Replication of the Famous Marshmallow Experiment and Self-Regulation Play Activities

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Meet the Presenters

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Doctorate in Sociology
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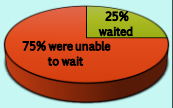
Executive Functions

Executive functions refer to a variety of skills: from the ability to weigh competing demands, the ability to resist the temptation to act before thinking, and the ability to be mentally flexible when new information is presented (Galinsky, 2010).

Delaying Gratification

Mischel and Ebbesen (1970)



Looking Away
Wiggling
Closing Eyes
Smelling
Licking

Delaying Gratification: Individual Differences

Maturity — Mischel & Metzner, 1962
- A child's ability to delay gratification does improve as the child matures
- But, this doesn't explain all of the variance.

Trust — Kidd, Palmeri & Aslin, 2013
- Children are more likely to delay gratification if they trust the researcher
- Those who have experienced the world as a reliable, trustworthy place

Stress — Mangione, 2013
- Those who experience *Toxic Stress* are less likely to delay gratification

- 75 per 1,000 two to five year olds have experienced maltreatment (The National Research Council, 2012).
- 98 per 1,000 two to five year olds have dealt with parental substance abuse (SAMHSA, 2002).
- 130 per 1,000 two to five year olds have witnessed maternal post-partum depression (O'Hara & Swain, 1996).

Delaying Gratification: Environment


Low student-to-teacher ratios


Safe physical environment


Qualified teachers


Language-rich environments


Nutritious meals

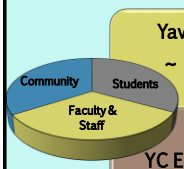
Children exposed to a reliable environment managed to wait four times longer (12 versus three minutes) than those exposed to an unreliable environment in a task similar to the original marshmallow experiment (Kidd, Palmeri & Aslin, 2013).

Del E. Webb Family Enrichment Center (FEC)

QUALITY FIRST
FIRST THINGS FIRST

ASSOCIATION FOR Early Learning Leaders
National Accreditation Commission FOR EARLY CARE AND EDUCATION PROGRAMS

Del E. Webb Family Enrichment Center



Yavapai College
~ 80 Children

Highest-Quality by Quality First AZ

FEC

YC Early Childhood Department

First Things First AZ to highlight exemplary early care & education

The Question

Does a high-quality preschool create a sense of trust in children to the point that those children are more likely to wait for the second marshmallow than children who have not had extensive high-quality schooling?

Participants

- Age
  - 2–5 years
  - 26–68 mo.
- Sex
  - 32 Female
  - 26 Male
- Schedule
  - 33 FT
  - 25 PT

Apparatus

- Child's Empty Classroom
- Small Table & Chair
- Video Camera
- 1 or 2 Large Marshmallows
- Cupcake Wrappers

Procedure

1. YC HSRB Approval & Site Authorization
2. Informed Consent
3. Time of Day for study determined
4. Classroom time with Researchers
5. Child's consent

Coding

Dependent Variable	· Time waited (in seconds) before consuming the marshmallow
Coping Strategies Coded	· 1 Primary Coder (Dr. Jacobson) · 3 Secondary Coders (cross-code 35% of the trials)
Grouped Strategies	· Franko, Powers, Zuroff & Moskowitz, 1985 · Active vs. Passive, Cognitive vs. Behavioral, Verbal vs. Nonverbal
Information Collected	· Frequency of behaviors · Amount of time (in seconds) spent on each strategy

Grouped Strategies

▪ Franko, Powers, Zuroff & Moskowitz, 1985

Active / Passive

Cognitive / Behavioral

Verbal / Nonverbal

Coping Behaviors Recorded	
Played with clothing **(A,B,N)**	Played with marshmallow in wrapper **(A,B,N)**
Played with jewelry **(A,B,N)**	Played with marshmallow on table **(A,B,N)**
Played with a body part **(A,B,N)**	Picked up marshmallow **(A,B,N)**
Put head on hands or table **(P,C,N)**	Smelled marshmallow **(A,B,N)**
Put hands up or pounded table in exasperation **(A,B,N)**	Licked marshmallow **(A,B,N)**
Began to fall asleep **(P,C,N)**	Picked bits off of marshmallow **(A,B,N)**
Stood up **(A,B,N)**	Ate tiny bits of marshmallow **(A,B,N)**
Walked around **(A,B,N)**	Hid the marshmallow **(A,B,N)**
Walked out of view of the camera **(A,B,N)**	Looked toward wall, window or door **(P,C,N)**
Left the table and got a book / toy **(A,B,N)**	Looked away from marshmallow **(P,C,N)**
Left the table and found something to do **(A,B,N)**	Talked to the camera **(A,B,V)**
Left the table and chose a new place to sit / lie **(P,B,N)**	Made faces to the camera **(A,B,N)**
Counted things in room / on walls **(A,C,V)**	Sang **(A,B,V)**
Stared at the marshmallow **(P,C,N)**	Glanced at marshmallow **(P,C,N)**
Touched the marshmallow **(A,C,V)**	Talked to self; not to camera **(A,B,V)**

How long did they wait?

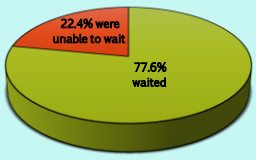
Of the 58 children at the FEC that participated, the average wait time was 461.40 seconds (about 7.5 minutes).

Over 3 times as many children waited (45) the entire time than those who did not (13).

The average wait time for those who failed to wait was 155.54 seconds (2.5 minutes) while the average of those who did wait was 549.76 seconds (the full 9 minutes).

How long did they wait?

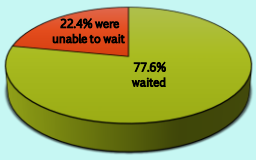
Mischel and Ebbesen (1970)

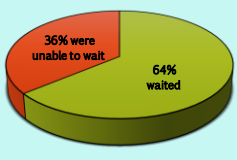


▪ The children at the FEC in 2014 showed a significantly higher percentage of children that waited than the children in the original studies in the 70's, $x^2(1)=53.29$, $p=0.00$.

How long did they wait?

Kidd, Palmeri & Aslin (2013)
Reliable Environment Condition





▪ There is no significant difference in the percentages between the FEC 2014 findings and the *Reliable Environment Condition* in the Kidd, Palmeri & Aslin (2013) study, $x^2(1)=53.29$, $p > 0.05$.

How long did they wait?

- Significant Positive Correlations
- Engaging in these behaviors was positively correlated with a longer wait time.

Touching the marshmallow

Smelling the marshmallow

Looking at the wall or celling

Looking at the camera

Talking to themselves

All significant correlations with p values less than 0.05 using the Spearman's Rho (ρ) Correlation analysis

Sex & Age Differences?

- There was no significant difference between females and males in regards to how long they waited, $t(56) = 1.33$, $p = 0.19$.
- In fact, no significant differences were found between the sexes for the duration or frequency of different types of coping.
- There was no significant difference in the amount of time waited and the age of the child, $F(2) = 0.78$, $p = 0.47$.

Age of the child

- Significant Positive Correlations
- The older the child the more likely they were to engage in these behaviors

Smelling the marshmallow

Singing

Verbal Coping Strategies

All significant correlations with p values less than 0.05 using the Spearman's Rho (ρ) Correlation analysis

Age of the child

- Significant Negative Correlations
- The older the child the less likely they were to engage in these behaviors

Pick off pieces of the marshmallow

Eat small pieces of the marshmallow

All significant correlations with p values less than 0.05 using the Kendall's tau (τ) Correlation analysis

Days at the FEC

- Significant Positive Correlations
- The more days a child has spent at the FEC increased the likelihood of these behaviors.

Seconds* with head of hands / table

Seconds playing with the mm in wrapper

Seconds talking to camera

Frequency of walking around

Frequency of smelling the mm

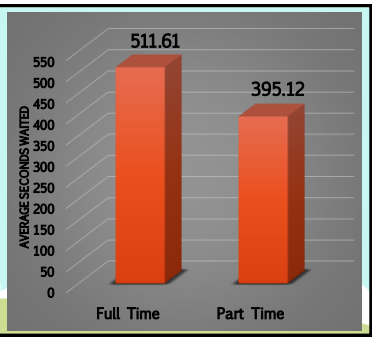
Frequency in cognitive coping

All significant correlations with p values less than 0.05 using the Pearson's r Correlation analysis

* *Frequency of putting their heads on their hands or table also significant*

Schedule Comparison

- The full-time children at the FEC waited significantly longer than the part-time children, $t(56) = 2.35$, $p = 0.03$.



The Question

Does a high-quality preschool create a sense of trust in children to the point that those children are more likely to wait for the second marshmallow than children who have not had extensive high-quality schooling?

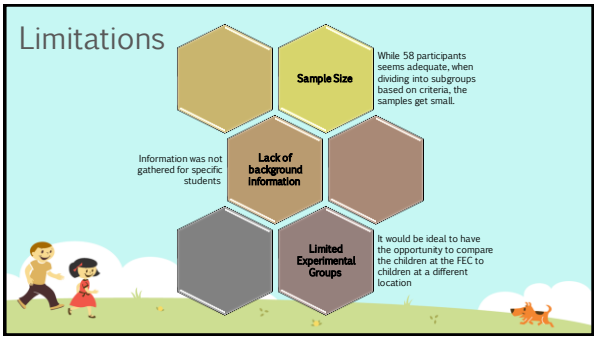
Full Time vs. Part Time

- The FT students (511.61 sec) waited significantly longer than the PT students (395.12 sec).

FEC vs. Kidd, Palmeri & Aslin (2013)

- There is no significant difference in the percentages between the FEC 2014 findings and the Reliable Environment Condition in the Kidd, Palmeri & Aslin (2013) study, $x^2(1)=53.29$, $p > 0.05$.

Limitations



Importance

A stable environment, like that in a high-quality preschool, possibly creates a sense of trust in children to the point that those full-time children were more likely to wait for the second marshmallow than part-time children.

Replication of the Famous Marshmallow Experiment and Self-Regulation Play Activities

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Background

Executive functions **refer to a variety of skills: from the ability to weigh competing demands, the ability to resist the temptation to act before thinking, and the ability to be mentally flexible when new information is presented (Galinsky, 2010).**

One important aspect of well-developed executive functions is the ability to delay gratification. In the famous marshmallow experiment, Mischel and Ebbesen (1970) asked a preschool-aged child to sit at a table with a marshmallow on a plate. The researcher then gave the child a choice: the preschooler could eat one marshmallow now, or if she was willing to wait for an undisclosed amount of time, the researcher would return with a second marshmallow and then the child could eat both marshmallows. Only 25% of the children were able to delay the gratification of eating the first marshmallow to gain the pleasure of two marshmallows later (Mischel & Ebbesen, 1970). The researchers noted that preschoolers who were able to delay gratification used a variety of strategies to resist eating the marshmallow (e.g, looking away, closing their eyes, wiggling in their chair, and smelling or licking. As one might imagine, the ability to delay much of anything is not so easy for most children. However, an extensive body of research has demonstrated that some children are better at delaying gratification than other children.

This may not be surprising, but determining *why* some children are better at delaying gratification has puzzled researchers thus far. Yet, Mischel and Ebbeson were unable to explain *why* some children had those skills while others did not (1970; Mischel, Ebbesen, & Zeiss, 1972). It is true that children's ability to delay gratification improves as the child matures (Mischel & Metzner, 1962). However, maturity does not explain all of the variance. Other researchers have concluded that children who were able to delay gratification may have been able to do so because they trusted the researcher when the researcher promised to come back with a second marshmallow. To these children adults are people who keep their promises. The reasoning goes that children who are able to delay gratification are children who have experienced the world as a reliable, trustworthy place (Kidd, Palmeri & Aslin, 2012).

Young children who are less likely to delay gratification may be children who have experienced high levels of *toxic stress* in their lives (Mangione, 2013). *Toxic stress* refers to a range of negative experiences children go through, as can be seen by the following statistics. The National Research Council (2012) states that 75 per 1,000 two to five year olds have experienced maltreatment. According to SAMHSA (2002) 98 per 1,000 two to five year olds have dealt with parental substance abuse and 130 per 1,000 two to five year olds have witnessed maternal post-partum depression (O'Hara & Swain, 1996).

The focus is now on whether high-quality early learning environments (e.g., preschools with low student-to-teacher ratios, safe physical environments, qualified teachers, language-rich environments, and nutritious meals) may provide children relief from the toxic stress in their lives.

There is a growing body of literature that points to the idea that perhaps environment is as important in the ability to delay gratification as is a child's maturity and innate ability. It was found that children exposed to a reliable environment managed to wait four times longer (12 versus three minutes) than those exposed to an unreliable environment in a task similar to the original marshmallow experiment (Kidd, Palmeri & Aslin, 2013).

Location of the Study

The Del E. Webb Family Enrichment center is a high-quality early learning and care center that has all the criteria that researchers require to be considered a low-stress environment. The FEC is accredited through the National Accreditation Commission for Early Care and Education Programs (NAC) and is considered "highest-quality" by Quality First AZ. The FEC just received another 5 star rating this month.

The FEC is part of Yavapai College. The school is dedicated to nurturing and educating children from birth to age five. The school serves the children of Yavapai College students, faculty and staff, and community members (they have approximately 80 children currently enrolled with 1/3 of the children coming from each of the above-mentioned groups). It also serves as a lab school. The FEC is partnered with the Early Childhood Education department, and through that partnership teachers at the FEC mentor the Yavapai College students who are studying to become educators. The school has been deemed high-quality by Quality First Arizona, the widely used program which ranks preschools within our state (http://qualityfirstaz.com/). In fact, other preschool administrators from around Arizona come to the FEC to tour the facility and learn the best practices in Early Childhood Education. Plus, First Things First Arizona has used the FEC in several promotional videos to highlight what exemplary early care and education looks like.

NAC Accreditation Standards

- Administrative Standards
- Family Engagement Standards
- Health & Safety Standards
- Curriculum Standards
- Interaction between Teachers & children Standards
- Classroom Health & Safety

Quality First Arizona Criteria

- **Health and safety practices** that promote children's basic well being
- **Staff qualifications,** including experience working with infants, toddlers and preschoolers as well as training or college coursework in early childhood development and education
- **Teacher-child interactions** that are positive, consistent and nurture healthy development and learning
- **Learning environments,** including age-appropriate books, toys and learning materials that promote emotional, social, language and cognitive development

- **Lessons** that follow state requirements or recommendations for infants, toddlers and preschoolers
- **Group sizes** that give young children the individual attention they need
- **Child assessment and parent communication** that keeps families regularly informed of their child's development

Quality First Arizona Star Ratings

- 5 Stars - Far exceeds quality standards
- 4 Stars - Exceeds quality standards
- 3 Stars - Meets quality standards
- 2 Stars - Approaching quality standards
- 1 Star - Committed to quality improvement
- 0 Stars - Program is enrolled in Quality First but does not yet have a public rating

The Question

Does a high-quality preschool engender a sense of trust in children to the point that those children are more likely to wait for the second marshmallow than children who have not had extensive high-quality schooling?

A replication of Mischel and Ebbesen's (1970) experiment was performed to examine the role a high-quality preschool plays on the child's ability to delay gratification. Specifically, will children with extensive experience at Yavapai College's Del E. Webb Family Enrichment Center (FEC) be more likely than children who have not had extensive experience at the FEC to delay eating their first marshmallow so that they may experience the greater gratification of two marshmallows later?

Method

58 Participants

- 2 to 5 years of age
- 32 Females & 26 Males
- 33 Full-Time & 25 Part-Time

Apparatus

- Empty classroom
- Small table & chair
- Video camera
- 1 or 2 large marshmallows
- Cupcake wrappers

Procedure

- YC's Human Subjects Research Board Approval
  - HSRB approval granted May 13, 2014 & Site approval
- Informed Consent Forms signed by one or both caregivers (both caregivers required when custody was split)
- Schedules Determined
  - Determined that all children would be run within the same 1-hour time of the day to control for hunger / satiation factors
  - Children were run between 1.5 hours after breakfast to 2.5 hours after breakfast
  - Required coordination with master teachers in each classroom to determine when the other children would be in outdoor play

- Classroom Time
    - Researchers spent time in each of the 3 classrooms (circle time, breakfast, lunch) to let the children get comfortable with them
- Child's consent
    - Even though caregiver consent was given, each child was asked if they wanted to participate

Coding

- Dependent Variable – time waited in seconds before consuming the marshmallow
- Coping Strategies
    - 1 primary coder (Dr. Jacobson)
    - 3 secondary coders to cross-code 35% of the trials
- Grouped coding strategies
    - Active vs Passive
    - Cognitive vs Behavioral
    - Verbal vs Nonverbal
        - Franko, Powers, Zuroff & Moskowitz, 1985
- Frequency of behaviors and amount of time spend on each strategy
    - See last page for a list of Coping Behaviors that were recorded

Results

Of the 58 children at the FEC that participated, the average wait time was 461.40 seconds (about 7.5 minutes). Over 3 times as many children waited (45) the entire time than those who did not (13). The average wait time for those who failed to wait was 155.54 seconds (2.5 minutes) while the average of those who did wait was 549.76 seconds (the full 9 minutes). The children at the FEC in 2014 showed a significantly higher percentage of children that waited than the children in the original studies in the 70's, $x^2(1)=53.29$, $p=0.00$. There is no significant difference in the percentages between the FEC 2014 findings and the *Reliable Environment Condition* in the Kidd, Palmeri & Aslin (2013) study, $x^2(1)=53.29$, $p > 0.05$.

How long did they wait?

Engaging in these behaviors was positively correlated with a longer wait time.

- Touching the marshmallow
- Smelling the marshmallow
- Looking at the wall or ceiling
- Looking at the camera
- Talking to themselves

All significant correlations with p values less than 0.05 using the Spearman's Rho (ρ) Correlation analysis

Sex & Age Differences?

There was no significant difference between females and males in regards to how long they waited, $t(56) = 1.33$, $p = 0.19$. In fact, no significant differences were found between the sexes for the duration or frequency of different types of coping. There was no significant difference in the amount of time waited and the age of the child, $F(2) = 0.78$, $p = 0.47$.

Age of the child

The older the child the more likely they were to engage in these behaviors

- Smelling the marshmallow
- Singing
- Verbal coping strategies

All significant correlations with p values less than 0.05 using the Spearman's Rho (ρ) Correlation analysis

The older the child the less likely they were to engage in these behaviors

- Picking off pieces of the marshmallow
- Eating small pieces of the marshmallow

All significant correlations with p values less than 0.05 using the Kendall's tau (τ) Correlation analysis

Days at the FEC

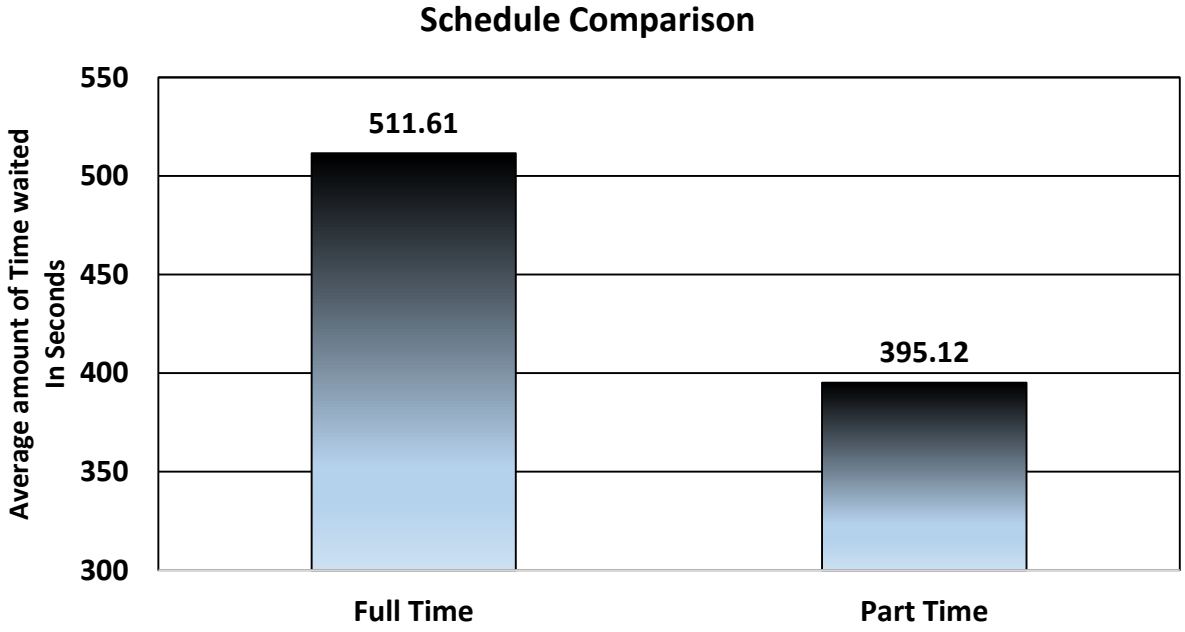
The more days a child had spent at the FEC increased the likelihood of these behaviors.

- Seconds & Frequency with head on hands or table
- Seconds playing with the marshmallow in wrapper
- Seconds talking to camera
- Frequency of walking around
- Frequency of smelling the marshmallow
- Frequency in cognitive coping

All significant correlations with p values less than 0.05 using the Pearson's r Correlation analysis

Schedule Comparison

The full-time children at the FEC waited significantly longer than the part-time children, t (56) = 2.35, p = 0.03.



Discussion

A high-quality preschool does create a sense of trust in a child to the point that she may be more likely to wait for the second marshmallow than a child that has not had extensive high-quality schooling.

Supporting Evidence

- The FT students (511.61 sec) waited significantly longer than the PT students (395.12 sec).
- There is no significant difference in the percentages between the FEC 2014 findings and the Reliable Environment Condition in the Kidd, Palmeri & Aslin (2013) study, $x^2(1)=53.29$, $p > 0.05$.

Limitations

- Sample Size
- Lack of background information
- Limited Experimental Groups

Importance

A stable environment, like that in a high-quality preschool, possibly creates a sense of trust in children to the point that those full-time children were more likely to wait for the second marshmallow than part-time children.

COPING BEHAVIORS RECORDED

Played with clothing	Played with marshmallow in wrapper
Played with jewelry	Played with marshmallow on table
Played with a body part (hands / feet / hair / etc.	Picked up marshmallow
Put head on hands or table	Smelled marshmallow
Put hands up or pounded table in exasperation	Licked marshmallow
Began to fall asleep	Picked bits off of marshmallow
Stood up	Ate tiny bits of marshmallow
Walked around	Hid the marshmallow
Walked out of view of the camera	Looked toward wall, window or door
Left the table and got a book / toy	Looked away from marshmallow
Left the table and found something to do	Talked to the camera
Left the table and chose a new place to sit / lie	Made faces to the camera
Counted things in room / on walls	Sang
Stared at the marshmallow	Glanced at marshmallow
Touched the marshmallow	Talked to self; not to camera