Undergraduate Psychology Research Methods Journal

Volume 1 | Issue 18 Article 2

5-2016

Meditation and Chocolate: Comparing their Effects on Cognitive Abilities

Ryan Dyck
Lindenwood University

Meditation and Chocolate: Discovering their Effects on Cognitive Abilities

Ryan Dyck[1]

Numerous studies have been conducted on the effects of meditation on long-term meditators. This current study aims to test the immediate effects of meditation on cognition. It is hypothesized that meditation will have a significant effect on cognition in comparison to the control of chocolate. In order to test this hypothesis participants were subject to two conditions: a meditation condition and a chocolate condition. After each condition participants were given a cognition test designed to test their reading comprehension and math skills. Using a related samples *t*-test I conclude that meditation does not have a significant effect on cognition using the given parameters. After the study was completed I noticed that there may have been a carryover effect from the meditation condition. To test this post hoc hypothesis two independent samples *t*-test were run. The first test used the test scores after the chocolate condition and compared individuals who underwent the chocolate condition first with individuals who participated in the meditation condition first. The second test used the same two groups and compared their test scores after the meditation condition. Both tests concluded that there was no significance in the order in which one received the conditions; however, the greatest difference was found when comparing the two groups test scores after the chocolate condition. Thus the overall findings of this study imply that further research needs to be done to determine if an isolated meditative practice can have a significant effect on cognition.

In the modern era of the Western world there is a great interest in how humans can improve their cognitive functioning. The present study aims to determine whether or not

[1] Ryan Dyck, Psychology Department, Lindenwood University. Correspondence regarding this paper should be addressed to Ryan Dyck at Lindenwood University Psychology Department, Lindenwood University, 209 South Kingshighway, St. Charles, MO, 63301, or email at rmd632@lionmail.lindenwood.edu

meditation has a significant immediate effect on cognition. Cognition will be measured by testing one's reading comprehension and mental math skills.

According to Gailliot et al. (2007), glucose plays an important role in self-regulation. Two possible key factors of self-regulation are controlling one's thoughts and directing one's attention. These may also play a significant role in one's test taking abilities. Other research by Gold (1995) has found that when glucose is increased moderately it can enhance one's cognitive functions. For these reasons chocolate will be used as a control to provide a moderate spike in glucose levels which may increase one's test taking ability.

Meditation has been a widely used practice among Asian cultures for centuries, and is recently becoming more common in the Western world. It is now used by a wide variety of people ranging from truck drivers to professional athletes (Murphy, Donavan, & Taylor, 1997). It has been found that diligent, long-term meditation can increase one's selective attention (Lutz, Slagter, Dunne, & Davidson, 2008). Selective attention is the process by which an individual focuses on a given stimulus when there are several others present. This is particularly important as there are often distractions when one is taking a test, such as noises and the anxiety of answering other questions. One's ability to tune out these distractions provides them with a distinct advantage over someone who cannot.

Another powerful benefit of diligent long-term meditation as stated by Lutz, Greschar, Rawlings, Richard, and Davidson (2004), is the self-induced increase in high-amplitude gamma-band activity during meditation. Their research also concluded that long-term meditators have significantly higher baseline gamma-band activity than non-meditators. The increase in gamma-band activity is especially interesting because higher gamma-band levels are associated with attention and memory (Herrmann, Munk, & Engel, 2004).

Although there has not been extensive research on the cognitive effects of short-term meditation two studies are of particular interest. The first study conducted by Schwartz, Davidson, and Goleman (1978) found that in comparison to exercise, meditation significantly decreased cognitive anxiety. With respect to this study, the reduction of cognitive anxiety is important as the ability to reduce cognitive anxiety during a test could substantially improve one's test scores. Furthermore, Tang et al. (2007) found that short term meditators, those who have practiced meditation for a five day period, had significantly better attention and control of stress. Those who have these heightened abilities, due to meditation, may have increased cognitive functioning over individuals do not have them.

The present study, as far as I am aware, is the first to test the immediate effects of meditation on cognition. This is important because immediately improving one's cognition is

extremely valuable for individuals in both the scholastic and commercial setting. It is my belief that meditation will have a significantly greater effect on one's cognitive abilities than chocolate.

To test this hypothesis I will use within-subjects design where in one condition participants will undergo a guided meditation exercise, and in the other they are given chocolate. After each condition, participants were given a cognition test which assessed cognition through the evaluation of reading comprehension and basic math skills. The test scores of each condition were compared to determine if there was a statistically significant difference between the meditation and chocolate conditions.

Method

Participants

There were 18 participants in this study all between the ages of 18-64. Sex of the participants was not asked as it was not pertinent to study. Participants were recruited using two different methods: first, 10 participants were recruited through the Lindenwood Participant Pool (LPP). The LPP is a place where students at Lindenwood, in introductory level behavioral science classes (psychology, sociology, exercise science, athletic training, and anthropology), can sign up to participate in studies and receive credit in the class in which they signed up through. To recruit from the LPP researchers must post an experiment on Sona Systems; from there members of the LPP can sign up for the study. For this particular study LPP participants

received two points of extra credit in their respective course. Second, there were 8 participants recruited through the posting of fliers on bulletin boards around Lindenwood University's campus. Participants recruited through this process received no compensation for their efforts.

Materials

The present study took place in the basement of Young Hall at Lindenwood University. The room was adequately furnished, and resembled a typical small study room on many University campuses. Participants of this study were subject to two conditions, alternating in order for every other participant. One condition was known as the meditation condition. In this condition participants underwent a guided meditation exercise lasting approximately 12 min (TheHonestGuys, 2014). In order to maximize the effectiveness of the meditative experience, the lights in the room were turned off and participants were asked to lie down on a yoga mat and listened to the guided meditation through a set of headphones I provided. The second condition was known as the chocolate condition. In this condition participants ate a snack size piece (20 g) of plain milk chocolate.

After each condition, participants were asked to complete a cognition test. There were two copies of the cognition test which were alternated every two participants to counterbalance any potential differences as one test was slightly (175 words) longer than the other. Each cognition test was comprised of a reading comprehension portion and a basic math portion. The

reading comprehension portion (see Appendix A) is a modified version of the Scholastic Aptitude Test (SAT's) reading comprehension practice test which was accessed through the SAT's website (Scholastic Aptitude Test, 2016) over the course of several weeks (new versions of the test are posted periodically). In order to shorten the length of the test, four questions of equal difficulty (SAT posts difficulty rating of each question) were taken from the two different reading passages. This test was chosen to assess participants' reading comprehension ability because the SAT is a standardized test used for College and University applicants around the United States; therefore, its validity has already been established.

Each math portion of the test (see Appendix B) is comprised of three types of basic math problems: multiplication, division, and fraction reduction. The problems were acquired from Mad Minute worksheets accessed through Mad Minute (n.d.) and Plymouth (n.d.). These worksheets were chosen so that both sections of the test had questions of equal difficulty, and because of the relatively basic math skills required to answer them. The reason for this was so that all participants would be able to answer all questions, and so that those with upper level math classes would not be at an extreme advantage over those with little to no University level math training.

Procedure

Prior to the arrival of participants, the room being used was set up so that the yoga mat, headphones, and iPod, to which the guided meditation would be played from, were at the far end of the room out of the way of the testing area. Upon arrival, participants were given a questionnaire that dealt with whether or not they were allergic to chocolate and/or nuts, and whether or not the participant had practiced meditation previously. If the participant was allergic to chocolate he or she was asked not to participate in the study for safety reasons. If the participant had a nut allergy that conflicted with the traces found in the piece of chocolate, he or she was also asked not to participate for safety reasons. Students in the LPP still received credit for their time even if they did not participate due to their allergy(s).

Upon completion of the questionnaire, participants were asked to participate in either the meditation condition or the chocolate condition. The meditation condition required participants to partake in a guided meditation exercise lasting approximately 12 min. In this exercise participants were asked to lie down on a yoga mat, listen to the exercise, and follows its instructions. The chocolate condition consisted of participants eating a snack sized portion of plain milk chocolate. To counter balance the effects of these conditions every other participant received meditation first. After undergoing the first condition (chocolate or meditation)

participants were administered one sample of the cognition test. There were two samples of the cognition test which were given alternatively to each participant.

Both cognition tests consisted of a reading comprehension portion and a math portion. The reading portion required subjects to read a short passage (between 475-650 words) and answer four multiple choice questions on the passage. The math portion consisted of simple multiplication, division, and fraction reduction problems. Participants were given 2 min per section to answer as many questions as possible with a maximum score of 30 points. After the test was completed, participants were then subjected to the other condition. For example, if the participant was in the chocolate condition first he or she was then to go through the meditation condition and vice versa. After undergoing the second condition participants were then administered the other cognition test (similar in length and composition to the first one).

After the second test was completed, LPP participants were given a participation slip to receive their extra credit and a feedback letter. Non-LPP participants were just given a feedback letter. Prior to leaving all participants were asked if they had any questions about the study, and I answered these questions to the best of my ability. Data from the experiment were then entered into SPSS (a standard data analyzing software program) using non-identifiable subject coding, and a paired samples *t*-test was conducted to determine if there was a significant difference between the chocolate condition and the meditation condition.

Results

I hypothesized that meditation would have a significant effect on one's cognitive abilities. In order to test this, a paired samples *t*-test was conducted and found that there was no significant difference in the test scores after the meditation condition (M = 61.84, SD = 20.00) compared to the chocolate condition (M = 62.64, SD = 21.55), t (17) = .22, p = .4135, thus supporting the null hypothesis.

After the experiment concluded, a post hoc hypothesis arouse stating that the effects of meditation had carried over into the chocolate condition. More specifically, the cognition scores after the chocolate condition would be higher in individuals who had received the chocolate condition second because of the residual effects of the meditation they experienced in their first trial. In order to determine if my data supported this hypothesis, two independent samples *t*-tests were conducted. The first independent samples *t*-test was conducted to see if those who took meditation first (M = 70.64, SD = 24.30) had significantly higher scores after the chocolate condition than those who had the chocolate condition (M = 54.64, SD = 15.86) first. The test concluded that there was no significant difference between the two groups t (16) = -1.653, p = .059.

Finally, a second independent samples *t*-test was conducted to see if participants who received meditation first (M = 62.11, SD = 23.54) had higher scores after meditation than those

who received chocolate first (M = 61.58, SD = 17.19). The analysis concluded that the order in which participants received the condition had no effect on their scores after meditation t (16) = -.054, p = .479

Discussion

This study did not support the hypothesis that meditation has a significant effect on cognition. Moreover, the post hoc analysis concluded that meditation did not have a significant carryover effect.

These results are not in accordance with previous literature. There are several reasons why the results of my study did not tie in with the literature reviewed. First off, all of the studies looked at meditation on a more long term basis, and none of them only looked at one instance of meditation. This is not to say that one instance of meditation cannot have a significant effect on an individual. Evidence for this rests in the second *t*-test that was conducted. Although this test did not find statistical significance for the effects of order on test scores after chocolate, it was within .9% of being statistically significant. Moreover, this test showed a much greater discrepancy between the means than any of the other test conducted. Before stating any possible implications it should be noted that these results could be due to a practice effect as participants had little rest between tests when they received the meditation condition first. However, despite this and the lack of statistical significance there are several possible implications of this test:

first, the cognitive effects of meditation may take longer than a couple of minutes to take full effect. Second, meditation in combination with chocolate may provide a greater increase in cognition over either one of these conditions alone.

The second reason why the results of this study did not line up with previous studies could be due to the type of meditation used. For instance, in another short term meditation study by Tang et al. (2007) meditators took part in integrative body-mind training (IBM), a modern branch of meditation that, as the title states, unifies the body and the mind. Other studies such as the one by Lutz et al. (2004) used meditators who practiced focused attention meditation (FA). This type of meditation requires a lot more focus and is generally regarded as more difficult than pure relaxation meditation. These different meditative techniques could have vastly different impacts on cognitive functioning.

Due to the limited amount of time participants had to complete the study there are several limitations. First in an ideal world participants would partake in one condition on one day, and the other condition on another day to ensure the effects of one condition did not influence the results of the other. Moreover, as previously alluded to, the effects of the conditions may take more than a couple of minutes to really effect the participant's cognitive abilities. To account for this it would have been better to wait a longer period, say 30 min, prior to testing the participant's cognitive abilities. Second, only a deep relaxation form of meditation was used.

Although this type of meditation is very effective for reducing stress, it may not be as effective at increasing cognitive functioning as other types of meditation, such as focused attention and IBMT. Future research may want to experiment with the different effects of varying meditative practices on cognition.

Another limitation of the study maybe the accuracy of the measures being used. Due to the nature of the recruitment process participants of varying levels of intelligence, and English abilities took part in this study. To combat this I used a within-subjects design; however, what I did not anticipate is that some participants would have perfect scores after both conditions. The intelligence level of these individuals was well beyond the realm of the experiment; therefore, I was not able to tell whether or not meditation had a significant effect on their cognitive functioning. On the other side of the scale, there were some individuals whose English skills prevented them from answering any reading questions correctly. This meant that only their math skills could be used to show a measurable difference. Comparatively, their language and overall cognition may have also improved, but due to their lack of English skills, it could not be statistically demonstrated. It is recommended that future studies use a more in-depth cognitive test to allow for measurement on a greater range of intelligences and language abilities.

Finally, it should also be noted that this study was designed to only test the effects of a single meditative experience. None of the participants practiced meditation on a regular basis.

The effects of meditation on cognition could be different for long-term, or at least consistent meditators.

This research is important to the field of psychology because it explored the effects of a single meditative experience on cognition. Despite the fact that it did not yield any statistically significant results it did allude to potential effects with respect to the combination of meditation and chocolate, and to possibility that there may be a delay for the true effects of meditation to be experienced. Finally, it provided useful information for future research on single meditative experiences.

References

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., ... & Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology, 92*(2), 325. doi: 10.1037/0022-3514.92.2.325

Gold, P. E. (1995). Role of glucose in regulating the brain and cognition. *The American Journal of Clinical Nutrition, 61*(4), 987S-995S. Retrieved from http://ajcn.nutrition.org/

Herrmann, C. S., Munk, M. H., & Engel, A. K. (2004). Cognitive functions of gamma-band activity: Memory match and utilization. *Trends in Cognitive Sciences, 8*(8), 347-355. doi: 10.1016/jitics.2004.06.006

Lutz, A., Greischar, L. L., Rawlings, N. B., Ricard, M., & Davidson, R. J. (2004). Long-term meditator's self-induce high-amplitude gamma synchrony during mental practice. *Proceedings of the National Academy of Sciences of the United States of America, 101*(46), 16369-16373. doi: 10.1073/pnas.0407461101

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences, 12*(4), 163-169. doi: 10.1016/jitics.2008.01.005

Mad Minute Multiplication Facts F35 (n.d.). Retrieved February 05, 2016 from http://www.moveitmaththesource.com/numberfacts/madminute/madminutemultipl.html

Murphy, M., Donovan, S., & Taylor, E. (1997). *The physical and psychological effects of meditation: A review of contemporary research with a comprehensive bibliography 1931–1996* (2nd ed.). Sausalito, CA: Institute of Noetic Sciences.

Plymouth. (n.d.). Retrieved February 05, 2016, from http://www.plymouth.k12.wi.us/OldSite/Staff%20Home%20Pages/Riverview/math/madminutes.htm

Scholastic Aptitude Test (2016). *SAT Daily Practice Test* [Measuring instrument]. Retrieved from sat.collegeboard.org/practice/practice-test-section

Schwartz, G. E., Davidson, R. J., & Goleman, D. J. (1978). Patterning of cognitive and somatic processes in the self-regulation of anxiety: Effects of meditation versus exercise. *Psychosomatic Medicine, 40*(4), 321-328. doi: 10.1097/00006842-197806000-00004

Tang, Y. Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., ... & Posner, M. I. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National Academy of Sciences, 104*(43), 17152-17156. doi: 10.1073/pnas.0707678104

TheHonestGuys (2014, January, 5). *Guided meditation-Deep relaxation* [Video file]. Retrieved from (https://www.youtube.com/watch?v=X7iBnp8T6nY).

Appendix A

Reading Comprehension Test A

"Lucy Honeychurch has no faults," said Cecil,
with grave sincerity.
"I quite agree. At present she has none."
"At present?"
"I'm not cynical. I'm only thinking of my pet theory
about Miss Honeychurch. Does it seem reasonable that
she should play piano so wonderfully, and live so quietly?
I suspect that someday she shall be wonderful in both.
The water-tight compartments in her will break down,
and music and life will mingle. Then we shall have her
heroically good, heroically bad—too heroic, perhaps,
to be good or bad."
Cecil found his companion interesting.
"And at present you think her not wonderful as far
as life goes?"
"Well, I must say I've only seen her at Tunbridge
Wells, where she was not wonderful, and at Florence.
She wasn't wonderful in Florence either, but I kept
on expecting that she would be."
"In what way?"
Conversation had become agreeable to them, and
they were pacing up and down the terrace.
"I could as easily tell you what tune she'll play next.
There was simply the sense that she found wings and
meant to use them. I can show you a beautiful picture
in my diary. Miss Honeychurch as a kite, Miss Bartlett

holding the string. Picture number two: the string breaks."
The sketch was in his diary, but it had been made afterwards,
when he viewed things artistically. At the time he
had given surreptitious tugs to the string himself.
"But the string never broke?"
"No. I mightn't have seen Miss Honeychurch rise,
but I should certainly have heard Miss Bartlett fall."
"It has broken now," said the young man in low,
vibrating tones.
Immediately he realized that of all the conceited,
ludicrous, contemptible ways of announcing an engagement
this was the worst. He cursed his love of metaphor;
had he suggested that he was a star and that Lucy was
soaring up to reach him?
"Broken? What do you mean?"
"I meant," Cecil said stiffly, "that she is going
to marry me."
The clergyman was conscious of some bitter
disappointment which he could not keep out of his
voice.
"I am sorry; I must apologize. I had no idea you
were intimate with her, or I should never have talked
in this flippant, superficial way. You ought to have
stopped me." And down in the garden he saw Lucy
herself; yes, he was disappointed.
Cecil, who naturally preferred congratulations
to apologies, drew down the corner of his mouth. Was
this the reaction his action would get from the whole
world? Of course, he despised the world as a whole;
every thoughtful man should; it is almost a test of
refinement.

"I'm sorry I have given you a shock," he said
dryly. "I fear that Lucy's choice does not meet with
60 your approval."

1a) Cecil's remark in line 1 ("Lucy . . . faults") is made in a tone of

(A) great conviction
(B) studied neutrality
(C) playful irony
(D) genuine surprise
(E) weary cynicism

2a) Mr. Beebe asks the question in lines 6-7 ("Does . . .quietly") primarily in order to

(A) raise an urgent concern
(B) anticipate a possible objection
(C) challenge a widely accepted theory
(D) note an apparent inconsistency
(E) criticize a popular pastime

3a) Mr. Beebe's statement, "The water-tight . . . bad" (lines 9-11), suggests that Lucy will

(A) ultimately become a famous and respected musician
(B) eventually play music in a less disciplined fashion
(C) one day begin to live with great passion
(D) soon regret an impetuous decision
(E) someday marry a man who will be the cause of her undoing

4a) For Mr. Beebe, “Picture number two” (line 27)represents

(A) a misleading occurrence

(B) a dangerous gamble

(C) an unlikely development

(D) an anticipated outcome

(E) an avoidable difficulty

Reading Comprehension Test B

Calling it a cover-up would be far too dramatic. But for more than half a century—even in the midst of some of the greatest scientific achievements in history—physicists have been quietly aware of a dark cloud looming on a distant horizon. The problem is this: There are two foundational pillars upon which modern physics rests. One is general relativity, which provides a theoretical framework for understanding the universe on the largest of scales: stars, galaxies, clusters of galaxies, and beyond to the immense expanse of the universe itself. The other is quantum mechanics, which provides a theoretical framework for understanding the universe on the smallest of scales: molecules, atoms, and all the way down to subatomic particles like electrons and quarks. Through years of research, physicists have experimentally confirmed to almost unimaginable accuracy virtually all predictions made by each of these theories. But these same theoretical tools inexorably lead to another disturbing conclusion: As they are currently formulated, general relativity and quantum mechanics cannot both be right. The two theories underlying the tremendous progress of physics during the last hundred years—progress that has explained the expansion of the heavens and the fundamental structure of matter—are mutually incompatible.

If you have not heard previously about this ferocious antagonism, you may be wondering why. The answer is not hard to come by. In all but the most extreme situations, physicists study things that are either small and light (like atoms and their constituents) or things that are huge and

heavy (like stars and galaxies), but not both. This means that they need use only quantum mechanics or only general relativity and can, with a furtive glance, shrug off the barking admonition of the other. For 50 years this approach has not been quite as blissful as ignorance, but it has been pretty close.

But the universe can be extreme. In the central depths of a black hole, an enormous mass is crushed to a minuscule size. According to the big bang theory, the whole of the universe erupted from a microscopic nugget whose size makes a grain of sand look colossal. These are realms that are tiny and yet incredibly massive, therefore requiring that both quantum mechanics and general relativity simultaneously be brought to bear. The equations of general relativity and quantum mechanics, when combined, begin to shake, rattle, and gush with steam like a decrepit automobile. Put less figuratively, well-posed physical questions elicit nonsensical answers from the unhappy amalgam of these two theories. Even if you are willing to keep the deep interior of a black hole and the beginning of the universe shrouded in mystery, you can't help feeling that The hostility between quantum mechanics and general relativity cries out for a deeper level of understanding. Can it really be that the universe at its most fundamental level is divided, requiring one set of laws when things are large and a different, incompatible set when things are small?

Superstring theory, a young upstart compared with the venerable edifices of quantum mechanics and general relativity, answers with a resounding no. Intense research over the past decade by physicists and mathematicians

around the world has revealed that this new approach to describing matter at its most fundamental level resolves the tension between general relativity and quantum mechanics. In fact, superstring theory shows more: within this new framework, general relativity and quantum mechanics require one another for the theory to make sense. According to superstring theory, the marriage of the laws of the large and the small is not only happy but inevitable. Superstring theory has the potential to show that all of the wondrous happenings in the universe—from the frantic dance of subatomic quarks to the stately waltz of orbiting binary stars—are reflections of one grand physical principle, one master equation.

1b) The "dark cloud" mentioned in line 4 refers to an

(A) atypical diagnosis
(B) unsupported hypothesis
(C) unknown threat
(D) evil influence
(E) important contradiction

2b) Which pairing best represents the different models of the universe presented in lines 7-14 ?

(A) Big and little
(B) Old and new
(C) Complex and simple
(D) Verified and undocumented
(E) Theoretical and practical

3b) The author uses the "automobile" (lines 45-46) to represent equations that

(A) demand a professional's attention

(B) are intrinsically unreliable

(C) do not work together effectively

(D) can be easily adjusted if necessary

(E) are based on dated mathematics

4b) The primary reason described for the usefulness of the theory mentioned in line 57 is its ability to

(A) explain new phenomena

(B) replace the theory of general relativity

(C) reinforce the predictions of quantum mechanics

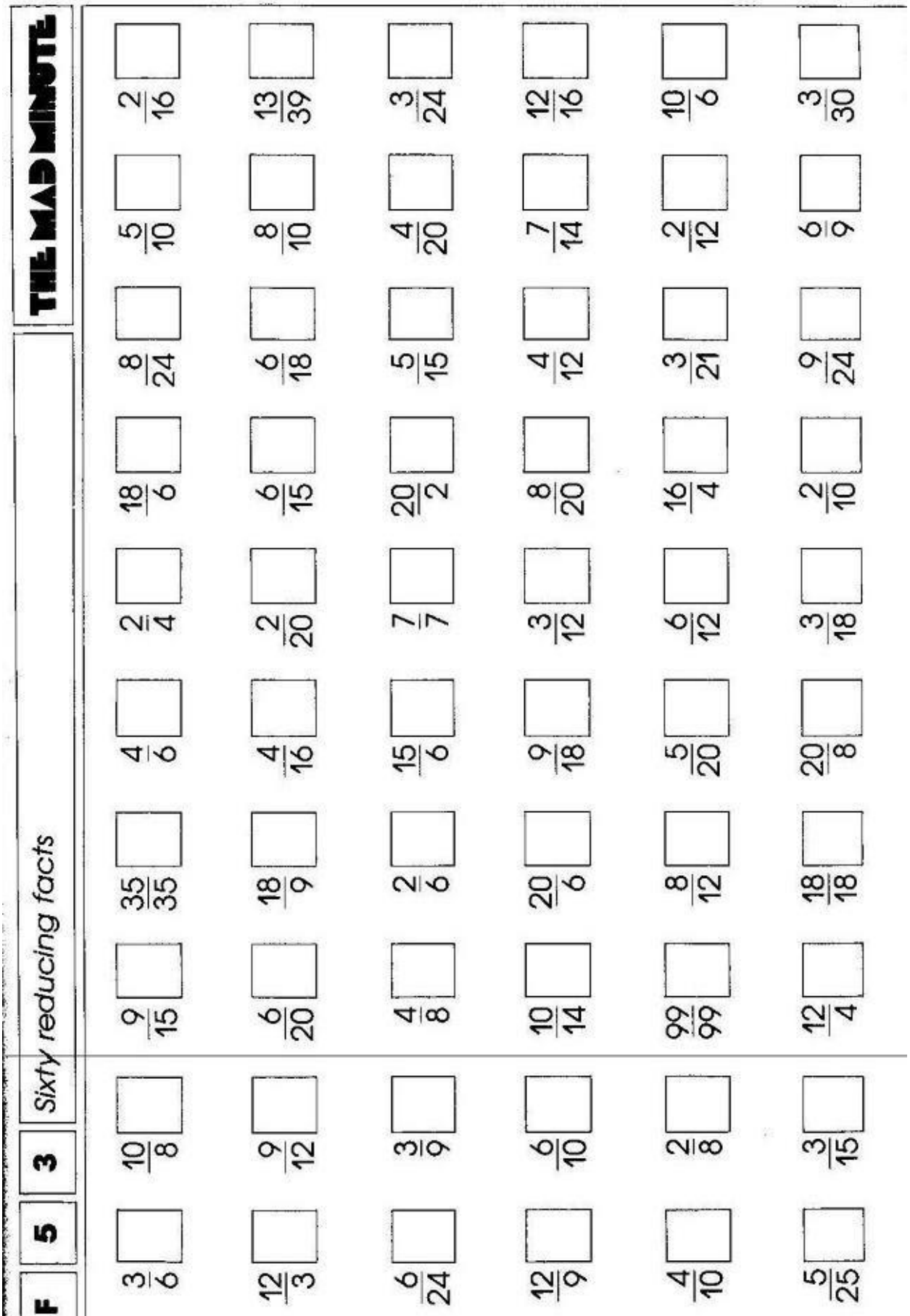
(D) indicate where other theories are inapplicable

(E) reconcile two seemingly contradictory theories

Appendix B

Math Portion of Exam

Sheets were cut in half so that 30 questions of equal difficulty went to test 1 and test 2 of the experiment respectively.


THE MAD MINUTE
F 5 3 Sixty reducing facts


5 ×5
8 ×8
9 ×5
9 ×6
3 ×8
5 ×0
4 ×8
9 ×4
2 ×7
3 ×6
8 ×1
4 ×9
5 ×9
9 ×7
7 ×8
2 ×5
5 ×7
8 ×6
4 ×5
3 ×0
0 ×8
5 ×3
7 ×6
2 ×8
7 ×1
7 ×3
4 ×4
7 ×5
6 ×8
3 ×9
6 ×3
6 ×9
4 ×6
7 ×9
8 ×9
6 ×7
7 ×4
5 ×6
9 ×2
3 ×4
6 ×2
5 ×8
8 ×3
4 ×3
8 ×7
8 ×4
3 ×7
2 ×9
1 ×9
5 ×4
8 ×5
9 ×8
9 ×9
6 ×5
9 ×3
6 ×4
6 ×6
1 ×6
7 ×7
4 ×7

F | 4 | 4 | *Sixty division facts* | **THE MAD MINUTE**

7)63	8)48	9)45	5)45	3)27	2)12	4)36	3)6	4)32	6)54
8)40	7)56	9)54	5)40	6)0	4)28	7)14	5)10	8)72	3)24
5)30	7)49	6)12	8)56	2)18	9)63	6)48	3)21	9)36	5)15
3)18	6)18	5)35	8)32	6)42	7)42	9)27	8)64	3)9	4)12
2)14	4)0	6)24	6)36	3)15	9)18	4)16	7)35	5)20	8)16
4)20	9)9	7)21	8)24	6)30	5)25	7)28	3)12	4)8	2)16