increased achievement, and increased the likelihood of graduating from high school (Blair, 2002; Bronson, 2000; Eisenberg et al., 2000). Studies have also shown that participants who succeeded in behavioral regulation exercises were also more advanced in understanding mathematics and reading (Miller, Kelly, Zhou, & Campbell, 2005; Dobbs, Doctoroff, Fisher, & Arnold, 2006; Espy et al., 2004; Gathercole, Alloway, Willis, & Adams, 2006). According to research (Cameron-Ponitz et al., 2008), the Head-Toes-Knees-Shoulder task was found to be an informative and reliable form of assessment in children's behavioral regulation. Self-regulation activities are crucial for developing successful students (Baumeister & Vohs, 2004). Therefore, our web-based game, *FollowMe*, was created to foster the development of self-regulation as seen in the Head-Toes-Knees-Shoulder activity.

FollowMe combined the classic *Simon Says* game and the Head-Toes-Knees-Shoulders concept. The web-based game displays four colors: red, blue, green, and yellow. Simon Says is best known as a memory game where the player needs to memorize a series of color patterns. Rather than simply memorizing color patterns, FollowMe adopts the rules behind the Head-Toes-Knees-Shoulders activity. For example, instead of the program asking the participant to “touch your knees,” it displays “red.” Similar to the Head-Toes-Knees-Shoulders activity, each color displayed will mean a different action. When asked to press red, the rule could be to press green instead. Therefore, the student is not only focusing on the command, but attempting to remember the rules. FollowMe combines the success of the Head-to-Toes task with the popular Simon Says game to foster self-regulation behaviors in children.

## Development

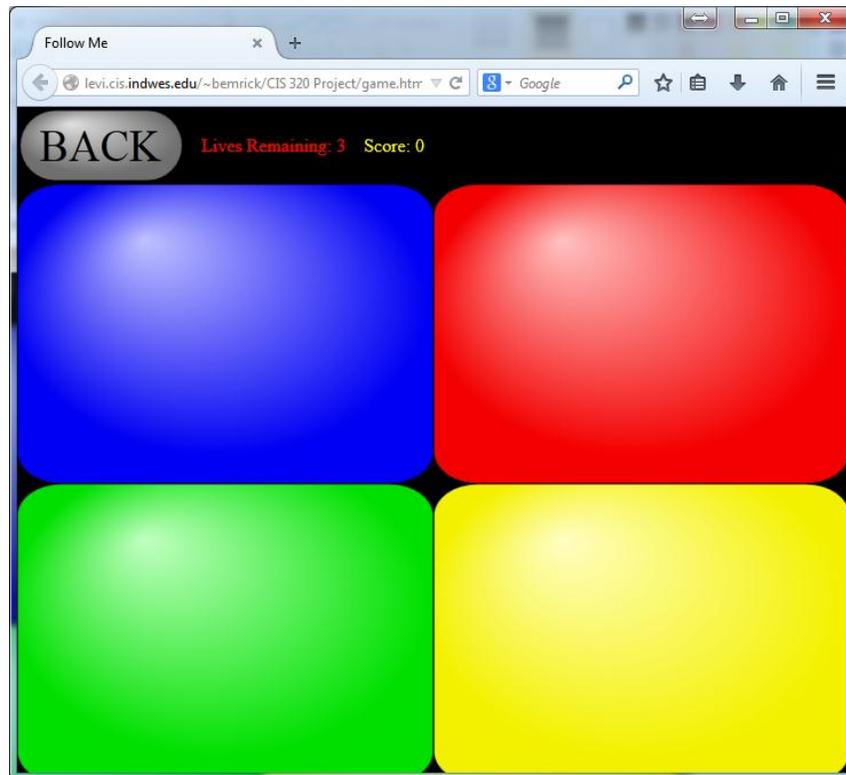
Self-regulation activities are crucial to a student’s success. To develop self-regulation and embrace 21st century skills, we created the web-based game FollowMe. Rather than training an instructor to give directions, we developed a game that serves as a self-regulation exercise for classrooms. The primary goal of FollowMe is to increase self-regulation using a game-based approach, which potentially helps children perform better academically by increasing their attention and self-discipline.

Overall, FollowMe was developed in four iterations -- webpage, visuals, rules, and options. During the first iteration, a simple webpage was created containing the menu buttons that served as a foundation for other iterations and functions (Figure 1). More specifically, a JavaScript canvas element was used in order to facilitate scaling of game graphics and buttons which presents a responsive design for different sized screens and resolutions. The game buttons use the Scalable Vector Graphics (SVG) standard, which provide easy scalability and support animations and changes during game play.



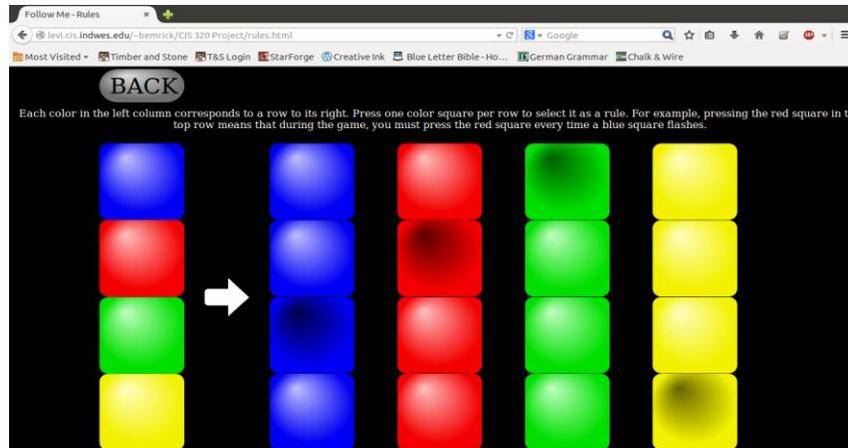
**Figure 1.** The home screen for FollowMe after the first iteration.

Iteration two brought about visual changes, including polished buttons and user feedback when the mouse hovers over buttons (Figure 2). It was during this iteration that the first pages were created where one could play the game and examine the basic game rules. With the game page, difficulty was encountered when attempting to click the graphical elements such as the game buttons. Therefore, the canvas concept was replaced with a webpage containing the buttons as separate Document Object Model (DOM) elements (Keith & Sambells, 2010) as a more flexible alternative. The functionality of the Back button was implemented (bringing the user back to the main menu) and implementation of the game logic was initiated with the four button colors flashing in a random sequence.



**Figure 2.** The final game screen for FollowMe.

Iteration three brought about a more dynamic rules page that allowed one to change the rules of the game (Figure 3). The Rules page was created that explained how to play the game, and the Start Game button that linked to the Rules page helped ensure that the player knew what to do before the game began. The Options page displayed the current rule set, as most recently defined by the player on the Rules page. The game screen was improved by scaling the game buttons to the screen, making them more prominent, and giving the entire page a brighter feel. A simple High Scores page was created that would later contain the player's saved scores. Initial functionality of the game page was implemented, but without the functionality of the rules page. Additionally, the buttons flashed in a random sequence, the player pressed the buttons in the same sequence, and the process repeated with one more button added to the end of the sequence.



**Figure 3.** The rules page of FollowMe, with the rule that when either the blue or green button flashes, the other should be pressed.

Phase four of the project brought about the most changes and challenges. The game was given the name “FollowMe,” the player could now see their current score and remaining lives on the game screen, and the score was recorded on the high scores page. The top ten scores were stored in cookies on the client computer for ease of implementation (a future enhancement would be to store the high scores on the server to facilitate competition between players on different client computers). Options that changed the game rules were implemented, allowing players to change which button should be clicked when a given button flashed. Finally, the buttons on the game page flashed in a random order every time -- when the player correctly repeated a pattern, a new pattern occurred that was one button flash longer than the previous one, but did not necessarily contain the previous sequence. The randomness was meant to make the game more challenging, and ultimately increase self-regulation.

These final changes to the game buttons and rules were the most important part of the game for developing self-regulation. By designing the game such that a player must click the blue button, for instance, upon seeing the red one flash, and by creating a random pattern with each new game cycle instead of simply increasing the previous pattern by one, it was possible to force the player to keep track of multiple variables at the same time. The player must not simply remember a pattern, because it changes every time, nor even remember a new pattern by the colors that flash. Instead, the player has to see a button flash, recall which color it is associated with, and remember to press that color when repeating the pattern.

Future development might include several new features. For example, two players could connect their devices and play against each other or in tandem -- player one would press two of the buttons and player two would need to press the other two. The two players would need to work together to repeat the total pattern. Optionally, one player could make up the patterns and attempt to cause the other to make a mistake in reproducing them. Another feature might add a time limit or speed trial to increase the difficulty to the game. Both time and speed options would greatly increase the difficulty of the game and provide new challenges to players who mastered the basic version of the game. Additionally, allowing the player to increase or decrease the number of buttons would also increase the complexity of the game and the experience of the player. New players could decide to use three buttons while advanced players might want five or more buttons. Changing the shape of the buttons and adding rules for shapes as well as color would increase the complexity of the game as well. For instance, if a red circle flashed, one would have to push the green triangle, not the green circle.

## Conclusion

Overall, FollowMe uses the Head-Toes-Knees-Shoulders theory and a game-based approach to help students develop self-regulation behaviors. Given the allure of games and the research on self-regulation, it is possible that FollowMe helps foster self-regulation in children. To further examine FollowMe, we plan on enhancing the program by requiring students to read, rather than hear the command. Based on the Stroop effect (Stroop, 1935), students will read a color command such as blue in a different font color. For example, if the command states “blue” in a red font color, the participant presses the color red rather than blue. The final phase of

the project is to study the impact of FollowMe. Possible research questions include: “How does FollowMe impact achievement?” “How does FollowMe impact friendships?” or “Which has a greater impact on self-regulation: Simon Says or the Stroop effect during game play?” After the second phase of the game is developed, these questions, along with others, can be explored.

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