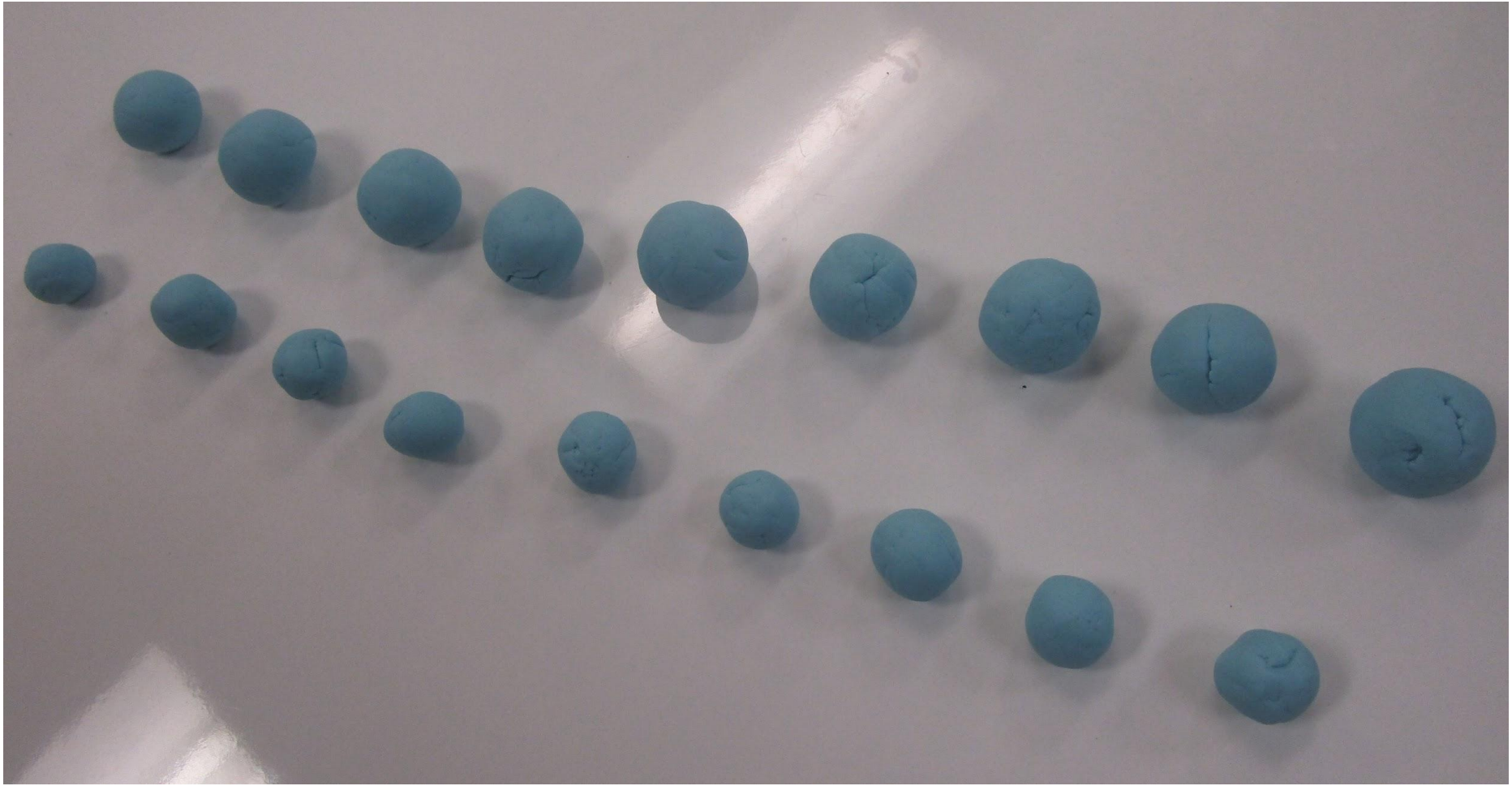
# Cognitive Development Research Results

By: Nate Piper and James Kerr

# The Test We Performed

Eighteen spheres of blue Play Doh were created. The spheres were grouped according to two diameters. Two groups of nine spheres were formed. All the members of a group shared the same diameter. The diameter of one group was larger than the second. The approximate diameter of the larger spheres was 2 cm. The approximate diameter of the smaller spheres was 1 cm. The groups of blue Play Doh spheres were placed in parallel lines at approximately equal intervals of 2 cm between each sphere. The spheres were ordered in each row so that the position of the larger and smaller spheres corresponded in vertical positioning with respect to the parallel lines. Both lines of Play Doh spheres were equidistant. (See image on the following slide)



Five subjects participated in the study ranging in age from 3 years to 8 years. The subjects were grouped by age for the purpose of the study. In one group, both subjects were 3 year old females. The second group included two males, approaching 7 years old. The final group included one 8 year old male.The subjects were individually invited to observe the experimental set up. Each member of the study was asked two questions, with a response to the first required before the second question would be asked,

Question #1: Does this row have more marbles, does this one have more marbles, or are they the same?

Question #2: If I smashed this row into one ball, and I smashed this row into one ball, would this one be bigger, would this one be bigger, or would they be the same?

The researcher pointed to the rows of blue marbles beginning with the row of spheres with the smaller diameter as a frame of reference.

# We would expect that….

Group One: (LD and AD), age 3, places the subjects in the stage that Piaget labeled as preoperational. Group Two: (BrG and BoG), age 6 (nearly 7), places the subjects in between the stages that Piaget labels as preoperational and concrete operational. Group Three: (GG), age 8 places the subject in the stage that Piaget labels as concrete operational.

- The researchers expected that the subjects in...
  - Group One (3yo) might have difficulty with the first question, since there were many spheres, and each row contained different sizes, and that they would have difficulty with the second question, because in this Piaget grouping, concrete logic has not yet developed.
  - Group Two, on the cusp of preoperational and concrete, might struggle with the hypothetical task (question two), but would succeed with question one.
  - Group Three would successfully answer both questions because in this Piaget grouping, subjects can use logical thought/operation concerning physical objects.

# Subject 1: (GG)

Subject 1 is 8 years old.

The subject had no difficulty in answering both questions with surety.  Nonverbal evidence suggested that the subject carefully counted the spheres before making a response,

The subject fits at the young end of the concrete operational group. Subjects in this group should be able to imagine the combination of the volumes in each row separately and compare the resulting synthesis without the need to physically manipulate the Play Doh. Students in this group should be able to visualize the combined volume of the smaller spheres will be less than the combined volume of the larger spheres.

# Subject 2: (BoG)

The subject is 6 years old.

The subject had no difficulty in answering both questions with surety.  Nonverbal evidence suggested that the subject carefully counted the spheres before making a response

The subject fits at the young end of the concrete operational group. Subjects in this group should be able to imagine the combination of the volumes in each row separately and compare the resulting synthesis without the need to physically manipulate the Play Doh. Students in this group should be able to visualize the the combined volume of the smaller spheres will be less than the combined volume of the larger spheres.

# Subject 3: (GrG)

Subject 3 is 6 years old,

The subject answered the first questions with surety, though he didn’t choose to count first. The subject did need the second question to be clarified.

The subject fits at the young end of the concrete operational group. Subjects in this group should be able to imagine the combination of the volumes in each row separately and compare theresulting synthesis without the need to physically manipulate the Play Doh. Students in this group should be able to visualize the the combined volume of the smaller spheres will be less than the combined volume of the larger spheres.


Development

# Subject 4: (LD)

Subject 4 is three years old.

Subject 4, (LD), correctly answered the first question. The answer to the second question was that the size would be the same.

Subjects that fall into the Piaget preoperational stage of development would be expected to understand concrete logic and would lack the ability to consider what the combined volume of the smaller and larger rows of Play Doh balls look like


and Child
Development

# Subject 5: (AD)

Subject 5 is 3 years old

Subject 5,  (AD), correctly answered the first question. The answer to the second question was that the size would be the same.

Subjects that fall into the Piaget preoperational stage of development would be expected to understand concrete logic and would lack the ability to consider what the combined volume of the smaller and larger rows of Play Doh balls look like


and Child
Development

# What are your overall patterns/findings?

The findings in this experiment were consistent with expectations based on Piaget's research and developmental groupings. Subjects (AD) and (LD) fall into the early chronological range of the preoperational developmental group. Subjects (GrD) and (BD) fall at the upper end of Piaget's preoperational development stage, but could be considered to functionally fall into the low end of Piaget's concrete operational developmental stage. Subject (GG) falls into Piaget's early concrete development stage. Subject (GG) shows clearer physical development than subjects (BoG) and (GrG) that fall into the same developmental stage. All of the male subjects falling into the concrete operational stage could imagine and compare the combined row volumes without the need of visual cues.

# Reflections

The study was well-organized. The parameters for the study were controlled. The variable of age was selected according to the available subjects. The space for the experiment was adequate and the responses of the subjects could be easily observed and recorded.

The space for the study was not isolated. The potential for distraction could influence the focus of the subjects on the study questions. One of the 2 year old subjects did not respond favorably to male adult researchers. Parental support was required to encourage participation for the 2 year old subjects.

We realized that the second research question might have been simpler to understand if we made it clear that we were squashing them together "*into a ball*," rather than simply "squashing them together." We made this clarification when a subject was confused by the question, and it seemed to help.

While not an intentional part of the study, the first (oldest) subject seemed most intent on getting the questions "right" - I wondered if this was a response to formal learning environments, or part of his natural developmental stage.

In concert with earlier observations, research with humans can be "messy" Observations in this study were consistent with the Piaget developmental classifications.