

Searching Under Cups for Clues about Memory

Manual Demonstration Procedure:

Students should first be divided into groups of three and each person should be assigned one of three roles: “the experimenter”, “the mind”, or “the timer”.

The experimenter should be given three small cups (numbered 1-3), one small ball of aluminum foil, and a data sheet. The experimenter should then be instructed to set up each trial. To do this, he or she should be instructed to place (or not place) an aluminum foil ball under 1, 2, or 3 cups; the number of cups and whether the aluminum foil ball is located under a cup should vary from trial to trial. The experimenter should pseudo-randomly select an arrangement from the data sheet (see Appendix A of this document) and should continue doing so until all of the 36 arrangements are presented. The mind should be informed that he or she will be searching for an aluminum foil ball that may (or may not) appear under one of several small cups. On each trial, the mind should search the cups as quickly as possible and respond “yes” or “no” to indicate whether the ball was found. The timer should be informed that his or her task is to record reaction times on each trial.

If an error is made the trial should be re-run. Every student should be informed that the mind will search using one of three possible methods: parallel, serial exhaustive, or serial self-terminating. Descriptions of each method should be provided (Instructions for the students along with descriptions of these search methods can be found in Appendix B of this document). The experimenter and timer should be instructed to look away when the mind searches and the mind should be instructed to look away when the

experimenter arranges each trial. A large cardboard divider can be used to help shield people's views. To help prevent the experimenter and timer from determining the search method based upon the sound, the mind should be instructed not to hit or slap the cups on the table during their search.

After all 36 trials have been completed, the experimenter and timer should calculate the average reaction time for "yes" and "no" trials in each of the three cup conditions (1, 2, or 3). Based upon these six numbers, the experimenter and timer should try and determine the search method used by the mind. Graph paper with the abscissa and ordinate pre-labeled "number of cups" and "reaction time" respectively should be provided. All students (the experimenter, timer, and mind) should be asked to consider the different possible outcomes of this demonstration. (i.e., what would the data look like for each of the search methods?)

Appendix A

The middle column (“setup”) contains the number of cups to be presented, followed by Y or N. “Y” indicates that an aluminum foil ball should be placed under a cup; “N” indicates that no foil should be used on that trial. If a “Y” appears, a second number (for 2 or more cups) indicates which cup the ball should be placed underneath. For example, “3 Y 2” indicates that three cups should be used and the aluminum ball should be placed under cup #2. You should present all 36 trials in a random order.

Trial	Setup	Time (Do NOT round)	
1	1 Y	_____	Means (1 cup): yes _____ no _____
2	1 Y	_____	
3	1 N	_____	
4	1 Y	_____	
5	1 N	_____	
6	1 N	_____	
7	1 Y	_____	
8	1 N	_____	
9	1 Y	_____	
10	1 N	_____	
11	1 N	_____	
12	1 Y	_____	
<hr/>			
13	2 Y 1	_____	Means (2 cups): yes _____ no _____
14	2 Y 2	_____	
15	2 N	_____	
16	2 Y 1	_____	
17	2 N	_____	
18	2 N	_____	
19	2 Y 2	_____	
20	2 N	_____	
21	2 Y 2	_____	
22	2 N	_____	
23	2 Y 1	_____	
24	2 N	_____	
<hr/>			
25	3 N	_____	Means (3 cups): yes _____ no _____
26	3 Y 1	_____	
27	3 N	_____	
28	3 Y 3	_____	
29	3 N	_____	
30	3 Y 2	_____	
31	3 N	_____	
32	3 Y 2	_____	
33	3 Y 1	_____	
34	3 N	_____	
35	3 N	_____	
36	3 Y 3	_____	

Appendix B

MIND Instructions

You are “the mind” and your task is to search for a ball of aluminum foil that may or may not be hidden under a cup. To determine whether a ball is under the cup(s) you will need to search. There are three ways you could go about this, they are: (1) Serial, Self-Terminating, (2) Serial, Exhaustive, or (3) Parallel. You should read about each of the search methods now, but you will search using the **Parallel Search** method only!

A. Parallel Search (YOU WILL USE THIS METHOD)

As soon as the timer says “go” you must ALWAYS pick up ALL of the cups at the same time (whether there are 1, 2, or 3 cups in front of you – you can use both hands). As SOON as you pick up the cups, you should say either “yes” or “no” whether you see a piece of aluminum foil in front of you. Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

B. Serial, Self-Terminating Search

As soon as the timer says “go” you must ALWAYS start with cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). As SOON as you see the foil, you MUST stop searching, and say “yes”. For example, if there were 3 cups in front of you but the foil was under cup 1, as soon as you pick up cup 1, stop searching and say “yes”. If it is not present say “no” (i.e., you would have lifted all the cups if it was not present.) Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

C. Serial, Exhaustive Search

As soon as the timer says “go” you must ALWAYS start with cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). You MUST continue searching through all of the cups that are there, even if you have found the foil before you get to the end. For example, if you lift cup 1 and the foil is there, you must still lift cup 2 and then cup 3. When you have finished lifting the final cup, say “yes” if the foil was present or “no” if it was not. Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

In this demonstration, the experimenter will set up a search trial for you. Please do NOT watch as the experimenter places (or does not place) the foil under a cup – you should not know where it is. Close your eyes (and don’t cheat!). After this, the timer will ask you if you are ready, and you can open your eyes and say “ready”. You will search through the cups using the **Parallel Search (method A)**. The timer will measure how long it takes you to make a response, and will press stop on their stop-watch as soon as you say “yes” or “no”.

Note: do not hit or slap the cups on the table; if you do, the other members of your group may be able to determine how you are searching based upon the sound.

MIND instructions

You are “the mind” and your task is to search for a ball of aluminum foil that may or may not be hidden under a cup. To determine whether a ball is under the cup(s) you will need to search. There are three ways you could go about this, they are: (1) Serial, Self-Terminating, (2) Serial, Exhaustive, or (3) Parallel. You should read about each of the search methods now, but you will search using the **Serial, Self-Terminating Search** method only!

A. Parallel Search

As soon as the timer says “go” you must ALWAYS pick up ALL of the cups at the same time (whether there are 1, 2, or 3 cups in front of you – you can use both hands). As SOON as you pick up the cups, you should say either “yes” or “no” whether you see a piece of aluminum foil in front of you. Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

B. Serial, Self-Terminating Search (YOU WILL USE THIS METHOD)

As soon as the timer says “go” you must ALWAYS start with cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). As SOON as you see the foil, you MUST stop searching, and say “yes”. For example, if there were 3 cups in front of you but the foil was under cup 1, as soon as you pick up cup 1, stop searching and say “yes”. If it is not present say “no” (i.e., you would have lifted all the cups if it was not present.) Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

C. Serial, Exhaustive Search

As soon as the timer says “go” you must ALWAYS start with cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). You MUST continue searching through all of the cups that are there, even if you have found the foil before you get to the end. For example, if you lift cup 1 and the foil is there, you must still lift cup 2 and then cup 3. When you have finished lifting the final cup, say “yes” if the foil was present or “no” if it was not. Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

In this demonstration, the experimenter will set up a search trial for you. Please do NOT watch as the experimenter places (or does not place) the foil under a cup – you should not know where it is. Close your eyes (and don’t cheat!). After this, the timer will ask you if you are ready, and you can open your eyes and say “ready”. You will search through the cups using the **Serial, Self-Terminating method (method B)**. The timer will measure how long it takes you to make a response, and will press stop on their stop-watch as soon as you say “yes” or “no”.

Note: do not hit or slap the cups on the table; if you do, the other members of your group may be able to determine how you are searching based upon the sound.

MIND instructions

You are “the mind” and your task is to search for a ball of aluminum foil that may or may not be hidden under a cup. To determine whether a ball is under the cup(s) you will need to search. There are three ways you could go about this, they are: (1) Serial, Self-Terminating, (2) Serial, Exhaustive, or (3) Parallel. You should read about each of the search methods now, but you will search using the **Serial, Exhaustive Search** method only!

A. Parallel Search

As soon as the timer says “go” you must ALWAYS pick up ALL of the cups at the same time (whether there are 1, 2, or 3 cups in front of you – you can use both hands). As SOON as you pick up the cups, you should say either “yes” or “no” whether you see a piece of aluminum foil in front of you. Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

B. Serial, Self-Terminating Search

As soon as the timer says “go” you must ALWAYS start with cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). As SOON as you see the foil, you MUST stop searching, and say “yes”. For example, if there were 3 cups in front of you but the foil was under cup 1, as soon as you pick up cup 1, stop searching and say “yes”. If it is not present say “no” (i.e., you would have lifted all the cups if it was not present.) Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

C. Serial, Exhaustive Search (YOU WILL USE THIS METHOD)

As soon as the timer says “go” you must ALWAYS start with cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). You MUST continue searching through all of the cups that are there, even if you have found the foil before you get to the end. For example, if you lift cup 1 and the foil is there, you must still lift cup 2 and then cup 3. When you have finished lifting the final cup, say “yes” if the foil was present or “no” if it was not. Do this as fast as you can. If you do not do the search correctly, please tell the experimenter that you need to redo the trial.

In this demonstration, the experimenter will set up a search trial for you. Please do NOT watch as the experimenter places (or does not place) the foil under a cup – you should not know where it is. Close your eyes (and don’t cheat!). After this, the timer will ask you if you are ready, and you can open your eyes and say “ready”. You will search through the cups using the **Serial, Exhaustive Search (method C)**. The timer will measure how long it takes you to make a response, and will press stop on their stop-watch as soon as you say “yes” or “no”.

Note: do not hit or slap the cups on the table; if you do, the other members of your group may be able to determine how you are searching based upon the sound.

TIMER instructions

You are “the timer” and your task is to time how long it takes “the mind” to search for a ball of aluminum foil that may or may not be hidden under a cup. There are three ways “the mind” could go about searching for the ball, they are: (1) Serial, Self-Terminating, (2) Serial, Exhaustive, or (3) Parallel. You should read about these search methods now.

A. Parallel Search

As soon as you (i.e., the timer) say “go” the mind will pick up **ALL** of the cups at the same time (whether there are 1, 2, or 3 cups in front of them). If the mind does not do the search correctly she or he will tell the experimenter to redo the trial.

B. Serial, Self-Terminating Search

As soon as you (i.e., the timer) say “go” the mind will start searching under cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). As **SOON** as the mind finds the foil, he or she **MUST** stop searching, and say “yes”. For example, if there were 3 cups and the foil was under cup 1, as soon as the mind picked up cup 1, she or he will stop searching and say “yes”. If it is not present he or she will say “no” (i.e., the mind will lift all of the cups if it was not present.) If the mind does not do the search correctly she or he will tell the experimenter to redo the trial.

C. Serial, Exhaustive Search

As soon as you (i.e., the timer) say “go” the mind will start searching under cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). The mind will continue searching through ALL of the cups, even if she or he has found the foil before he or she gets to the end. For example, if the mind lifted cup 1 and found the foil, she or he will continue to lift cup 2 and then cup 3. When he or she has finished lifting the final cup, she or he will say “yes” or “no”. If the mind does not do the search correctly he or she will tell the experimenter to redo the trial.

In this demonstration, the experimenter will set up a search trial. When the trial is ready, ask the mind if she or he is ready to search. When ready, say “go” and start the stopwatch. When the mind has finished searching (i.e., says “yes” or “no”), stop the stopwatch and write down the reaction time. **DO NOT WATCH THE MIND SEARCH THE CUPS!!! You will need to determine how the mind was searching based on the reaction time data.**

EXPERIMENTER instructions

You are “the experimenter” and your task is to set up the experiment on every trial. You will do this by placing (or not placing) a ball under 1, 2, or 3 cups (see the list of trials). The mind will then search for the ball of aluminum foil that may or may not be hidden under a cup. There are three ways “the mind” could go about searching for the ball, they are: (1) Serial, Self-Terminating, (2) Serial, Exhaustive, or (3) Parallel. You should read about these search methods now.

A. Parallel Search

As soon as the timer says “go” the mind will pick up ALL of the cups at the same time (whether there are 1, 2, or 3 cups in front of them). If the mind does not do the search correctly he or she will tell you (i.e., the experimenter) to redo the trial.

B. Serial, Self-Terminating Search

As soon as the timer says “go” the mind will start searching under cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). As SOON as the mind finds the foil, she or he MUST stop searching, and say “yes”. For example, if there were 3 cups and the foil was under cup 1, as soon as the mind picked up cup 1, he or she will stop searching and say “yes”. If it is not present she or he will say “no” (i.e., the mind will lift all of the cups if it was not present.) If the mind does not do the search correctly he or she will tell you (i.e., the experimenter) to redo the trial.

C. Serial, Exhaustive Search

As soon as the timer say “go” the mind will start searching under cup 1 and then look under cup 2 (if there are 2 or 3 cups) and then cup 3 (if there are 3 cups). The mind will continue searching through ALL of the cups, even if she or he has found the foil before he or she gets to the end. For example, if the mind lifted cup 1 and found the foil, she or he will continue to lift cup 2 and then cup 3. When he or she has finished lifting the final cup, she or he will say “yes” or “no”. If the mind does not do the search correctly he or she will tell you (i.e., the experimenter) to redo the trial.

In this demonstration, you will set up a search trial. When the trial is ready, the timer will ask the mind if she or he is ready to search. When ready, the timer will say “go” and start the stopwatch. When the mind has finished searching, the timer will stop the stopwatch and write down the reaction time. **DO NOT WATCH THE MIND SEARCH THE CUPS!!! You will need to determine how the mind was searching based on the reaction time data.**