

13TH ANNUAL COLORADO SPRINGS UNDERGRADUATE RESEARCH FORUM

SATURDAY, APRIL 2, 2016

HOSTED BY UCCS

KEYNOTE SPEAKER
JON KHOURY, EXEC. DIRECTOR
COTTONWOOD CENTER FOR THE ARTS



**The Value of Art and Its Relationship
to the Pursuit of
Living One's Life Authentically**

Jon Khoury, Executive Director of the Cottonwood Center for the Arts, will discuss the value of art and its relationship to the pursuit of living one's life authentically. He will explore the ways in which art can help us to understand ourselves and the world around us, and how it can be a powerful tool for personal and social transformation.

2016 CSURF

- ### CSURF Event Locations
- Check-in/info Desk
UCCS Center Binger Hall
 - Poster Presentations
UCCS Center Binger Hall
 - Talk/Oral Presentations
UCCS Center 2nd & 3rd Floors
 - Lunch pick up
Cottonwood Hall Auditorium
 - Keynote Speaker
Cottonwood Hall Auditorium

13th Annual Colorado Springs Undergraduate Research Forum

University of Colorado

Session	Time	Topic	Speaker
Poster Presentations	8:00 AM - 12:00 PM	Various	Various
Poster Presentations	1:00 PM - 5:00 PM	Various	Various
Keynote Speaker	10:00 AM	The Value of Art and Its Relationship to the Pursuit of Living One's Life Authentically	Jon Khoury

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UCCS University of Colorado
Colorado Springs

COLORADO COLLEGE





Thinking to the Beat of the Music

Jacqueline E. Child and Patricia Waters
The Colorado College, Colorado Springs, CO



Introduction

Objective
To determine if music can enhance autobiographical memory in those with dementia under three conditions: individualized, random, or silence.

Background Information
Two main control types of dementia: Alzheimer's disease and vascular dementia (Bower, 2002).
Autobiographical memory is the first to atrophy in AD (Irish et al., 2002).
Music may then enhance recall, improve autobiographical memory, suggesting that some improves recall, but music is superior to noise (Foster & Lewis, 2001).

Hypothesis
1. Autobiographical memory will be enhanced when listening to music.
2. Individualized music will enhance the participants' memory the most, followed by random music. Silence will not have any effect on memory.

Method

Questionnaire
The ADLIFE Questionnaire used to measure participants to determine autobiographical memory. See website for details (http://www.adlife.com).
Instrument: *Colorado Music Preference Profile* (C-MPP). Family members and friends were used to determine the participants' favorite music from the last 10 years. 10 were used out of 10 (100% qualitative choice).

Participants (N = 6)
Individuals who resided from an extended care facility in the Colorado Springs area. Staff from the facility selected residents who have mild-to-moderate dementia.
All participants were given signed consent forms (1 x 10), informed consent and were paid \$10.

Procedure
Participants were tested under three conditions: individualized music, random music, and silence.
Condition: 100% autobiographical memory enhancement.

Procedure

Participants were tested in a small quiet room.
Participants first completed the Modified Rey-Osip Cook Drawing Task, which tested cognitive ability.
Music conditions were counterbalanced to prevent practice effects.
Participants were tested three times (one week in between each condition). Each session took approximately 30 minutes.

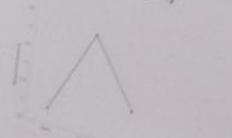
Participants were tested on their autobiographical memory using the Life Events List.
Each participant received compensation at the end of the study (funded by the Keller Family Venture Grant Fund).

Results

Main Effect of Music on Memory
A set of within subject effects revealed no differences in memory based on the order of the music conditions (counterbalancing): $p = .88$.
A repeated measures ANOVA measuring mood of music on memory enhancement was found to be significant: $F(2, 14) = 5.47, p = 0.02, \eta^2 = 0.44$.

There was a trend towards memory enhancement induced by random music and individualized music: $p = .022$.
Due to limited data, cognitive ability measured by the Modified Rey-Osip Cook Drawing Scale could not be analyzed.

Effect of Condition on Memory



Post hoc tests demonstrated a significant difference between the memory scores in the silence condition ($M = 4.25$) and the individualized condition ($M = 9.00$), $p = 0.02$.

Discussion

Findings
Individualized music enhances autobiographical memory.
Memory was better in music conditions than in silent conditions.
There was a significant difference between the silent condition and the individualized condition.

For a dementia patient, autobiographical memory is enhanced when listening to individualized music.
Music did not seem to impact specific aspects of autobiographical memory, rather it was random throughout the sample.

Study Limitations
This study was limited due to its small sample size of 6 participants.
Only women participated.
This experiment was not a double-blind study.
Method of coding introduced the possibility of bias.

Future Research
Further studies with control groups consisting of a more difficult questionnaire for healthy adults.
Investigate the effectiveness of music while working with healthy individuals to enhance autobiographical memory.

Implications
Individuals suffering from dementia should be listening to individualized music to enhance autobiographical memory.
This is a non-pharmacological alternative for memory enhancement for patients with Alzheimer's disease.



Selected References

Foster, N. A., & Lewis, J. E. (2001). The effects of auditory stimulation on autobiographical memory in dementia: Evidence for the effects of music. *Journal of Music Therapy*, 37(3), 210-228.

Irish, M., Cunningham, C. J., Walsh, J. E., Cusack, D., Lawlor, B. A., Robertson, J. H., & Coen, R. (2002). Investigating the enhancing effect of music on autobiographical memory in mild Alzheimer's disease. *Geriatrics and Gerontology International*, 2(1), 108-116.

Waters, J. E. (2002). *Delivering dementia: Clinical voices for the diagnosis of dementia*. New York: Guilford Press.

Removing Linguistic Agency Enhances People's Likelihood to Forgive

Alison Rowe, Tomi-Ann Roberts, and Kevin Holmes
Colorado College, Colorado Springs, CO



Introduction

Forgiveness

- Defined as a replacement of negative thoughts/feelings towards an offender with positive ones (Lewinsohn, 1991)
- Blame has been identified as one main impediment
- Psychic distance from the offender/behavior is often necessary for this process to occur (Trope & Liberman, 2010)
- Positive mental and physical health benefits have been associated with forgiveness (Lewinsohn, 2003)
- stress, depression, and anxiety
- cardiovascular health and various systems functioning
- muscle relaxation and feelings of physical calm

Linguistic Agency

Third party observers place more blame on an offender after reading an agentive description of an offense than after reading a non-agentive description of the same situation (Trope & Liberman, 2010)

Agentive Descriptions (Trope & Liberman, 2010)

Describe change-of-state using a transitive expression i.e. "He stole the cookies."

Non-agentive Descriptions (Trope & Liberman, 2010)

Describe change-of-state using an intransitive expression i.e. "The cookie jar opened."

Present Study

- Participants read six vignettes describing instances of interpersonal harm. Three were agentive and three were non-agentive to be observed across stories
- Reading time of each type allowed for within-subjects comparisons to forgive the offender
- Participants rated levels of perceived blame as well as their willingness to forgive the offender
- Participants also rated their general tendencies to blame or forgive in situations of interpersonal harm.

Hypotheses

- Participants will blame offenders less after reading non-agentive descriptions.
- Participants will be more willing to forgive offenders after reading non-agentive descriptions than they will for agentive descriptions.

Method

Participants

200 participants recruited via Amazon Mechanical Turk

Gender	Age	Education
Male: 112	38.7	High School
Female: 88	37.2	College
		Post-graduate
		High School
		College
		Post-graduate
		High School
		College
		Post-graduate

Procedure

- with participants design, 6 scenarios of interpersonal harm
- Scenarios in one of two structures, constituting IV
- Agentive Language
 - Participants read 3 agentive descriptions of transgressions
- Non-agentive Language
 - Participants read 3 non-agentive descriptions of transgressions

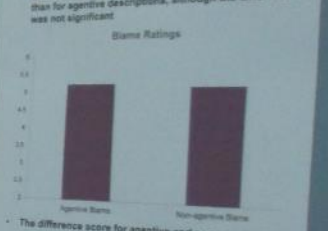
Dependent Variables

- Blame
 - Participants responded to a blame measure after reading each description
- Willingness to Forgive
 - Participants responded to a forgiveness measure after reading each description
- General Tendencies
 - Participants responded to a series of questions about how they typically respond when faced with an offense

Results

Hypothesis #1:

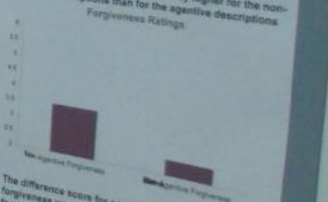
- Blame ratings were lower for non-agentive descriptions than for agentive descriptions, although the difference was not significant



- The difference score for agentive and non-agentive blame was not significantly correlated with general blame
- Therefore, the effect of agency on blame was not impacted by participants' general tendencies to blame

Hypothesis #2:

- Forgiveness ratings were significantly higher for the non-agentive descriptions than for the agentive descriptions



- The difference score for agentive and non-agentive forgiveness was not significantly correlated with general forgiveness
- Therefore, the effect of agency on forgiveness was not impacted by participants' general tendencies to forgive



Comparative Neuronal Morphology of Gigantopyramidal Neurons in Felids, Primates, Ungulates, the Wallaby, and the Rat

Mackenzie Tennison
Colorado College, Colorado Springs, CO



Figure 4. Dendritic tree of neurons in the primary motor cortex of the Siberian tiger (ST) and the double-headed (right) and left (left) pyramidal neurons from the rat (R). Scale bar: 100 μ m.



Figure 5. Dendritic tree of neurons in the primary motor cortex of the rat (R). Scale bar: 100 μ m.



Figure 6. Dendritic tree of neurons in the primary motor cortex of the wallaby (W). Scale bar: 100 μ m.

Results and Discussion

General Qualitative Observations

- Quantal and deep axonal neurons
- Neuron morphology varied in size, axonal branching patterns, axonal length, dendritic branching, primary dendrite location
- Pyramidal neurons
- Axonal dendrites bifurcated more often than typical pyramidal neurons
- Pyramidal axons terminated in various locations

General Quantitative Observations

- Quantal and deep axonal neurons
- Quantal and deep axonal neurons
- Quantal and deep axonal neurons



Figure 7. Microscopic images of neurons in the primary motor cortex of the rat (R). Scale bar: 100 μ m.

Statistical Analysis

Statistical analysis was performed using ANOVA. Significant differences were found between groups for dendritic length, axonal length, and axonal diameter.

Species Data

Species: Siberian Tiger, Rat, Wallaby




Influence of *Bifidobacterium infantis* on the Development of Anxiety, Depression, and Adolescent Rats

Spencer Cooke, William Harris, Ryan Lach, Tia Tummino, Lori Driscoll
 Laboratory of Behavioral Neurotoxicology
 Colorado College, Colorado Springs, CO

Introduction

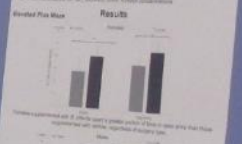
The gut-brain axis is a bidirectional communication system between the gut and the brain. The gut microbiome plays a significant role in the development of anxiety and depression. *Bifidobacterium infantis* is a probiotic bacterium that has been shown to have beneficial effects on the gut-brain axis.



Method (cont.)

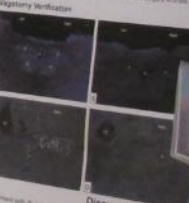
Chemical Analysis
 Quantitative real-time PCR was used to measure the expression of inflammatory markers in the brain.

Behavioral Testing
 The rats were tested for anxiety and depression using the open field test and the sucrose preference test.



Results

Parameter	Mean	SEM	F-value	p-value
Open Field Entries	10.24 (1.01)	0.87 (0.22)	38.47	<0.001
Sucrose Preference (%)	66.75 (1.48)	1.98 (1.14)	1.98	0.16
Depression Index	43.33 (2.70)	2.76 (1.27)	1.98	0.16
Anxiety Index	6.88 (0.87)	0.87 (0.22)	1.98	0.16

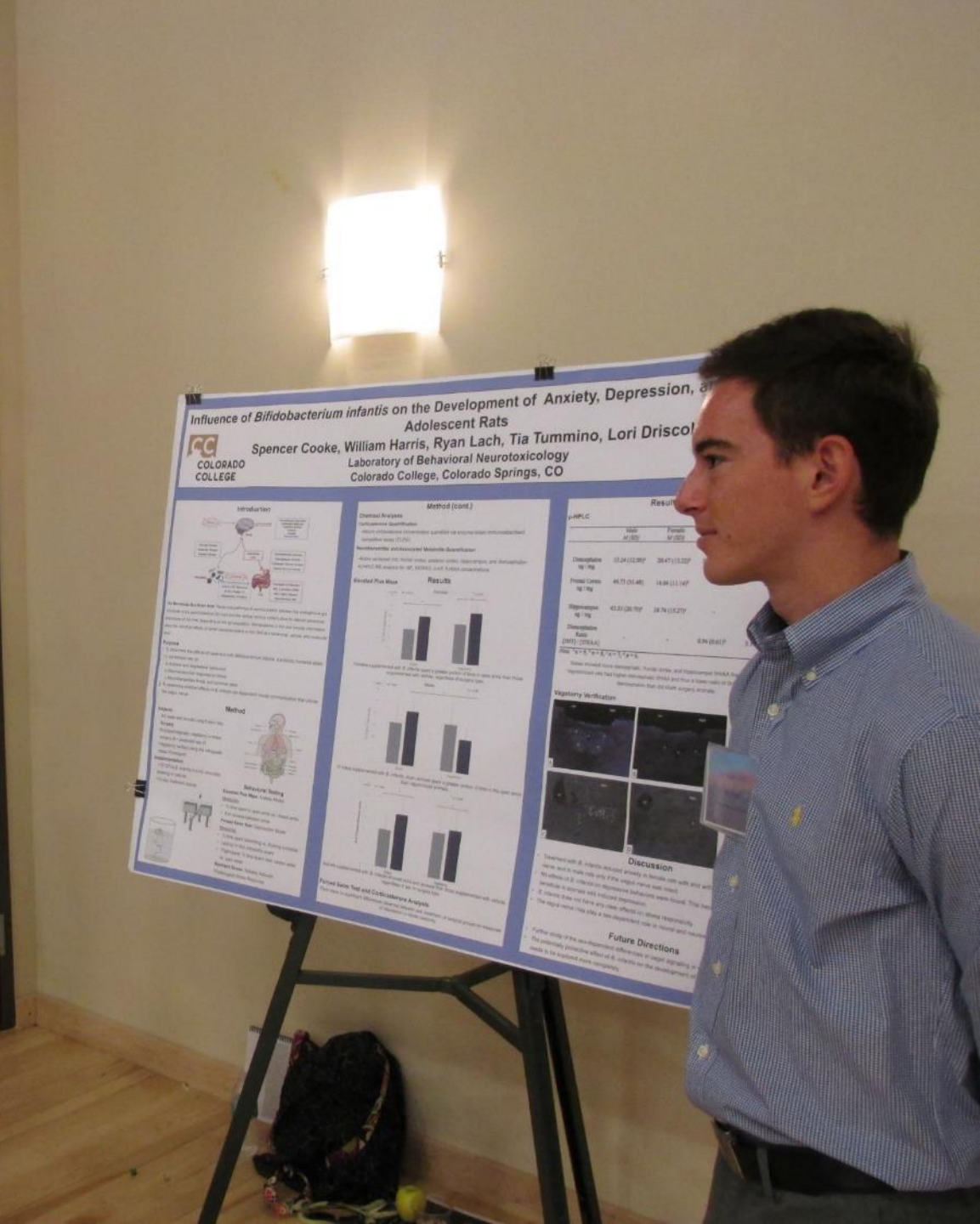


Discussion

The results of this study suggest that *Bifidobacterium infantis* has a beneficial effect on the gut-brain axis, reducing anxiety and depression in adolescent rats.

Future Directions


Further studies of the gut-brain axis and the effects of probiotics on anxiety and depression are needed.





Thinking to the Beat

Jacqueline E. Child and
The Colorado College, Colo



Objective
To determine if music can enhance autobiographical memories in those with dementia under three conditions: individualized, random, or silence.

Background Information
The most common type of dementia, Alzheimer's disease and vascular dementia (Brown, 2002).
Autobiographical memories are the first to diminish in AD (Park et al., 2000), suggesting that these responses record, but music is superior to visual (Foster & Murray, 2002).

Hypotheses
1. Autobiographical memory will be enhanced when listening to music related to random music. Silence will not have any effect on memory.

Introduction
Participants were tested in a small quiet room.
Participants first completed the Modified Fuldset (M-Fuldset) to assess global ability.
Music conditions were counterbalanced to prevent practice effects.
Participants were tested three times over one week in between each session took approximately 30 minutes.
Participants were tested on their autobiographical memory of events last.
Each participant received compensation at the end of the study for the Music Family (music) (Grand Fund).

Procedure

Questionnaire
A Dementia Self-Rating Questionnaire (DSQR) was used to determine the severity of dementia. The modified one-item DSQR (DSQR-1) was used to determine the severity of dementia. Family members were also used to determine the participants' dementia severity from the Modified Fuldset (M-Fuldset). Participants were asked to draw a stick figure to the left of the questionnaire.

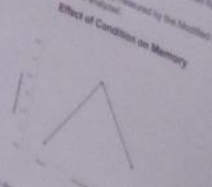
Participants (N = 8)
Participants were recruited from all behavioral labs located in the Colorado College building and from the local behavioral community who take music.

Results
Participants were tested on their autobiographical memory under three conditions: individualized music, random music, and silence. The results showed that music significantly enhanced memory.

Method

Main Effect of Music on Memory
A test of within-subject effects revealed no differences in memory by the order of the music conditions (counterbalanced(2)), $p = .08$. A repeated measures ANOVA measuring impact of music on memory and performance was found to be significant, $F(2, 14) = 5.47$, $p = 0.02$, $d = 0.44$.
There were a trend between memory enhancement increased by random music and performance, $F(2, 14) = 3.12$, $p = .08$.
Due to limited data, cognitive ability measured by the Modified Fuldset (M-Fuldset) could not be analyzed.

Effect of Condition on Memory



Post-hoc tests demonstrated a significant difference between the memory and performance conditions, $F(2, 14) = 3.12$, $p = 0.08$, $d = 0.22$.



Influence of *Bifidobacterium infantis* on the Development of Anxiety, Depression, and Stress in Adolescent Rats

Spencer Cooke, William Harris, Ryan Lach, Tia Tummino, Lori Driscoll
Laboratory of Behavioral Neurotoxicology
Colorado College, Colorado Springs, CO

Introduction
The Gut-Brain Axis (GBA) is a bidirectional communication system between the gut and the brain. The GBA is composed of the gut microbiome, the gut, and the brain. The gut microbiome is a complex community of microorganisms that reside in the gut. The gut microbiome is involved in the production of neurotransmitters, the regulation of the immune system, and the regulation of the stress response. The GBA is involved in the development of anxiety, depression, and stress. *Bifidobacterium infantis* is a probiotic that has been shown to have beneficial effects on the GBA. The present study investigated the effects of *Bifidobacterium infantis* on the development of anxiety, depression, and stress in adolescent rats.

Method
Adolescent rats were divided into two groups: a control group and a group that received *Bifidobacterium infantis*. The rats were tested for anxiety, depression, and stress using a variety of behavioral tests. The results of the tests were compared between the two groups.

Results
The results of the tests showed that the rats that received *Bifidobacterium infantis* had significantly lower levels of anxiety, depression, and stress compared to the control group. These findings suggest that *Bifidobacterium infantis* may have beneficial effects on the GBA and may be a potential treatment for anxiety, depression, and stress.

Conclusion
The present study provides evidence that *Bifidobacterium infantis* has beneficial effects on the GBA and may be a potential treatment for anxiety, depression, and stress in adolescent rats. Further research is needed to determine the mechanisms of these effects and to evaluate the effectiveness of *Bifidobacterium infantis* as a treatment for anxiety, depression, and stress in humans.

Group	Anxiety	Depression	Stress
Control	High	High	High
<i>Bifidobacterium infantis</i>	Low	Low	Low

BROWN
ULTIMATE

Removing Linguistic Agency Enhances People's Likelihood to Forgive

Alison Rowe, Tomi-Ann Roberts, and Kevin Holmes
Colorado College, Colorado Springs, CO



Introduction

Forgiveness

- Defined as a replacement of negative thoughts/cognitions towards an offender with positive ones (Wright, 1986)
- Blame has been identified as one such cognition
- Psychic distance from the offender/offense is often necessary for this process to occur (Finkelhor et al., 2016)
- Positive mental and physical health benefits have been associated with forgiveness (Sayers, 2002)
- ↓ stress, depression, and anxiety
- ↑ cardiovascular health and nervous system functioning
- ↑ muscle relaxation and feelings of physical calm

Linguistic Agency

- Third party observers are less likely to forgive an offender after reading an agentive description (Sayers, 1982)
- Participants read 3 agentive descriptions using a transgressive expression i.e. "He ripped the costume."
- Non-agentive Descriptions (Sayers, 1982)
"Describe change-of-state using an intransitive expression i.e. "The costume ripped."

Study

- Participants read six vignettes describing instances of interpersonal harm. Three were agentive and three were non-agentive
- Following three of each type allowed for within subjects differences to be observed across stories
- Participants rated levels of perceived blame as well as their willingness to forgive the offender
- Participants also rated their general tendencies to blame or forgive in situations of interpersonal harm.

Method

Participants

- 200 participants recruited via Amazon Mechanical Turk

Male	114	White/Caucasian	137
Female	76	Asian/Asian American	11
		Latino/Latina	11
		African American	2
		Hispanic	2
		Asian American	1
		Black/African American	1
		Mixed Race	2

Procedure

- with participants design, 6 vignettes of interpersonal harm
- Scenarios in one of two structures, constituting 19

- Agentive Language

- Participants read 3 agentive descriptions of transgressions

- Non-agentive Language

- Participants read 3 non-agentive descriptions of transgressions

- Blame

- Participants responded to a blame measure after reading each description

- Willingness to Forgive

- Participants responded to a forgiveness measure after reading each description

- General Tendencies

- Participants responded to a series of questions about how they typically respond when faced with an offense

- Blame

- Participants responded to a blame measure after reading each description

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- Participants responded to a forgiveness measure after reading each description

- General Tendencies

- Participants responded to a series of questions about how they typically respond when faced with an offense

Results

Hypothesis #1:

- Blame ratings were lower for non-agentive descriptions than for agentive descriptions, although the difference was not significant

Blame Ratings

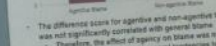


- The difference score for agentive and non-agentive blame was not significantly correlated with general blame
- Therefore, the effect of agency on blame was not required by participants' general tendencies to blame

Hypothesis #2:

- Forgiveness ratings were significantly higher for the non-agentive descriptions than for the agentive descriptions

Forgiveness Ratings



- The difference score for agentive and non-agentive forgiveness was not significantly correlated with general forgiveness
- Therefore, the effect of agency on forgiveness was not required by participants' general tendencies to forgive

Future Directions

- The present study presented transgressions in hypothetical situations
- What happens when people are reacting to real-life experiences?
- As our blame measure was not significantly correlated with forgiveness, what besides blame could be driving the measurement of forgiveness?
- What?
- Can?

- Forgiveness is not giving
- Forgiveness is greater when the offender is remorseful than when they are not
- Forgive. But... so long.

- Blame

- Participants responded to a blame measure after reading each description

- Willingness to Forgive

- Participants responded to a forgiveness measure after reading each description

- General Tendencies

- Participants responded to a series of questions about how they typically respond when faced with an offense

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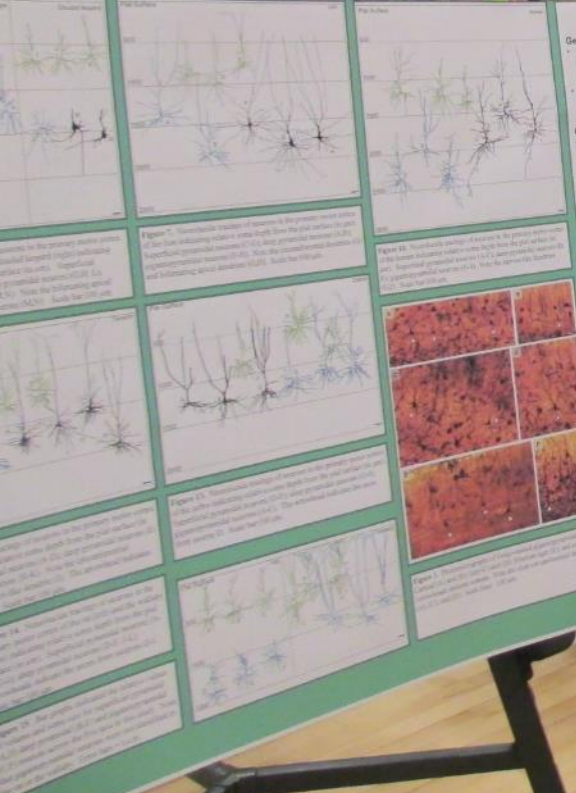
- Participants responded to a blame measure after reading each description

- Willingness to Forgive

- Participants responded

Neuronal Morphology of Gigantopyramidal Neurons in Primates, Ungulates, the Wallaby, and the Rat

Mackenzie Tennison
Colorado College, Colorado Springs, CO



Results and Discussion

General Qualitative Observations

- Neuronal morphology varies in most species, exhibiting intraspecific variability. At least several distinct groups can be identified within each species.
- Gigantopyramidal neurons are present in all species, but their morphology varies.
- Apical dendrites of most neurons exhibit a more typical pyramidal morphology.
- Non-typical dendrites are present in all species, but their morphology varies.

General Quantitative Observations

- Somatodendritic pyramidal neurons in the neocortex exhibit a wide range of dendritic branching patterns.
- Gigantopyramidal neurons with robustly larger dendrites are more likely to be found in the rat (Fig. 10).

Primates

- Most primate neurons exhibit a typical pyramidal morphology.
- Large pyramidal neurons are found in the rat (Fig. 10).
- Large pyramidal neurons are found in the rat (Fig. 10).

Ungulates

- Large pyramidal neurons are found in the rat (Fig. 10).
- Large pyramidal neurons are found in the rat (Fig. 10).

Rat and Wallaby

- Large pyramidal neurons are found in the rat (Fig. 10).
- Large pyramidal neurons are found in the rat (Fig. 10).

Functional Implications

- Gigantopyramidal neurons may function to increase the width of the dendritic tree, increasing the number of synapses.
- Gigantopyramidal neurons may function to increase the width of the dendritic tree, increasing the number of synapses.

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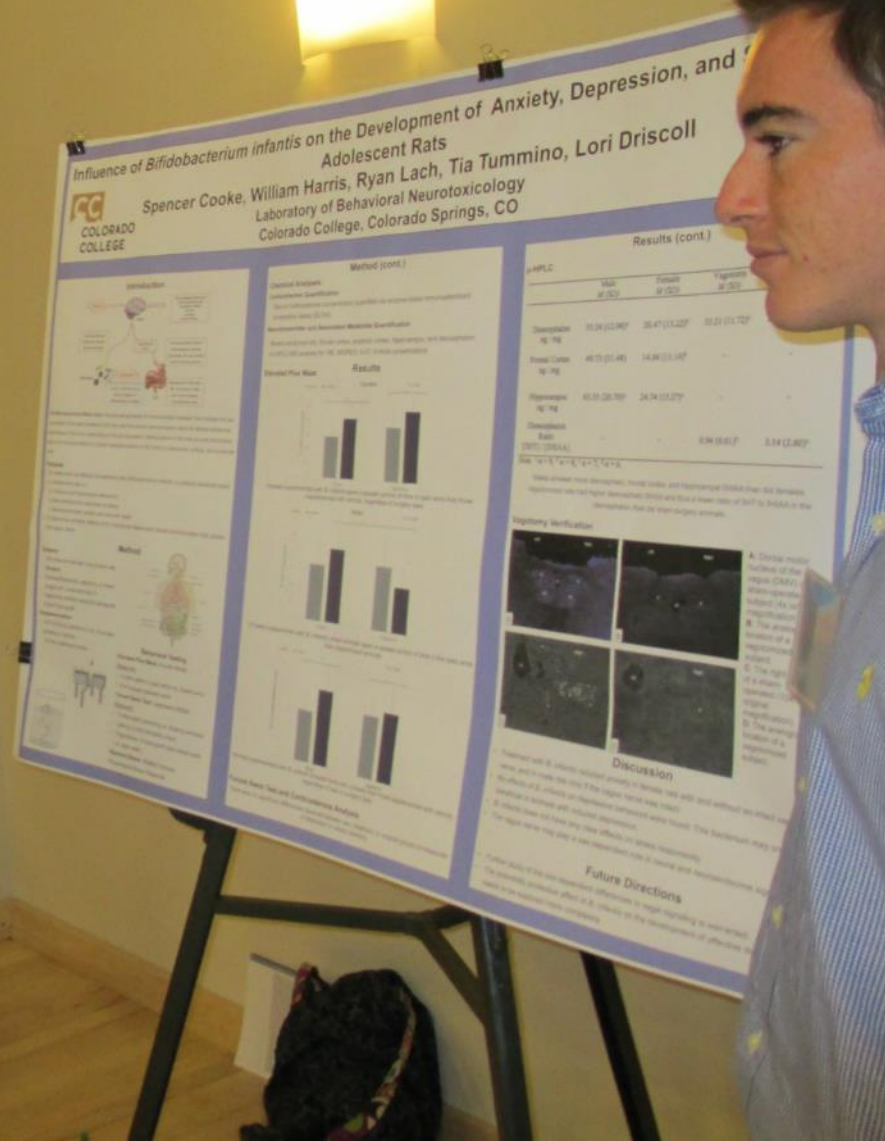
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Removing Linguistic Agency Enhances People's Likelihood to Forgive

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Introduction

Empirical

- Defined the relationship of negative psychological events to desire for justice (Rowe, 2012)
- Results have been mixed on this relationship
- People desire justice for the sake of justice or the desire to be perceived as just (Rowe, 2012)
- People who are perceived as just are more likely to be forgiven (Rowe, 2012)
- Justice is a social construct and varies across cultures
- Justice is a social construct and varies across cultures

Linguistic Agency

- Those who believe their lives have been shaped or altered by reading a specific description of an event are less likely to forgive (Rowe, 2012)
- Agency is a social construct and varies across cultures
- Agency is a social construct and varies across cultures

Present Study

- Participants read an experiential description of an event and were asked to rate their desire for justice
- Participants who read the experiential description were more likely to forgive than those who read the agency description
- Participants who read the agency description were more likely to forgive than those who read the agency description

Implications

- Removing linguistic agency enhances people's likelihood to forgive
- Removing linguistic agency enhances people's likelihood to forgive

Method

Participants

200 participants were recruited via Amazon Mechanical Turk

Procedure

Participants were randomly assigned to one of two conditions: Agency or Linguistic Agency

Measures

Desire for Justice (Rowe, 2012)


Forgiveness (McCullough & Kurzban, 2012)

Statistical Analysis

Two-way ANOVA


Results

Figure 1



Condition	Mean Desire for Justice
Agency	~4.5
Linguistic Agency	~3.5

Figure 2



Condition	Mean Forgiveness
Agency	~4.5
Linguistic Agency	~3.5

Discussion

Results of the present study suggest that removing linguistic agency enhances people's likelihood to forgive

These findings have important implications for understanding the relationship between justice and forgiveness

Future research should explore the underlying mechanisms of this relationship





Thinking to the Beat of the Music

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Objective
To determine if music can enhance autobiographical memories in those with dementia under three conditions: individualized, random, or silence.

Background Information
Two most common types of dementia, Alzheimer's disease and vascular dementia (Roman, 2002).
Autobiographical memories are the first to diminish in AD (Irish et al., 2006).
Music, more than cafeteria noise, enhances autobiographical memories, suggesting that noise impairs recall, but music is superior to noise (Fowler & Valentine, 2001).

Hypotheses

1. Autobiographical memory will be enhanced when listening to music.
2. Individualized music will enhance the participants' memory the most, followed by random music. Silence will not have any effect on memory.

Method

Questionnaire
Life Events List- Questionnaire sent to families of participants to determine autobiographical memories (ex: wedding date, birth of first child, holiday).
Assessment of Personal Music Preference (Family Version)- Family members completed this form to determine the participants' favorite music from the past. This music was used for the individualized condition.
Modified Rouleau Clock Scale- Participants were asked to draw a clock to the best of their ability. It was scored out of 16 (Briant qualitative scales).

Participants (N = 8)
Participants were recruited from an extended care facility in the Colorado Springs area. Staff from the facility selected residents who have mild to moderate dementia.
All participants were women, ages ranged from 81-95. Informed consent and assent was received.

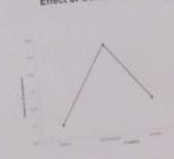
Procedure
Participants were tested under three conditions: individualized music, random music, and silence.
Participants were tested on their autobiographical memory using the Life Events List.

Procedure
Participants were tested in a small quiet room.
Participants first completed the Modified Rouleau Clock Drawing Task, which tested cognitive ability.
Music conditions were counterbalanced to prevent practice effects.
Participants were tested three times (one week in between each condition). Each session took approximately 30 minutes.
Participants were tested on their autobiographical memory using the Life Events List.
Each participant received compensation at the end of the study (funded by the Keller Family Welfare Grant Fund).

Results

Main Effect of Music on Memory
A test of within subject effects revealed no differences in memory based on the order of the music conditions (counterbalancing), $p = .58$.
A repeated measures ANOVA measuring impact of music on memory enhancement was found to be significant, $F(2,14) = 5.47, p = 0.02, \eta^2 = 0.44$.
There was a trend between memory enhancement induced by random music and individualized music, $p = .09$.
Due to limited data, cognitive ability measured by the Modified Rouleau Clock Drawing Scale could not be analyzed.

Effect of Condition on Memory



Post hoc tests demonstrated a significant difference between the memory scores in the silence condition ($M = 0.25$) and the individualized condition ($M = 0.52$), $p = 0.04$.

Discussion

Findings
Individualized music enhances autobiographical memory. Memory was better in music conditions than in silent conditions. There was a significant difference between the silent condition and the individualized condition.
For a dementia patient, autobiographical memory is enhanced when listening to individualized music.
Music did not seem to impact specific aspects of autobiographical memory rather it was random throughout the sample.

Study Limitations
The study was limited due to its small sample size of 8 participants. Only women participated.
This experiment was not a double-blind study.
Method of coding introduced the possibility of bias.

Future Research
Further studies with control groups consisting of a more difficult questionnaire for healthy adults.
Future research should at the effects severity has on the impact of music and memory enhancement.


Implications
Individuals suffering from dementia should be listening to individualized music to enhance autobiographical memory.
This is a non-pharmacological alternative for memory enhancement for patients with Alzheimer's disease.




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Influence of *Bifidobacterium infantis* on the Development of Anxiety, Depressed-Like Behavior, and Gut Microbiota in Adolescent Rats


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Introduction



The gut microbiome is a complex community of microorganisms that reside in the gastrointestinal tract. It plays a crucial role in maintaining overall health and is increasingly linked to various mental health conditions, including anxiety and depression. *Bifidobacterium infantis* is a probiotic strain that has been shown to have beneficial effects on gut health and mental well-being.

Method

Adolescent rats were divided into two groups: a control group and a group that received *Bifidobacterium infantis* supplementation. The rats were monitored for changes in their behavior, anxiety levels, and gut microbiota composition over a period of several weeks.

Behavioral Testing

The rats were subjected to various behavioral tests, including the elevated plus maze and the open field exploration test, to assess their anxiety levels and exploratory behavior.

Method (cont.)

Microbiome and Anxiety Behavior Quantification

Microbiome analysis was performed using 16S rDNA sequencing to identify the composition of the gut microbiota. Anxiety behavior was quantified using standardized behavioral tests.

Group	Behavioral Measure	Results
Control Group	Open Field Exploration	~15%
	Elevated Plus Maze	~10%
	Behavioral Anxiety Score	~1.5
<i>Bifidobacterium infantis</i> Group	Open Field Exploration	~25%
	Elevated Plus Maze	~20%
	Behavioral Anxiety Score	~0.8

Fecal DNA Sequencing Analysis

Fecal DNA was extracted and sequenced to analyze the composition of the gut microbiota. The results showed that the *Bifidobacterium infantis* group had a significantly higher abundance of beneficial bacteria compared to the control group.

Discussion

The results of this study demonstrate that the administration of *Bifidobacterium infantis* to adolescent rats leads to a significant increase in exploratory behavior and a decrease in anxiety-like behavior. These findings suggest that the gut microbiome plays a critical role in the development of anxiety and depression, and that probiotic supplementation may be a promising intervention for these conditions.





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