Use of Oils to Mitigate Methane Formation in the Rumen

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ABSTRACT

The effects of two essential oils (oregano (ORO) and moringa leaf extract oil (MLE)), and moringa seed oil (MSO)) on in vitro rumen fermentation and methane (CH_4) production were examined in a 24-h batch culture experiment. Treatments in the study consisted of control (no oil supplemented), control plus ORO, control plus MLE, and control plus MSO. The oils were added to rumen cultures at 500 mg/L and each treatment was run in triplicate. After the 24-h of incubation and relative to control, CH4 production was reduced ($P<0.05$) only with the addition of ORO. Additionally, dry matter degradability, propionate concentration and total fatty acids (VFA) were only reduced ($P<0.05$) with the addition of ORO. The addition of ORO also increased ($P<0.05$) the concentration of butyrate relative to other treatments. To conclude, our results showed that ORO was the only oil effective in reducing rumen CH4 formation, however, the effect was also associated with negative effects on rumen fermentation.

BACKGROUND

Livestock animal producers have not thoroughly considered the environmental impact of their farms on greenhouse gas emissions. Instead, many famers today are interested in enhancing nutrient efficiency on their farms to bring forth a higher quality farm produce. The goal of many producers and animal nutritionist today is to perfectly manage the rumen microbial ecosystem in order to effectively enhance digestibility of feed and reduce greenhouse gas emissions. Methane (CH_4) is the most concerning greenhouse gas , as it is much more potent than carbon dioxide (CO_2). Livestock, specifically cattle, contribute approximately 18% to the global anthropogenic greenhouse gas emissions (Christopher Matthews, FAO 2006). This is a great concern because ruminant products are an important part of the human diet and the need for ruminant animals is expected to increase due to population growth. The production of ruminant products is highly associated with a relatively large environmental impact. This large impact is cause by the production of methane gas as a by-product of ruminant fermentation. Many dietary strategies have been introduced to lower methane emission in ruminant animals however, most have only been tested using essential oils with adverse effects on rumen fermentation.

Hypothesis

The use of oils will reduce methane production in ruminant animals without negatively impacting rumen fermentation.

Acknowledgments

MATERIALS/METHODS

- **Treatment:** Oregano (*Origanum vulgare*), seed oil (*Moringa oleifera*), and leaf oil extract (*Moringa*) refer to picture 1.

- **Rumen fluid collection:** A fistulated Holstein dairy cow was used as a rumen fluid donor. The fluid was collected and filtered using a layer of cheesecloth, then quickly transferred to the laboratory.

Picture 1.

- **ANKOM gas jars:** A total of 12 jars were used. Each jar contained 3 g finely grounded diet (1.5 g grain concentrate plus 1.5 g alfalfa), the treatment oil, and a digestibility bag. All jars were placed in water bath at 39 C refer to picture 2.

Picture 2.

- **Gas collection:** total gas released from jars were collected in Taddler bags. A 1 ml sample was then withdrawn from each bag by syringe and analyzed for methane using gas chromatography (GC) refer to picture 3.

- **Digestibility:** The effect of oils on dry matter digestibility was measured by placing 3g of diet in nylon bag in the ANKOM jars as showmen in picture 2. After the 24-incubation, the bags were removed and dried in an oven at 100 C for 24 hrs.

Picture 3.

- **VFA:** After the 24-h incubation, a 4 ml sample from each culture jar was collected and added to 1 ml of 25% meta-phosphoric acid . Collected samples were then centrifuged at 20,000g for 20 minutes. Approximately, two ml of the sample was then injected into GC to measure VFA as described by Jenkins (1987)

- **pH:** the level of pH was gathered before and after fermentation using an electronic pH meter.
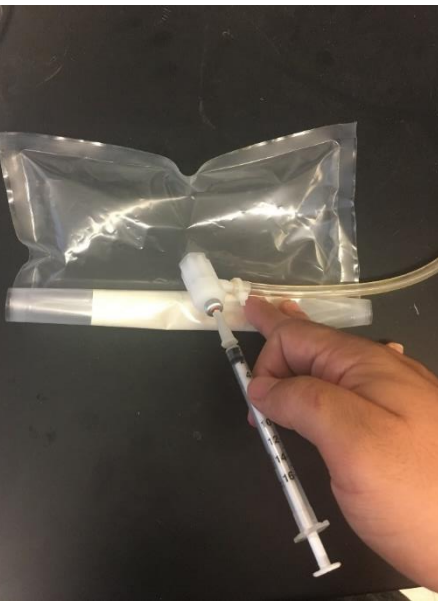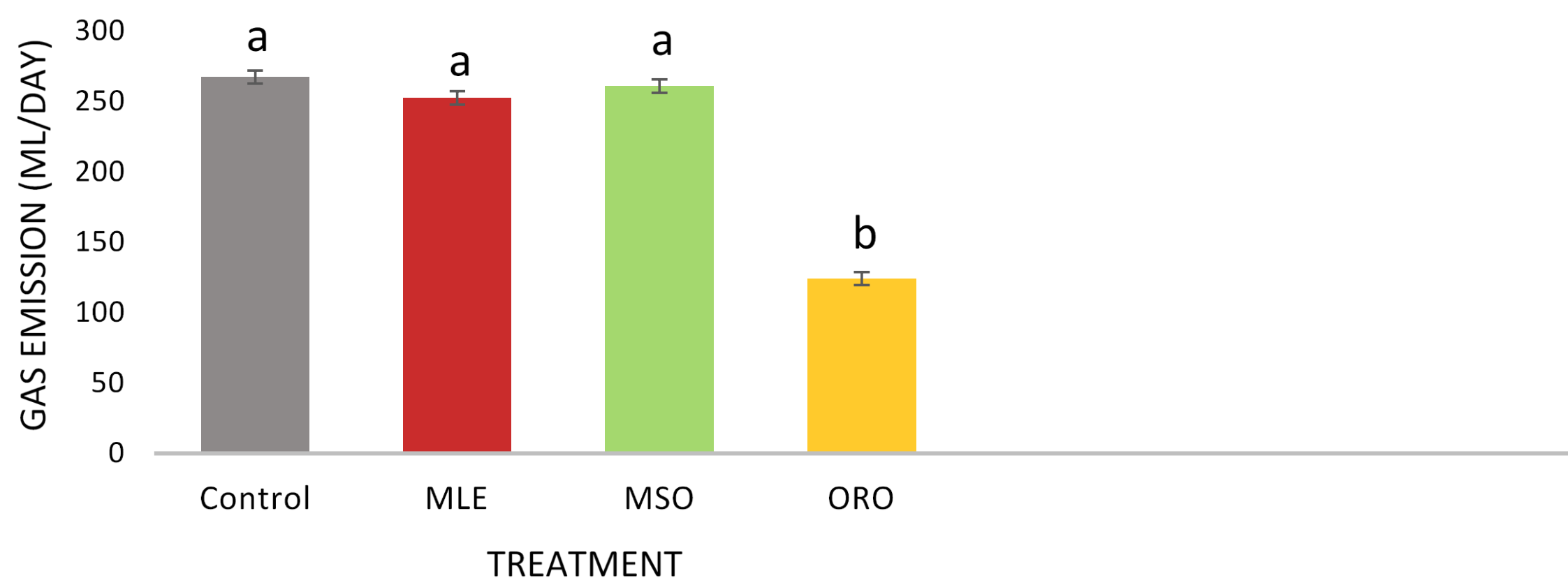
RESULTS

Table 1. The effect of oils on total gas production (ml/day)

	Control	MLE	MSO	ORO	MSE
Gas (mL)	267.26[a]	252.44[a]	260.86[a]	124.06[b]	18.136

a-b Means with different subscripts are significantly different at p<.05

- Moringa leaf extract (MLE)
- Moringa seed oil (MSO)
- Oregano essential oil (ORO)

RESULTS-(Continued)

Table 2. Effect of oils on methane (CH_4) production after 24-h incubation

	Control	MLE	MSO	ORO	MSE
CH4 (%)	22.11[a]	24.58[a]	22.62[a]	12.44[b]	3.377

a-b Means with different subscripts are significantly different at p<.05
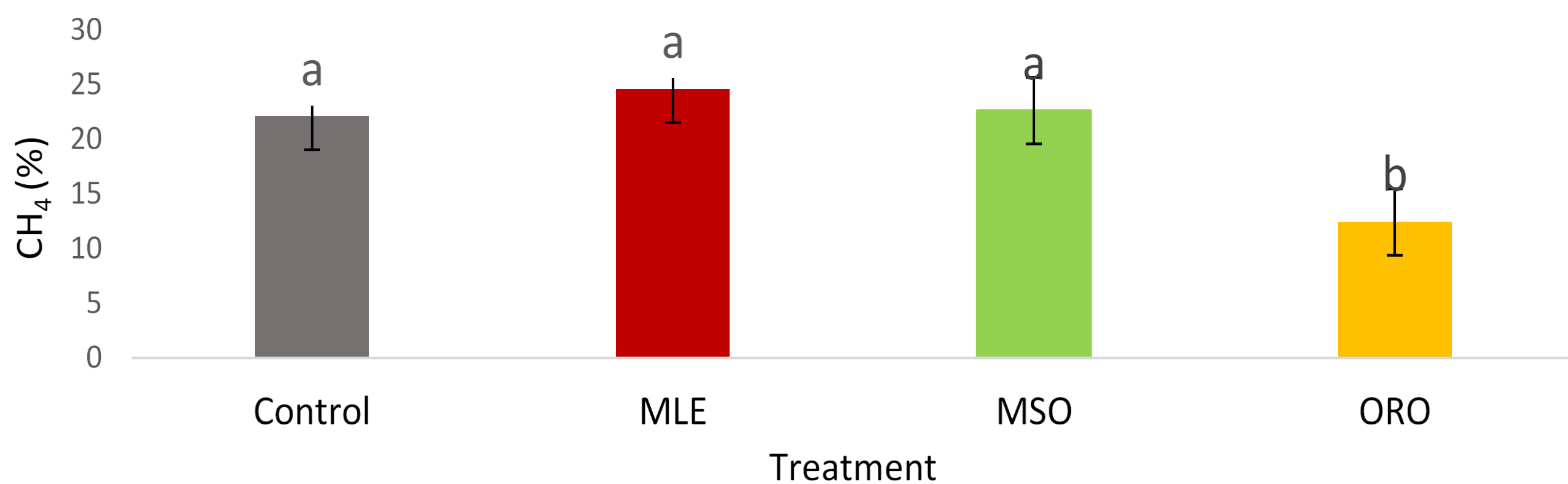

Figure 2: Percentage decrease (%) of CH_4 values after 24-h incubation

Table 3. Effect of oils on dry matter (DM) digestibility %

	Control	MLE	MSO	ORO	MSE
Dig (%)	56.77[a]	50.54[b]	51.1[b]	45.96[b]	1.711

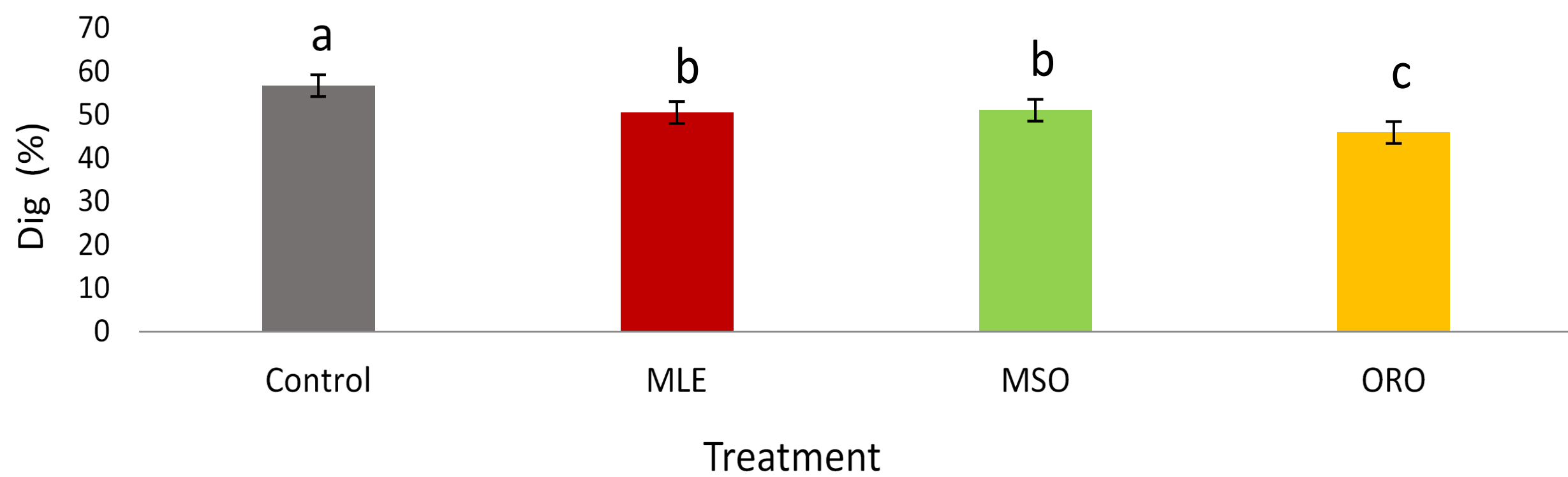a-b Means with different subscripts are significantly different at p<.05

Figure 3: Diet DM digestibility values after 24-h incubation.
a-b Means with different letters are significantly different at p<.05

Table 4. Effect of oils on volatile fatty acids (VFA) and pH level.

Item	Control	MLE	MSO	ORO	MSE
VFA, mM	51.25[a]	37.42[a]	37.44[b]	25.09[c]	2.551
Acetate, %	40.25[a]	39.38[a]	39.49[a]	42.71[a]	1.380
Propionate, %	25.97[a]	26.33[a]	25.94[a]	17.52[b]	0.469
Butyrate, %	27.71[b]	28.63[b]	28.99[b]	33.98[a]	1.732
pH	6.10	6.09	6.09	6.24	0.12

a-c Means with different subscripts within a row are significantly different at p<.05

CONCLUSION

Our results showed that oils effects on methane emission depend on the oil source. In this study, only ORO reduced rumen methane production. However, the addition of ORO also negatively impacted rumen digestibility.

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The Intersectionality of Literacy & Christianity During American Slavery

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Abstract

This project seeks to reveal the factors that contributed to the acceptance of Christianity by enslaved people in the eighteenth and nineteenth centuries. Content analysis of narratives created by men and women who had been enslaved elucidates the crucial role of literacy in the conversion to Christianity. My research has allowed me to show that this process of transformation led to the development of a new cultural identity that intertwined features of African Traditional Religions and European Christianity and that remains visible in African American culture today.

Background

In recent decades historians have interpreted the reasons why slaves chose to convert to Christianity. In early years it was seen from a European basis in which slaves were forced to convert and they believed the catechism that was preached to them. However, contemporary historians have begun to understand conversion through the lens of enslaved people by analyzing their narratives. This has lead to multiple innovative approaches to understanding slave conversion in conjunction with the development of literacy. Historians have thus understood literacy to be one the most significant factors in conversion in that it allowed enslaved people to better understand for themselves the teachings of Christianity and the larger context for their humanity.[1]

Key Concepts

Catechesis: religious instruction provided to new converts to Christianity, often in preparation for the rite of baptism.[2]

Cultural Analysis: cultural analysis yields insights into the manner in which a particular worldview authorizes, implements, and structures the commonplace rituals, spaces, and interpretive activities of those interpreted by a particular cultural regime.[3]

Slave Narratives: Accounts written by enslaved Africans about their experiences in the United States, Great Britain, Canada, and Caribbean.

Methods

I relied on qualitative methods to collect and analyze evidence. Primary sources include several narratives written by formerly enslaved people. Scholarly works on African and African American religion and history comprised the secondary sources. I used the primary and secondary sources to interpret the relationship between the development of literacy in the English language and the acceptance of Christianity by African Americans during the era of slavery.

The primary sources provide first-hand testimony of individual perceptions of the relationship for people who converted to Christianity. The secondary sources offer contextual information about Kongo Traditional Religion and Christianity, especially as to how these religions shaped the development of African American identities, which then allowed for a cultural analysis. The secondary sources also present the state of research among scholars who have investigated topics related to this project.

Slave Narratives

Noah Davis 1804-1867

"In my attempts to preach the gospel to my fellow sinners, I often **felt embarrassed, not knowing how to read a chapter in the Bible correctly.** My desires now increased for such a knowledge of the sacred Scriptures, as would enable me to read a chapter publicly to my hearers. I thought that if I had all my time at my own command, I would devote it all to divine things. This desire I think, led me more than anything else, to ask permission of my master, Dr. F. Patten, to purchase my freedom. I made this a subject of prayer, both night and day, that God would show me what he would have me do. I felt encouraged "

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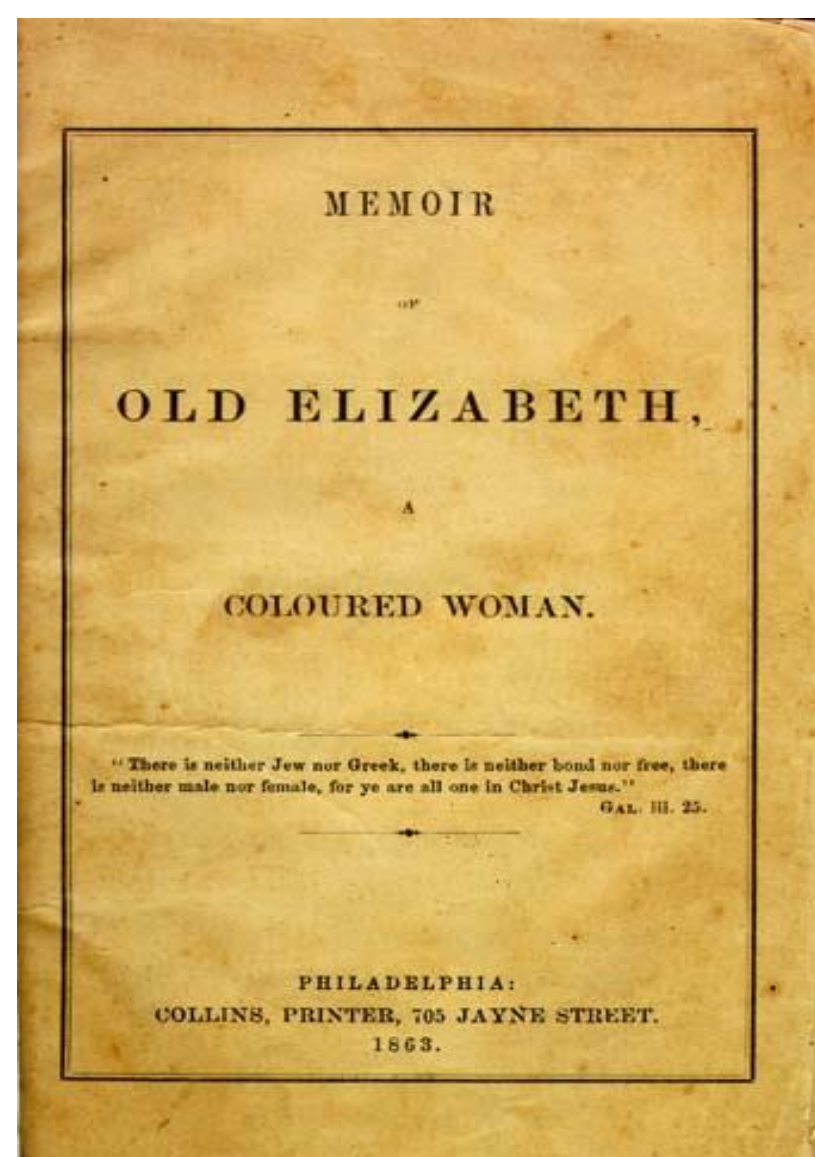
Elizabeth 1765?-1866

"I **questioned within myself how it would be possible for me to deliver the message, when I did not understand the Scriptures.** Whereupon I was moved to open a Bible that was near me, which I did, and my eyes fell upon this passage, "Gird up thy loins now like a man, and answer thou me. Obey God rather than man,"&c. "Our meeting gave great offence, and we were forbid holding any more assemblies. Even the elders of our meeting joined with the wicked people, and said such meetings must be stopped, and that woman quieted. But I was not afraid of any of them, and continued to go, and burnt with a zeal not my own."

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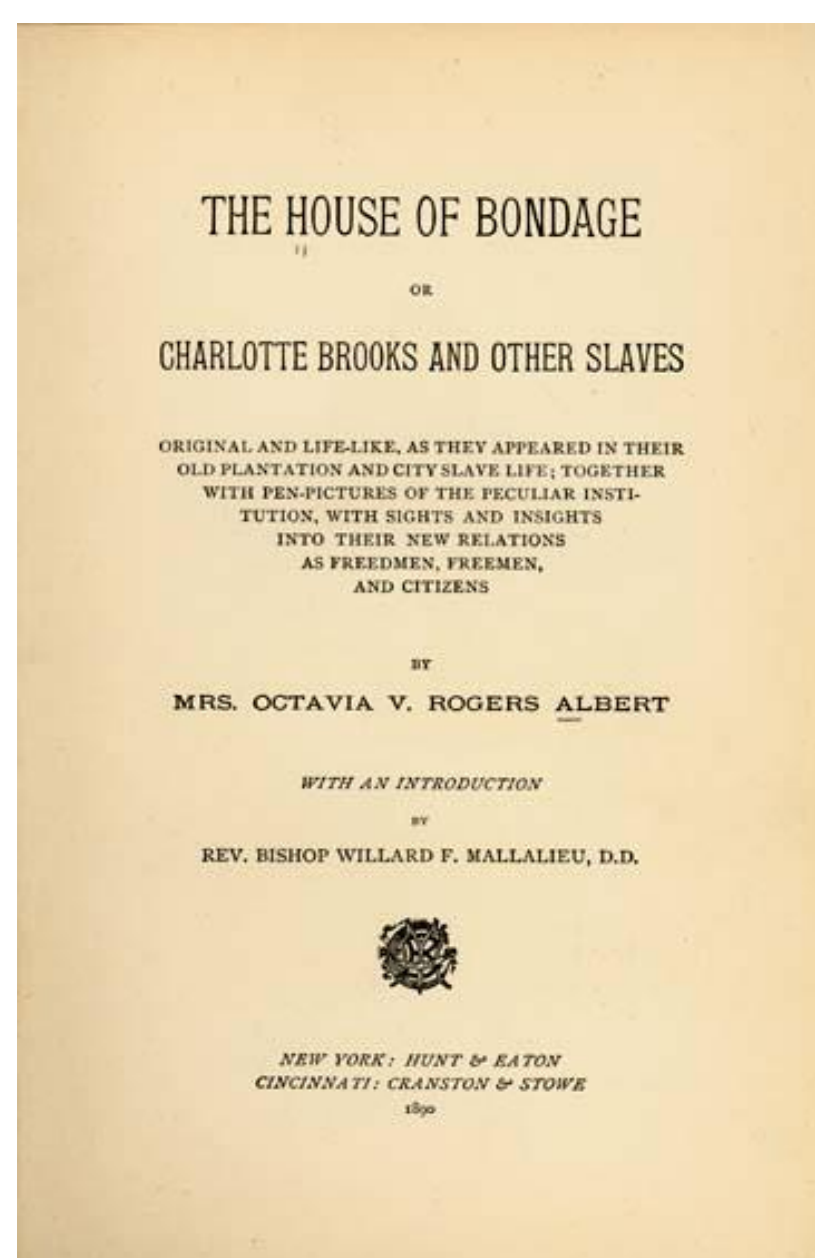
Charlotte Brooks 1853-1889

"**Did any of the black people on his place believe in the teachings of their master?**"
"**No, my child; none of us listened to him about singing and praying**. I tell you we used to have some good times together praying and singing. He did not want us to pray, but we would have our little prayer-meeting anyhow. Sometimes when we met to hold our meetings we would put a big wash-tub full of water in the middle of the floor to catch the sound of our voices when we sung. When we all sung we would march around and shake each other's hands, and we would sing easy and low, so marster could not hear us. O, how happy I used to be in those meetings, although I was a slave. She helped me to make my peace with the Lord. O, the day I was converted! It seemed to me it was a paradise here below! It looked like I wanted nothing any more. Jesus was so sweet to my soul!

https://docsouth.unc.edu/neh/religiouscontent.html

Conclusion

This study can be his study can be expanded by focusing solely on the narratives of enslaved women to examine their particular perspectives on slavery in general and more specifically, how they viewed the relationship between literacy and Christianity.

Additionally, future studies should move beyond Fredrick Douglass as the central focus for exploring the experiences of enslaved people when discussing literacy and Christianity. While scholars have more access to his writings, it is important to examine journeys of other slaves to give a voice to their experiences.

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Acknowledgements

School Factors and Their Relationship with School Outcomes in the State of Illinois

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Purpose: Five factors and three outcomes were chosen to answer: What relationship do paired school factors have with school outcomes?

Factors

Teacher Attendance
Current research shows that teacher absenteeism reduces student achievement (Miller). In contrast to, previous research that showed either no or very small effect on student achievement (Miller).
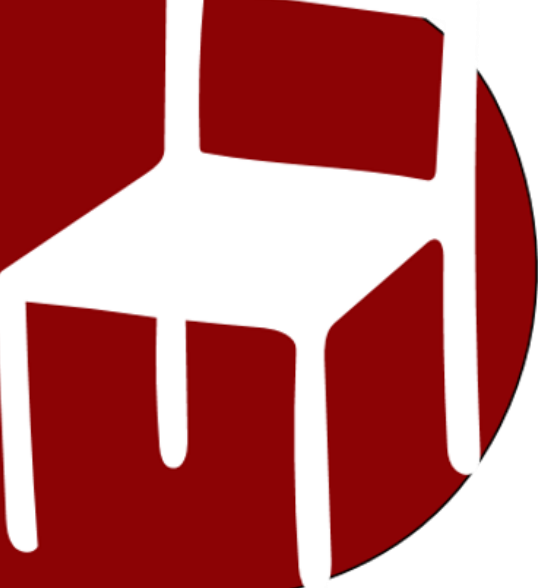
Free/Reduced Lunch
The National School Lunch Program (NSLP) was founded in 1946 to feed hungry children in schools, and if students are not eating properly, they are more likely to not be engaged during school hours (Faught).

Class Size
Research has shown that smaller classroom sizes have smaller achievement gaps within the classrooms. However, research also states that the influence is a relatively small one (Bosworth).

Arts (Visual and Performing)
Research supports the idea that these courses improve academic achievement and increase the chances a student will pursue higher education (Gross).

Advanced Placement (AP)
As of 2017, 3 million students in the US took at least one AP course, to prepare for college level rigorous work, making the AP program one of the most participated in school programs (Russell).
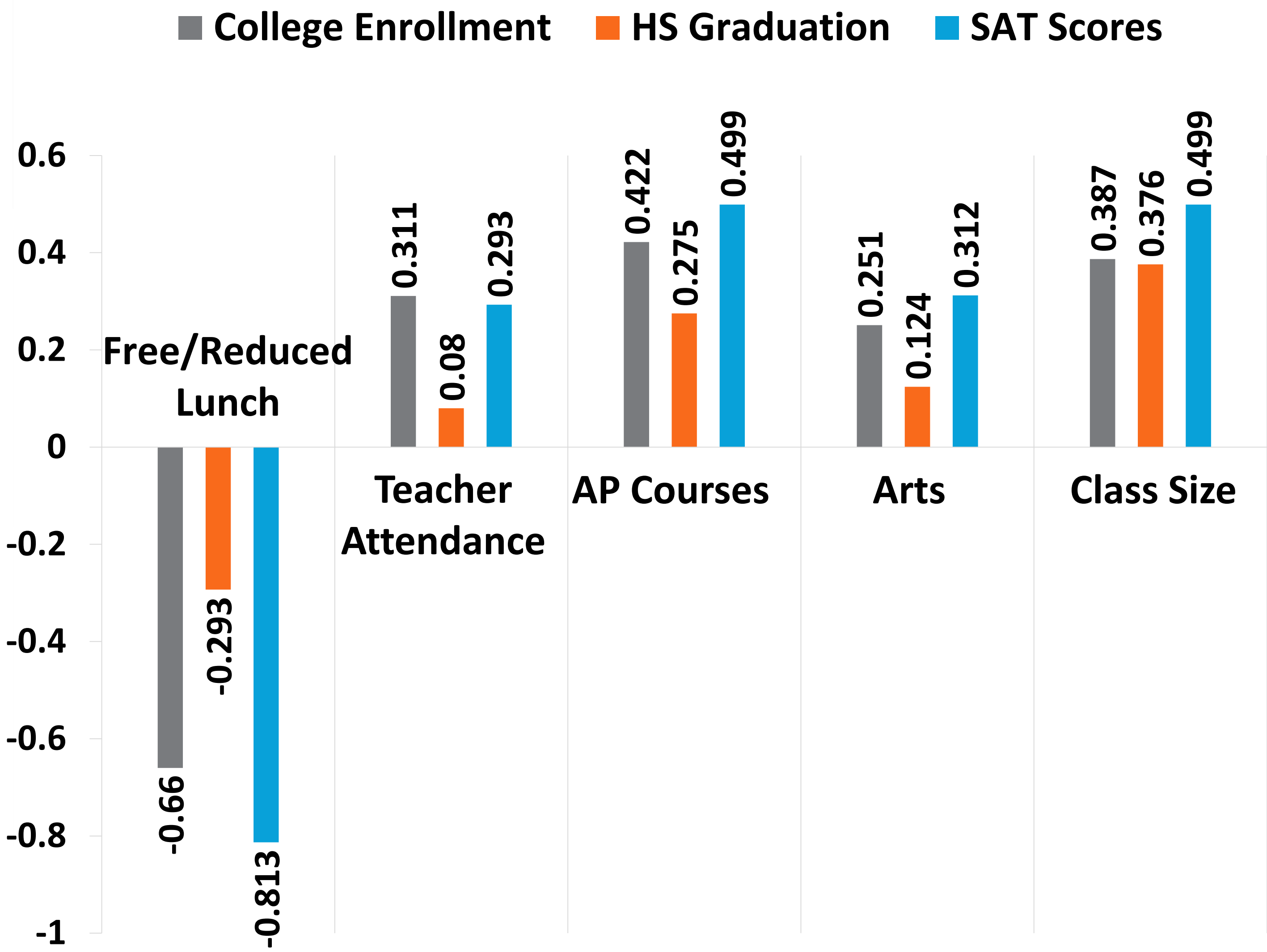
Methods

- Data was collected from Illinois School Report Card database
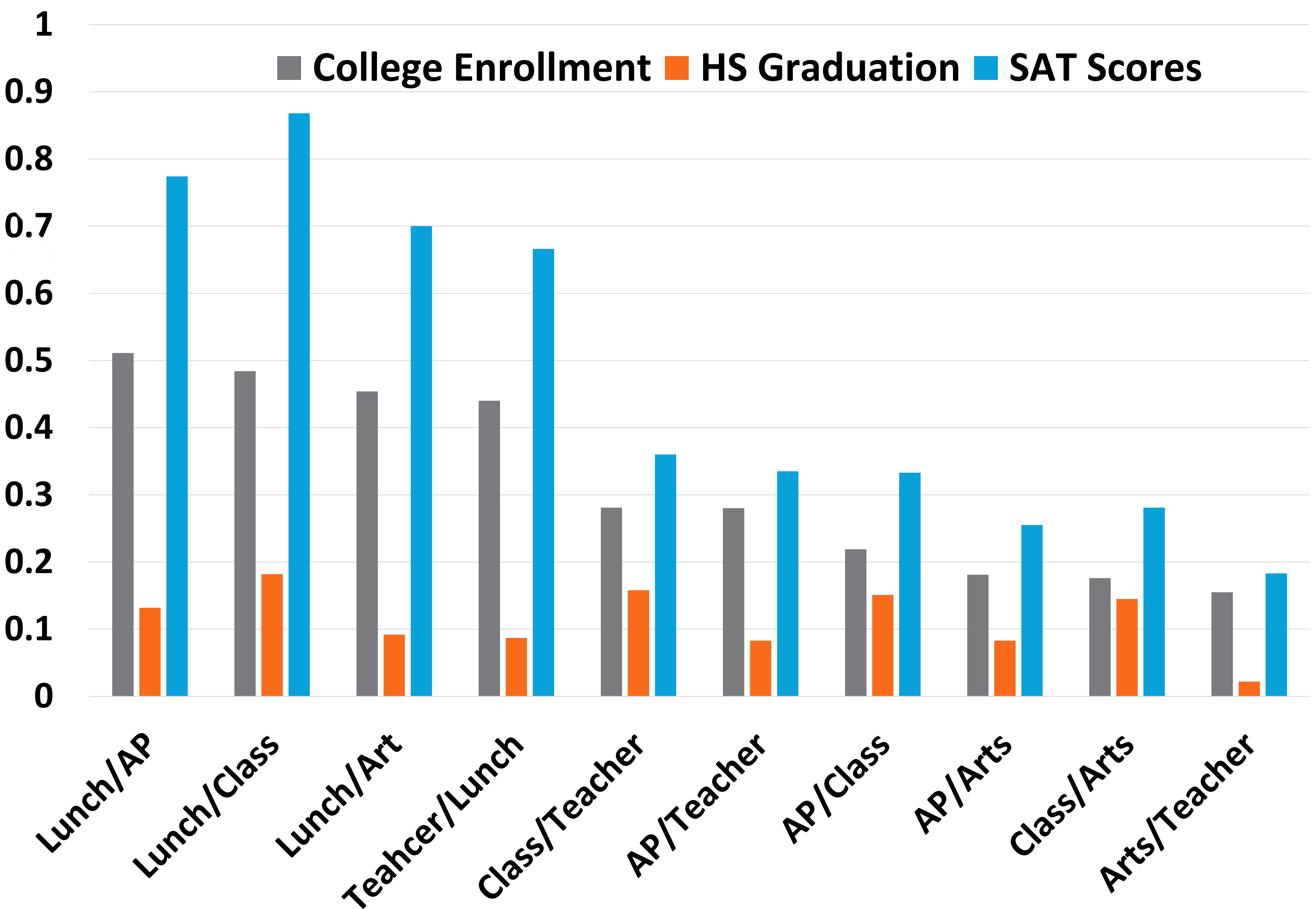- Multilinear Linear Regression was computed in SPSS to find the prediction data

Outcomes

- College enrollment,
- High school graduation
- SAT Scores

Results

Individual Factor Correlation

Legend: ■ College Enrollment ■ HS Graduation ■ SAT Scores

Free/Reduced Lunch: College Enrollment -0.66, HS Graduation -0.293, SAT Scores -0.813
Teacher Attendance: College Enrollment 0.311, HS Graduation 0.08, SAT Scores 0.293
AP Courses: College Enrollment 0.422, HS Graduation 0.275, SAT Scores 0.499
Arts: College Enrollment 0.251, HS Graduation 0.124, SAT Scores 0.312
Class Size: College Enrollment 0.387, HS Graduation 0.376, SAT Scores 0.499

Paired Factors' Adjusted *R^2

Legend: ■ College Enrollment ■ HS Graduation ■ SAT Scores

Categories: Lunch/AP, Lunch/Class, Lunch/Art, Teahcer/Lunch, Class/Teacher, AP/Teacher, AP/Class, AP/Arts, Class/Arts, Arts/Teacher

*Adjusted R^2 allows us to see how much of the outcome data can be predicted by the influence of each pair. The higher the percentage = the more the pair can be used to predict the outcome

Discussion

- High school graduation was impacted the least out of the three outcomes
- SAT scores see a huge predictor in Lunch/Class, Lunch/Arts and Lunch/AP
- Lunch had the biggest impact on its pairings because typically speaking low socio-economic schools have high percentages of lunch and low outcome percentages
- Teacher attendance pairings do not show much effect on outcomes
- Lunch/AP has a moderate relationship because the balance between lunch vs AP funding
- AP and Art seen at the tail end of the outcome predictors due to measurement method

Future Implications and Research

- Ensure schools with high percentages of students on free/reduced lunch have AP and art courses
- Consider making high school graduation requirements to reflect the rigor of college
- Look into how many students at each high school go on to graduate college instead of high school
- Specifically study the relationship of AP and Art's potential impact on the outcomes by observing students at the schools and tracking their educational progress during and post high school
- Develop a study that observes financial budgets and school demographics of each school

References

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An Examination of the Relationship of Learning Disabilities and Anxiety in School-Age Children

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Abstract

The purpose of the current study was to examine the relationship between learning disabilities and anxiety in children in school-age children. This was examined through self-report questionnaires, along with parent- and teacher- reports, administered during one 9-hour testing day. The Weschler Intelligence Scale for Children (WISC-IV) and Woodcock-Johnson III Tests of Cognitive Abilities (WJ-III) were used to measure cognitive abilities and academic achievement in order to determine a presence of a learning disability in reading. The Revised Children Manifest Anxiety Scale (RCMAS) and the Behavior Assessment System for Children (BASC-2) were used to measure emotional and behavioral factors. The responses were then compared between the RD group and the control group using *t*-tests.

Introduction

Many children with learning disabilities are affected not only by academic problems and adjustment problems as well, the latter of which are not considered with current programs. These emotional/behaviors problems do have a negative effect on their academia (McGovern et al., 2016). As a result, these children can develop anxiety disorders, low self-esteem, and even depression (Mammarella et al. 2016). This study focuses on the relationship between learning disabilities and comorbid anxiety, with the hope that school programs will soon adjust to include emotional/behavioral issues when helping children with learning disabilities.
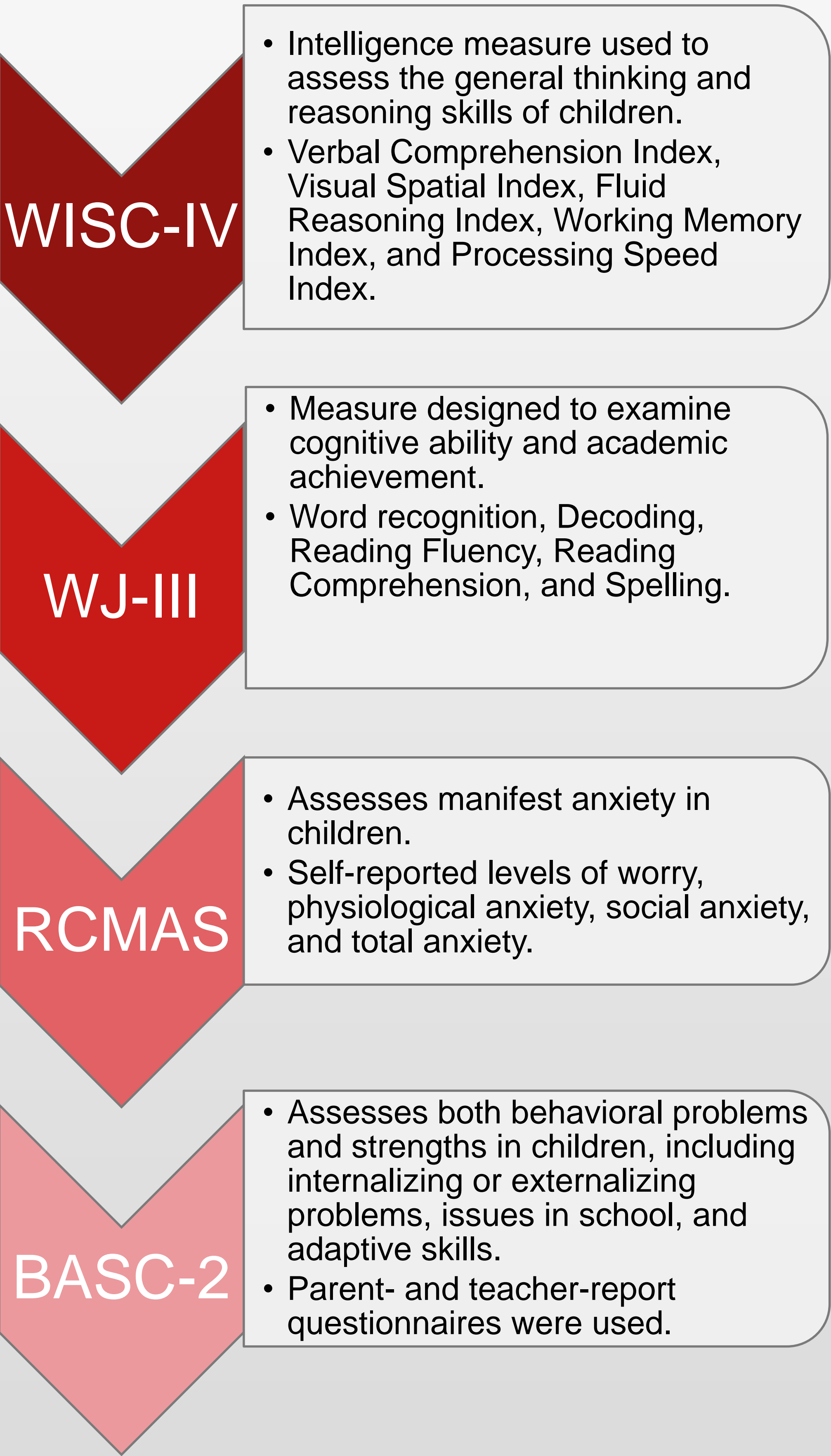
Demographics

Factor	Total Sample
Gender	
N	263
Female	46.4%, N = 122
Male	53.6%, N= 141
Age	M = 9.54, SD = 1.36
Grade	
First	2.7%, N = 7
Second	16.7%, N = 44
Third	27.8%, N = 73
Fourth	19.4%, N = 51
Fifth	17.5% N = 46
Sixth	12.9%, N = 34
Seventh	3.0%, N = 8

Hypothesis

Students with learning disabilities will exhibit higher levels of anxiety than those without learning disabilities on self-report.

Methods

A sample of 263 individuals participated in this study. RD = 99, Without RD = 164. They were recruited through multiple elementary school districts. Testing took place in a laboratory setting, in one nine-hour day including breaks. Participants were asked to complete a series of measures including: **WISC-IV, WJ-III, RCMAS,** and **BASC-2.**

WISC-IV
- Intelligence measure used to assess the general thinking and reasoning skills of children.
- Verbal Comprehension Index, Visual Spatial Index, Fluid Reasoning Index, Working Memory Index, and Processing Speed Index.

WJ-III
- Measure designed to examine cognitive ability and academic achievement.
- Word recognition, Decoding, Reading Fluency, Reading Comprehension, and Spelling.

RCMAS
- Assesses manifest anxiety in children.
- Self-reported levels of worry, physiological anxiety, social anxiety, and total anxiety.

BASC-2
- Assesses both behavioral problems and strengths in children, including internalizing or externalizing problems, issues in school, and adaptive skills.
- Parent- and teacher-report questionnaires were used.

Acknowledgments

Results

Measure		M	SD	t	Sig
P_anxiety				-1.767	.080
	RD	55.19	13.492		
	Control	51.24	10.923		
P_somat				-.163	.870
	RD	48.62	12.557		
	Control	48.28	9.768		
T_anxiety				-1.039	.301
	RD	53.31	10.029		
	Control	51.33	9.872		
T_somat				.361	.719
	RD	49.49	12.763		
	Control	50.22	8.803		
RCMAS_ Total Anxiety				-1.781	.077
	RD	46.31	10.391		
	Control	42.68	11.490		
RCMAS_ Physiological				-.993	.323
	RD	8.61	2.834		
	Control	8.07	3.071		
RCMAS_Worry/ Oversensitivity				-1.497	.137
	RD	8.47	2.866		
	Control	7.68	2.866		
RCMAS_Social Concerns/ Concentration				-2.457	.015
	RD	9.22	2.932		
	Control	7.92	2.813		

Discussion

- Children with learning disabilities show higher levels of social anxiety
- Parents are better reporters than teachers, but self report is most sensitive for anxiety

Limitations
- Possible bias in reporting of questionnaires
- 9-hour testing day with emotional behavioral measures taken last
- Social Concerns is not a pure scale

Future Implications
- Adjust school programs to include emotional and behavioral struggles

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Stress and Academic Performance in Children

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Abstract

This study examined the relationship between stress and academic outcomes in children. Stress was operationalized as the manifestation of distress based on peer relationships, social problems, and moody personality. Results indicated high trends between negative peer relationships, social problems and academic performance. Additionally, results indicated significant differences between males and females. From the significant relationships found, researchers can take preventative actions towards alleviating stress in children and help enhance their academic performance.

Introduction

Many of the factors of stress tend to include socio-ecological aspects (Arnold, Lucier-Greer, Mancini, O Neal, & Wickrama, 2014) such as personality and behavioral traits, peer relationships, and mental health.

Results from a study examining peer victimization, distress and student engagement and its effect on academics, indicate that all 4 variables, which link victimization to academic achievement, were significant (Gesten, Karver, & Wienke Tortua, 2014).

Another study showed that sex made a difference in coping strategies with stress and academic performance, indicating that girls use more help-seeking skills and support from peers, whereas males did not look to use these strategies (Dubow & Preuss 2003).

Hypotheses

H1: Stressors, operationalized as negative peer relationships and peer victimization, would be related to concurrent poor school performance.

H2: Early stressors of negative peer relationships at age 5 would predict negative school performance several years later.

H3: Children's personality, specifically moodiness, would be related to all stressors at both ages and to academic performance.

Methods

Participants:
- 120 5-year-old twins were tested during the first round of testing and later 109 of those same children were tested during the follow-up.

Procedure:
- During 5-year-old testing, parent-report measures and one self-report measure were used to obtain data on social problems and peer relationships.
- During follow-up testing, parent-report measures and one self-report measure were again used to obtain data on social problems, peer relationships/victimization, and academic performance.

Measures

Behavioral Style Questionnaire (BSQ; McDevitt & Carey, 1978): The BSQ is a parent-report measure of children's temperamental characteristics at age 5. For the current study the subscale for **moodiness** was used.

Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001): The CBCL is a parent-rated measure of children's problem behaviors at both age 5 and at follow-up . For the purpose of this study, the **social problems subscale** was used, as well as a single item that asked how well does the child get along with other kids.

Family Climate Inventory (FCI-P; Kurdek, Fine, & Sinclair, 1995): The FCI-P is a parent-rated questionnaire, done at age 5, that asks parents to provide a rating of the climate in their family's household. For this study, only the **peer norms subscale** was used.

Strengths & Difficulties Questionnaire (SDQ; Goodman, 1997): The SDQ is a child-rated questionnaire, used to measure problem behaviors during follow-up testing. For the purpose of this study, only **item #19** was used which was "Other children often pick on me or bully me."

Pictorial Scale of Perceived Competence and Social Acceptance (PSPCA; Harter & Pike, 1980): The PSPCA is a child-rated measure of self-esteem at age 5. For the current study **the peer acceptance subscale** was used.

School Achievement (CBCL; Achenbach & Rescorla, 2001): The CBCL was used during follow-up to obtain children's **grades**.

Table 1 Regression of Academic Performance on CBCL and SDQ at Follow-up

	BOYS			GIRLS		
	Beta	t	p	Beta	t	p
CBCL "Gets along with other kids"	.124	.728	.470	**.228**	**2.146**	**.035**
CBCL Social Problems	.062	.378	.707	**-.368**	**-3.378**	**.001**
SDQ "Gets bullied"	.092	.609	.546	.122	1.127	.263

Table 2 Regression of Academic Performance on BSQ, CBCL, FCI & PSPCA at 5

	BOYS			GIRLS		
	Beta	t	p	Beta	t	p
BSQ Moodiness	**-.498**	**-2.767**	**.008**	-.085	-.749	.457
CBCL Social Problems	.204	1.189	.241	**-.244**	**-2.047**	**.045**
FCI Peers	.044	.278	.782	.082	.728	.469
PSPCA Peer Acceptance	-.247	-1.516	.137	.219	1.859	.067

Figure 1 Correlation Coefficients of Moodiness with Academics, CBCL Subscale by Sex

** p < .01
* p < .05
+ p < .10
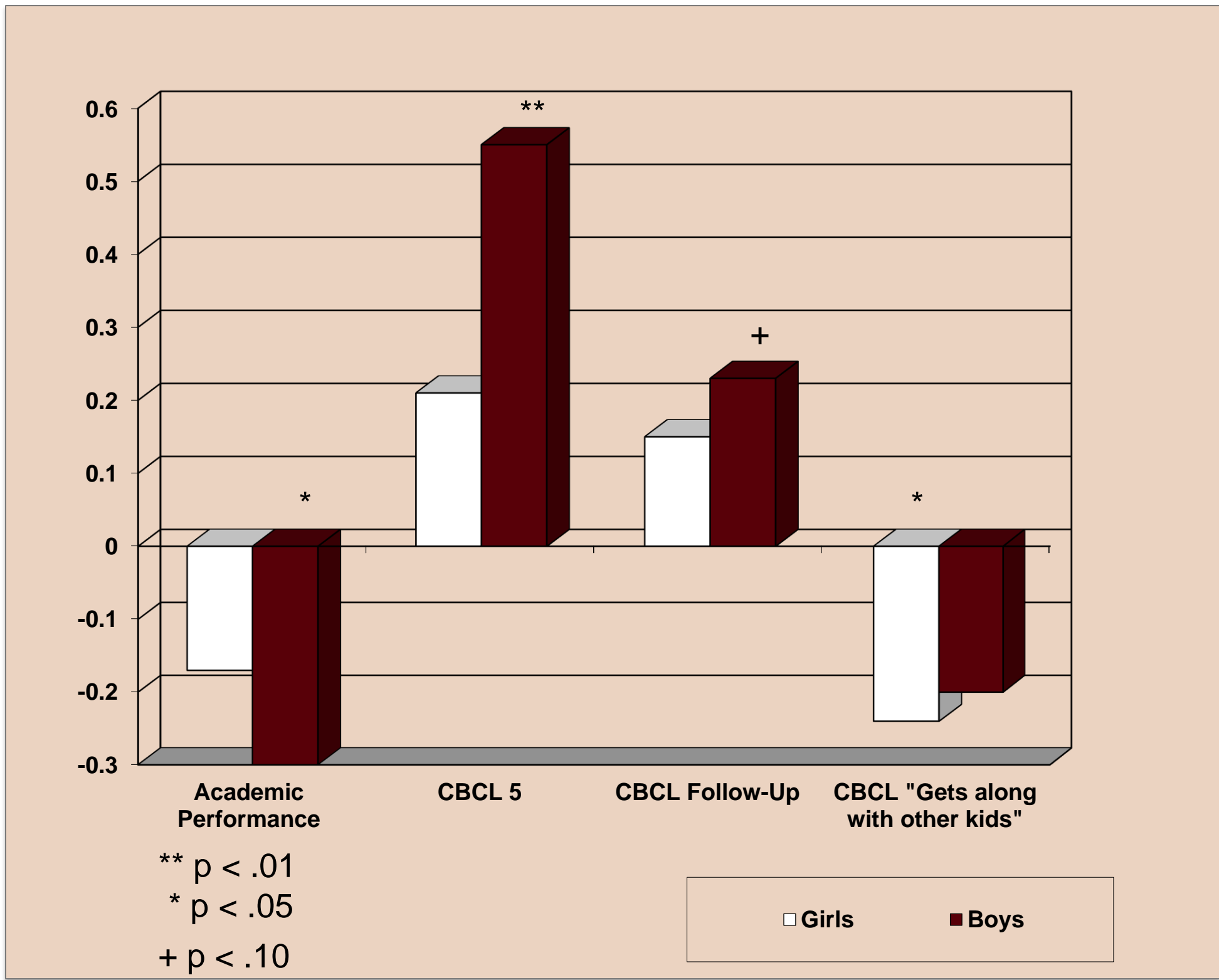
Results

H1: 1st Regression showed no significant relationship, but noted a possible trend F(3,124) = 2.39, p =.072.
- A second regression was run to examine sex effects, showing that girls with higher social problems and that did not get along well with others was related to poor school performance. See Table 1.

H2: 1st Regression showed no significant relationship, but noted a trend F(4,114) = 2.37, p=.057.
- A second regression was run to examine sex effects, showing that boys who were rated by their parents as moody had more negative school performance. See Table 2.

H3: 1st Correlation Moodiness showed a significant relationship with the question "how well does your child get along with other children?" r = -.22, p = .012, social problems at age 5 r = .400, p = < .001, social problems at follow-up r = .199, p = .024, PSPCA peer acceptance r = -.190, p = .033, and school performance r = -.240, p = .006.
- A second correlation was run looking for differences in sex and indicated that for girls moodiness correlated with the question from the CBCL and for males moodiness correlated with social problems at age 5 and school performance. See Figure 1.

Discussion

Results from this study indicated that both hypothesis 1 and 2 had trends at age 5 and at follow-up that could possibly link moodiness and negative peer relationships to poor school performance. Results from hypothesis 3 indicated major differences between boys and girls, noting that for girls, moodiness had a significant negative relationship with getting along with others and social problems. Moodiness for boys however, had a significant negative relationship only with academic performance.

Limitations:
- Parent report measures/bias
- Parent ratings of grades were not based on actual letter grades, teacher reports of grades would be better.

Strengths:
- Longitudinal study design
- Multiple reporters

Implications:
- Take preventative actions towards alleviating stress in children to help enhance their academic performance.

Acknowledgements

SOCIAL FACTORS AFFECTING ATTITUDES TOWARD HISPANIC IMMIGRATION IN SOUTHERN ILLINOIS

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Abstract

The purpose of my study is to investigate the social factors that influence public opinion concerning, and attitudes toward, Hispanic immigration in southern Illinois. Independent variables that affect views on immigration policy discussed in this paper include: the majority's economic outlook, education, a sense of cultural threat and a threat of crime posed by Hispanics. Other independent variables include demographic information such as political ideology, race, age, and sex. The overall significant findings were that despite contact with Hispanics people who thought Hispanics were good for the U.S. economy had more favorable immigration attitudes that those who didn't.

Hypothesis

White majority contact with Hispanic minorities increases the majority's bias toward Hispanic minorities in Southern Illinois.
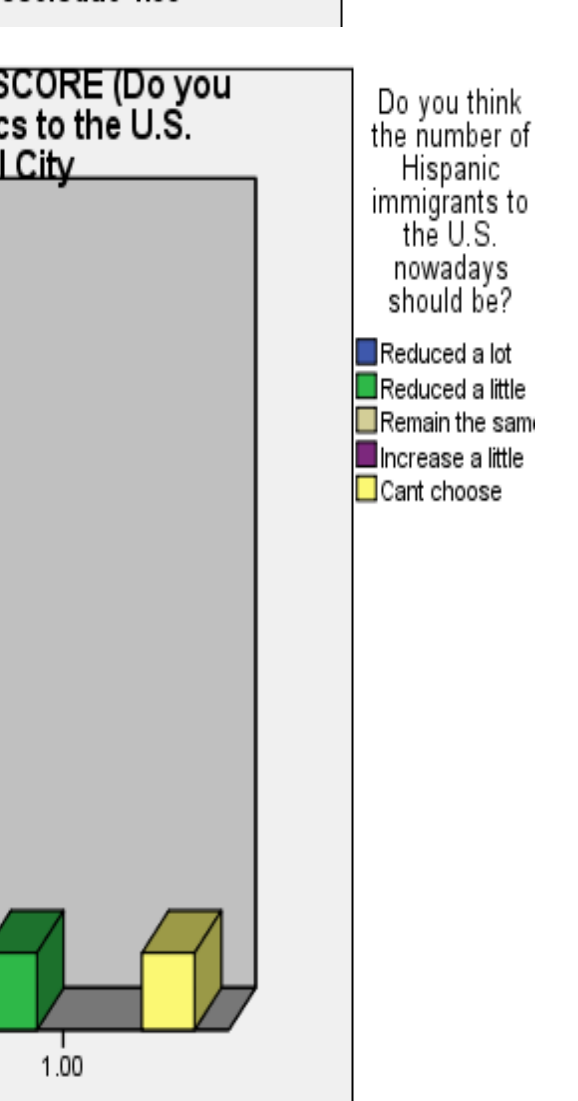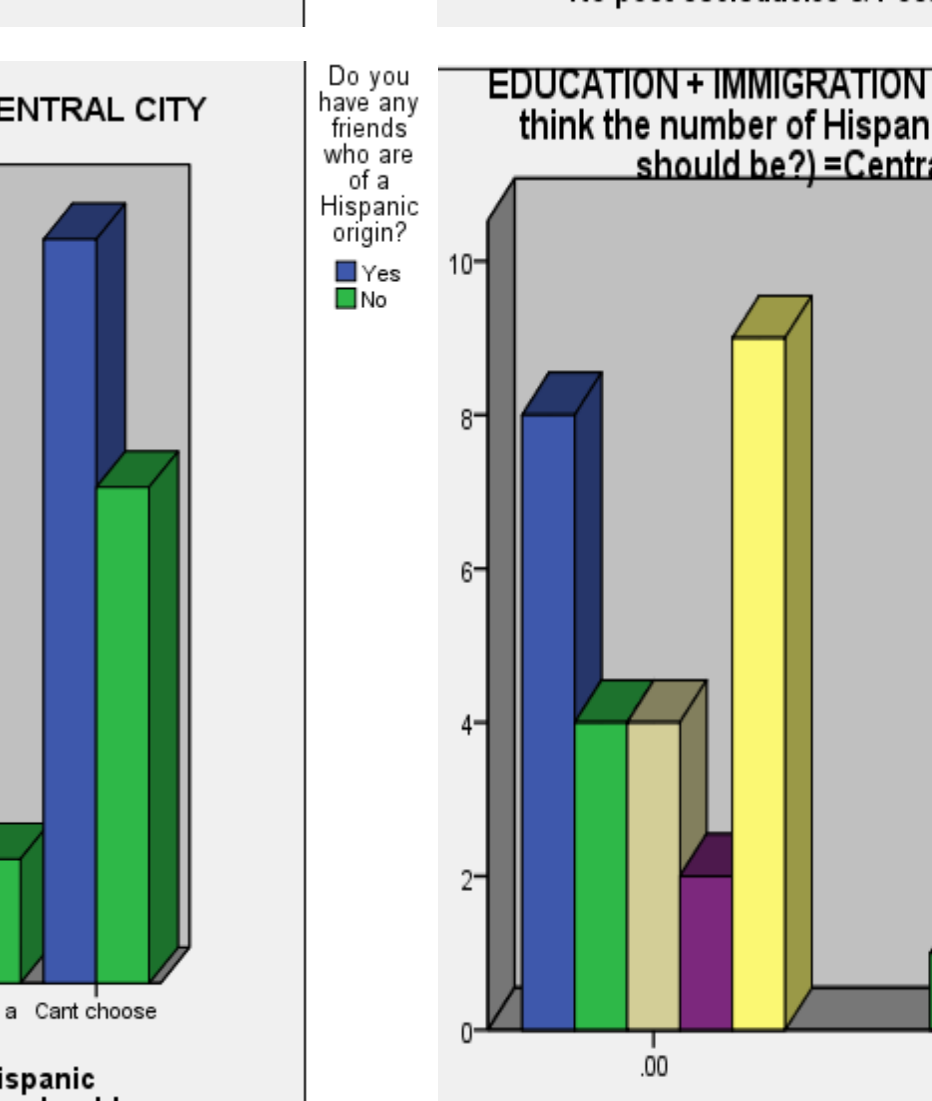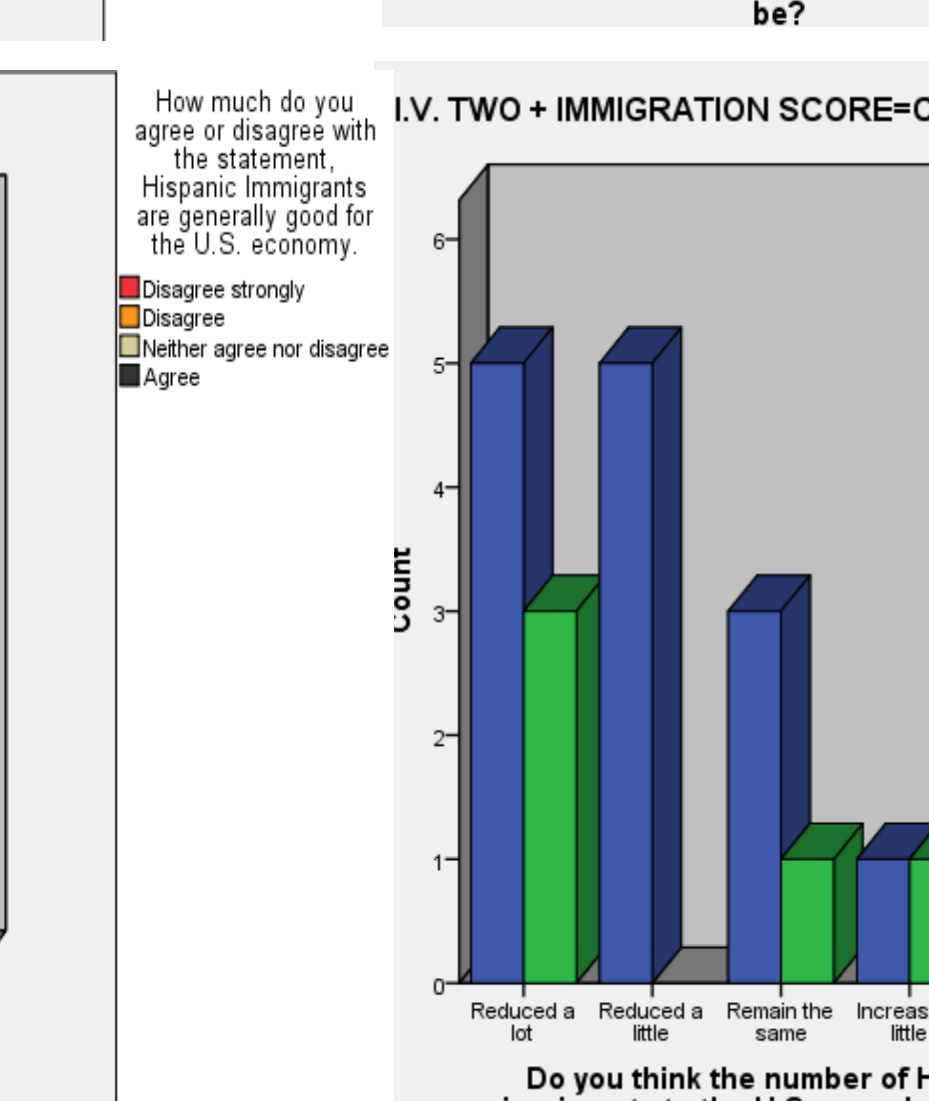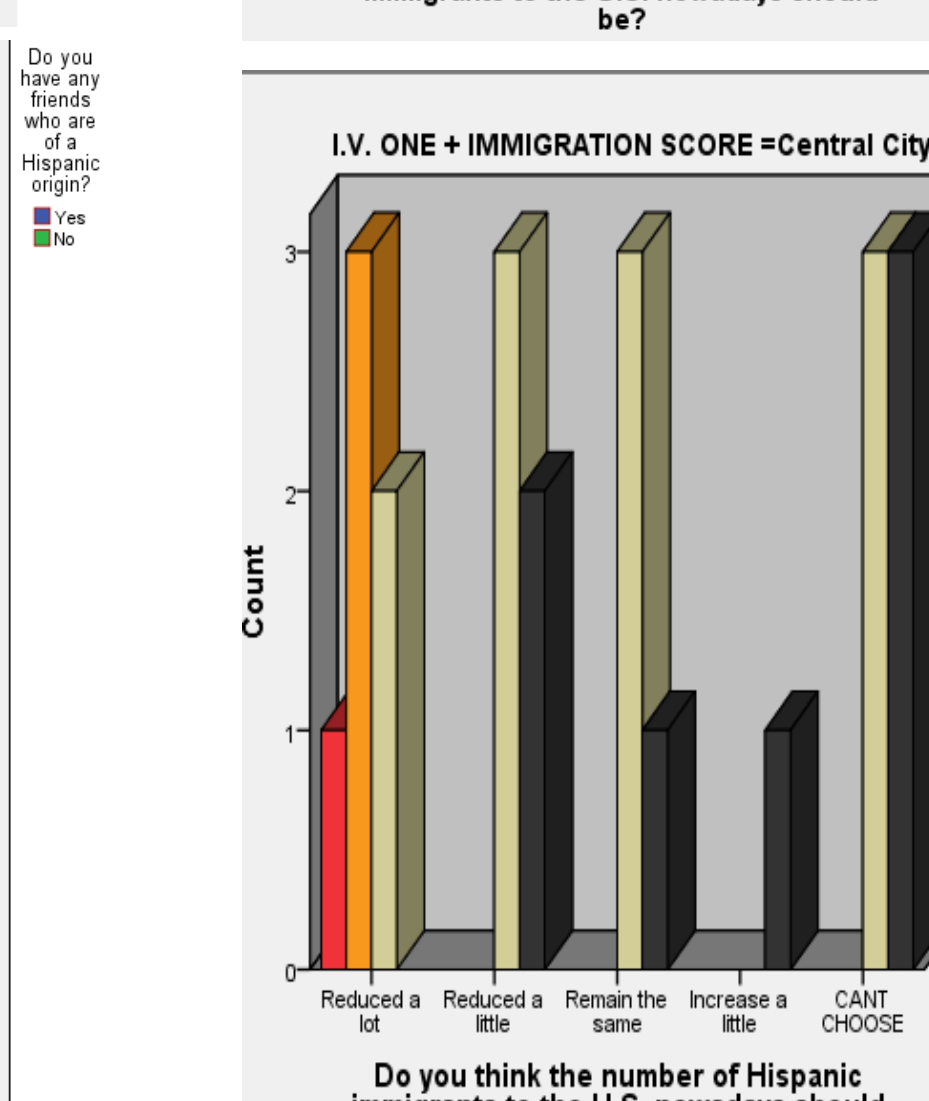
Key Concepts

➢ **Contact Theory -** contact with members of an "outgroup" would reduce prejudice among the ethnic majority (Allport's (1954)

➢ **Group threat theory** - threats to the dominant group's position by immigrants are the primary source of antagonism and anti-immigration attitudes (Dixon and Rosenbaum 2004)

Demographics / Methods

Comparative case study of two towns/Surveys: door to door using <u>multi-level cluster sampling strategy.</u>

COBDEN N: 26	DEMOGRAPHIC DATA OF RESPONDENTS	CENTRAL CITY N: 29
18-54 years: 19.2% 55-75+ years: 80.8%	AGE	18-54 years: 55.2% 55-75+ years: 44.8%
Male: 26.9% Female: 73.1%	SEX	Male: 34.5% Female: 65.5%
White: 96.1% Other: 3.9%	RACE	White: 93.1% Black: 6.9%
HS or less: 46.2% Trade School: 3.9% Associates or Bachelors: 30.8% Graduate degree: 19.2%	EDUCATION	HS or less: 58.6% Trade School: 24.1% Associates or Bachelors: 17.2% Graduate degree: .0%
Republican: 15.4% Democrat: 69.2% independent: 11.5%	POLITICAL IDENTIFICATION	Republican: 24.1% Democrat: 44.8% Independent: 31%
1,157 (POPULATION) 518 (HOUSEHOLDS)	TOTAL TOWN POPULATION & HOUSEHOLDS	1,172 (POPULATION) 538 (HOUSEHOLDS)

Results

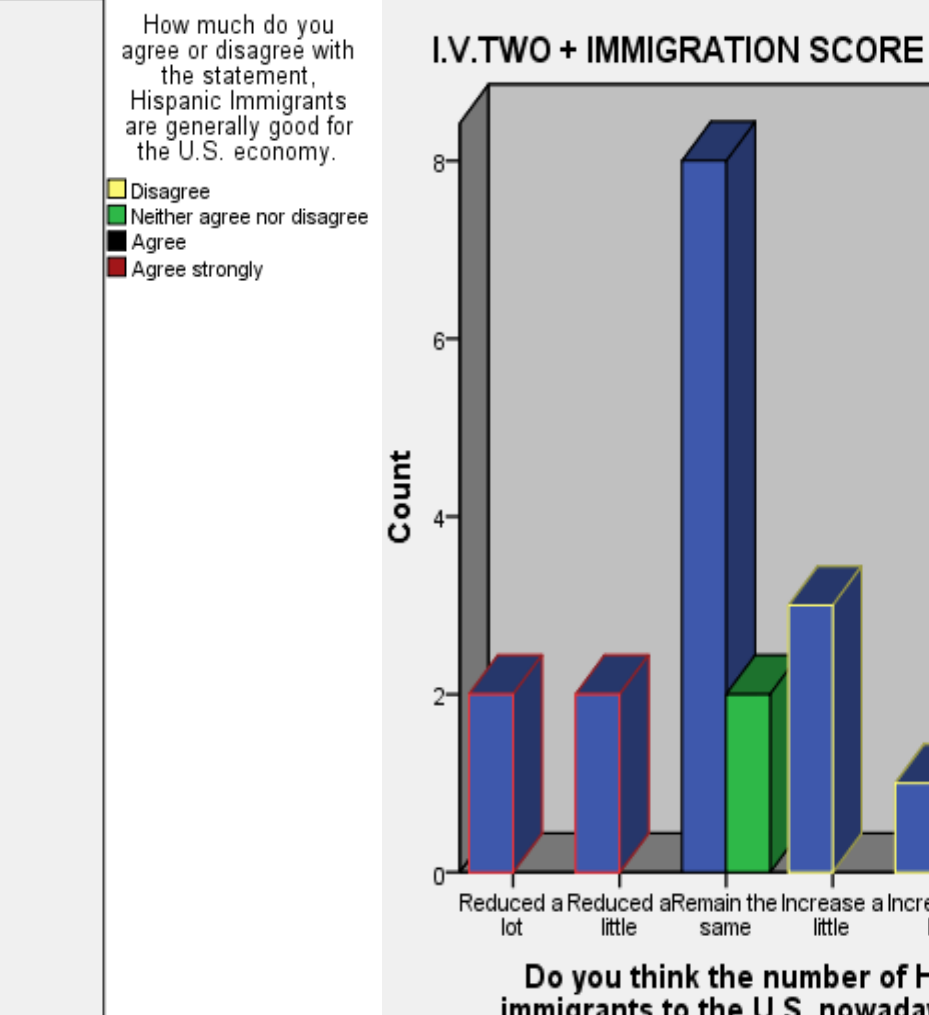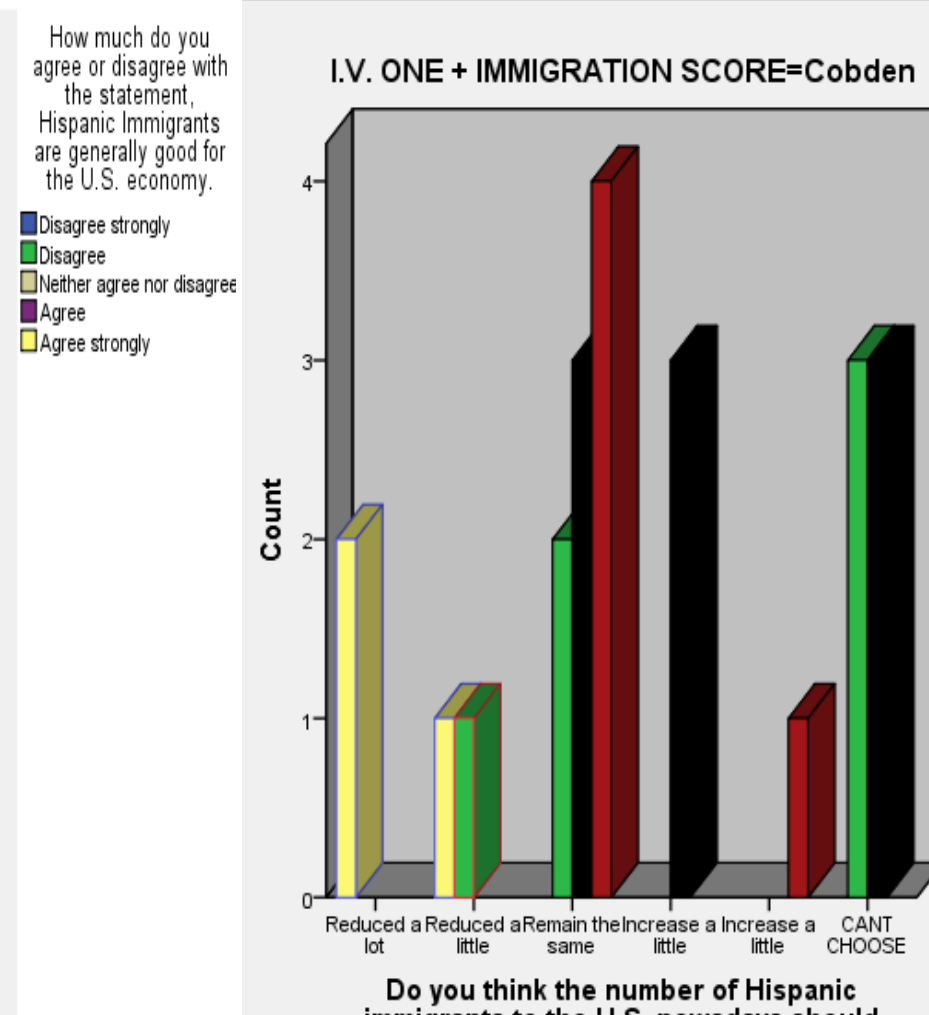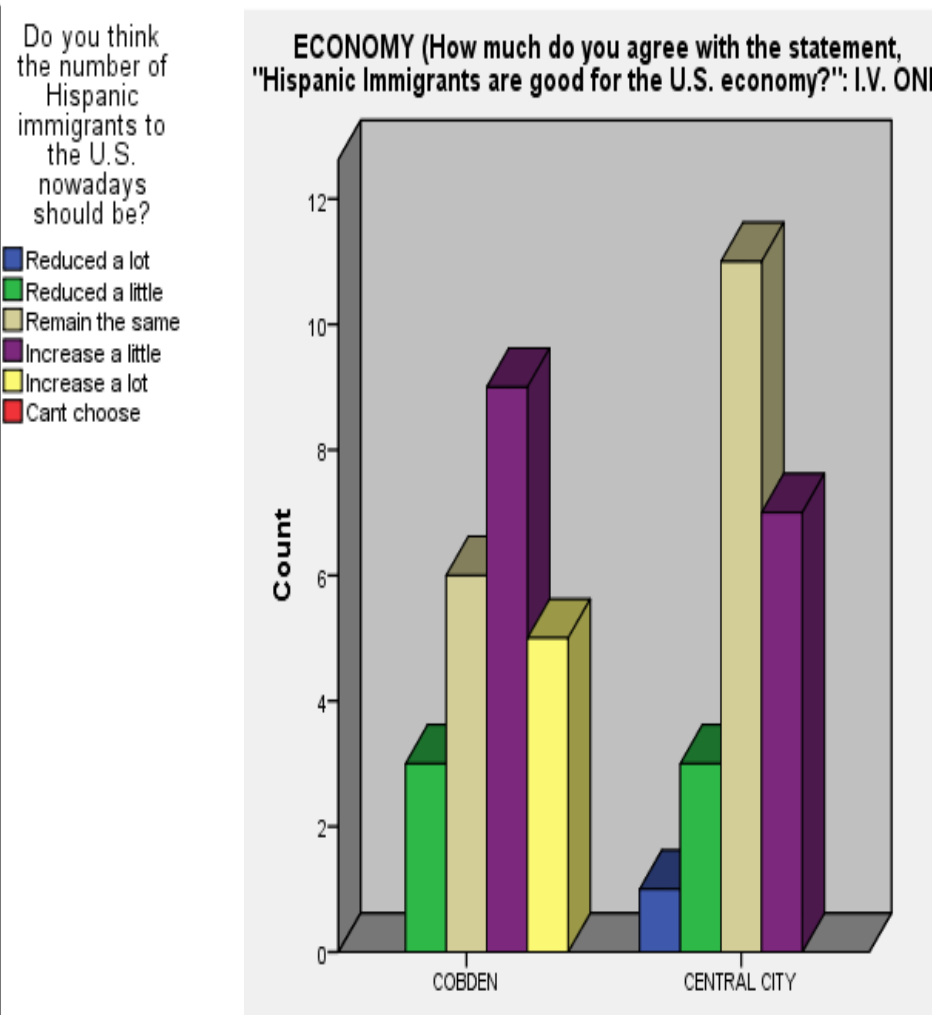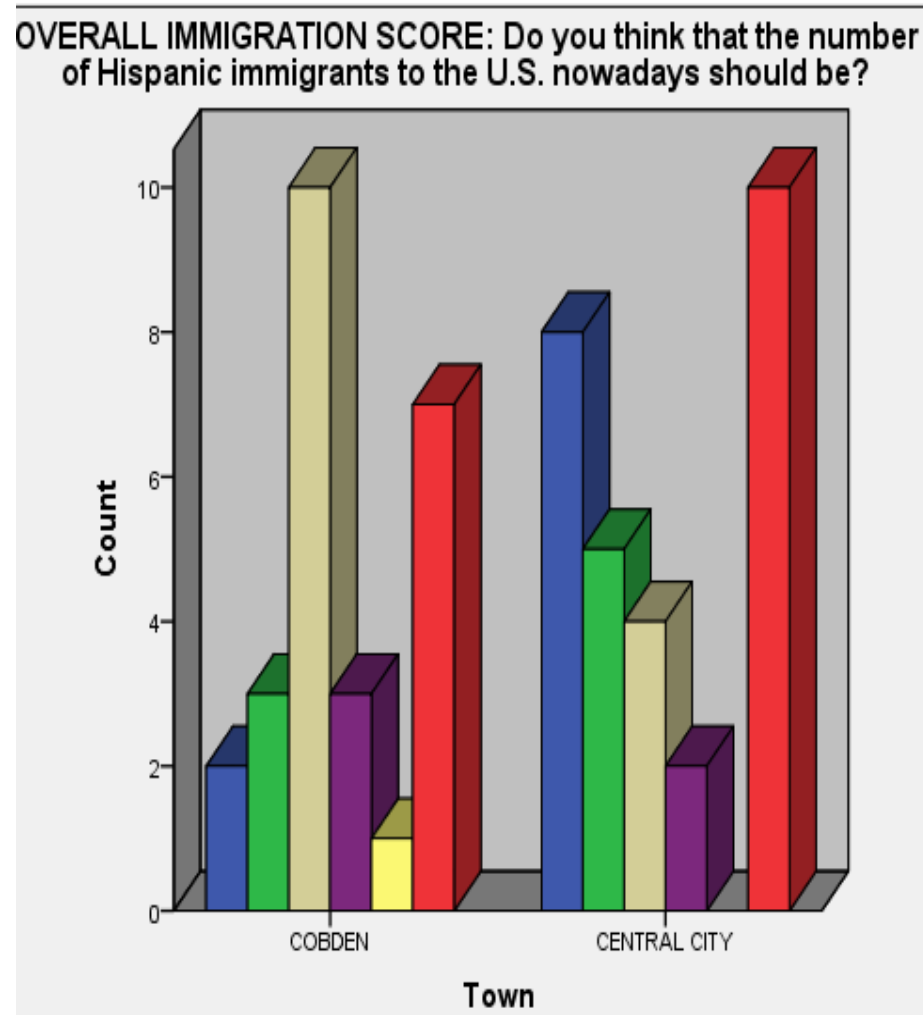| COBDEN, IL		CENTRAL CITY, IL
REDUCE: 19.2% INCREASE: 15.3%	TOTAL IMMIGRATION SCORE	REDUCE: 44.8% INCREASE: 6.9%
AGREE: 13% DISAGREE: 60.8%	I.V. ONE (ARE HISP. BAD FOR ECONOMY??)	AGREE: 18% DISAGREE: 31%
AGREE: 100% (sought Hispanic reduction) DISAGREE: 20% (sought Hispanic increase ALOT)	I.V. ONE + IMMIGRATION SCORE : (SCORE FOR THOSE WHO AGREED AND DISAGREED THAT HISPANICS WERE BAD FOR ECONOMY)	AGREE: 71.4% (sought Hispanic reduction)&28.6% (sought Hispanic increase) DISAGREE: 14% (sought Hispanic increase ALOT)
PEARSON'S R = .835. PERCIEVE HISPANICS AS BAD FOR ECON. *GREATER DECREASE*	BAD FOR THE ECONOMY CORRELATION COEFFECIENT/REGRESSION: R² = .782	PEARSON'S R = .389. PERCIEVE HISPANICS AS BAD FOR ECON. *LESSER DECREASE*
COBDEN: 80.8%=Yes	I.V. TWO (CONTACT - DO YOU HAVE HISPANIC FRIENDS)	CENTRAL CITY:69%=Yes
19% OF 80.8% DECREASE	I.V. TWO+IMMIGRATION SCORE	50% OF 69% DECREASE
30.8% (19.2% of total are Graduate degrees)	I.V. THREE (EDUCATION-POSTSECONDARY DEGREE)	6.9% (No Graduate degrees)
DECREASE: 0.00% INCREASE: 37.5%	I.V. THREE + IMMIGRATION SCORE	DECREASE: 27.8% INCREASE: 5.6%

Conclusion

➢ 27.8% of without a post-secondary degree supported decreasing Hispanic immigration. 0.00% of those with a post-secondary degree in the same town who did not.

➢ Mayda (2006) who after conducting a cross-national study found that lower-skilled natives were much more likely to hold anti- immigration views in regions that have a higher share of lower-skilled immigrants.

➢ In this case natives who held lower degrees would in turn have to compete with Hispanic immigrants in Cobden for jobs that do not require any sort of post-secondary degree.

➢ Attitudes toward Hispanic immigration in Southern Illinois are predicated on the overall perceptions of the socio-economic contribution, or burden, a minority group is perceived to bring with it.

Limitations

It was a self-administered survey that included postage for respondents to send back. Only 1/4 of surveys were returned. Also, some surveys were not analyzed since they came in much later.

Future Research

Since the economic need for migrant labor in Cobden might have mitigated negative stereotypes toward the town's Hispanic minority group future research could add a third "control town" to the comparative case study. This third town would have a large Hispanic population, comparable to Cobden, but would differ in that the Hispanic population would not be instrumental in the towns economy in any way positive or negative. This would capture overall immigration attitudes that might not be affected by anything else other than contact between the majority and minority group.

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Exploring a Protective Factor that Influences Positive Outcomes for Victims of Physical Child Abuse

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Abstract

The purpose of the current study was to explore whether parental emotional support influences positive outcomes for victims of physical child abuse. Using the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) Assessments 0-18 data set, 973 individuals from the ages of 12-16 years were studied to determine the impact of parental emotional support as a protective factor related to positive outcomes. Physical abuse experienced in childhood and parental emotional support were chosen as the independent variables and positive outcomes, including academic achievement, no history of delinquency and employment status, were the dependent variables. ANCOVAs were run to study the impact of parental emotional support on victims of physical child abuse for each outcome. Parental emotional support did not significantly impact any of the positive outcomes for females. However, parental emotional support was significant in academic achievement and employment for males. There were no significant findings with the outcome of no delinquency.

Background

- Child abuse has been associated with many negative consequences in adolescents and adults who were abused as children

- Past research has found links between physical child abuse and negative outcomes such as, delinquency and criminal behavior, negative educational outcomes, and unemployment in adulthood. (Petersen, A. C., Joseph, J., & Feit, M. N. 2014)

- Protective factors for resilience following child abuse and neglect that have been studied are stable supportive peer, family and social relationships. (Rutter, M. 1987)

- Although there has been some research already on the role of protective factors, many have failed to identify if there are differences between males and females.

- In this study, this research gap will be investigated by examining and understanding the role of emotional support in outcomes in the both sexes of victims of physical child abuse.

Research Questions

- What impact do protective factors have for victims of physical child abuse when comparing males and females' expected and actual outcomes?

Methods

- Using the LONGSCAN Assessments 0-18 data set, variables were pulled to assess physical child abuse, parental emotional support (protective factor) and positive outcomes (**educational, employment, and no history of criminal behavior**).

- The sample size consisted of 973 participants from the ages of twelve to sixteen.

- 51.7 % were female and 48.3% male.

- ANCOVAs were run to was examine the impact of parental emotional support on positive outcomes comparing each sex.

Demographics

Figure 1. Sex by Age of Participants in Sample
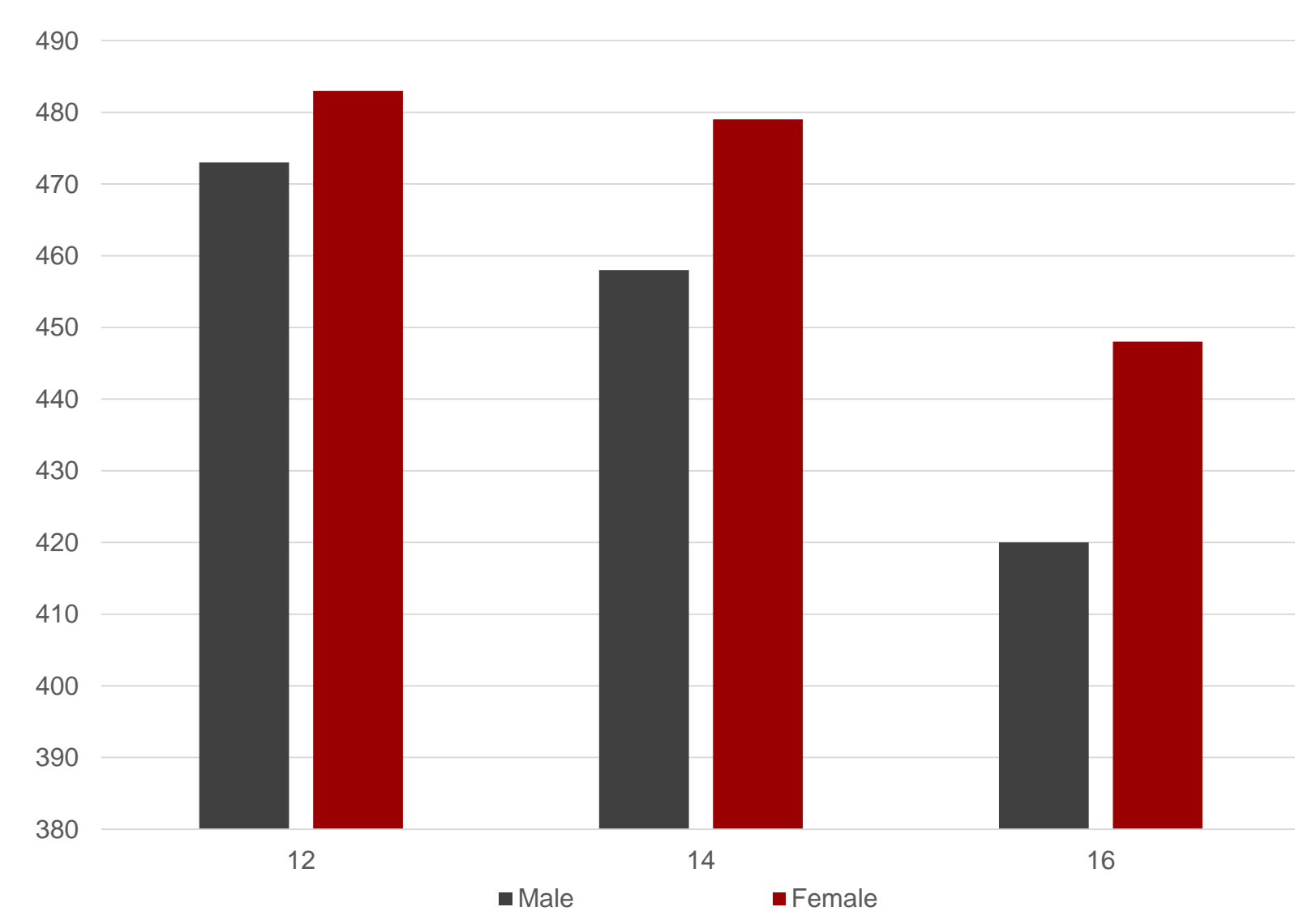
Results

- Results showed that in among the three positive outcomes explored, delinquency, academic achievement and employment , parental emotional support impacted the outcomes for males in both academic achievement and employment .

- There was no significant outcomes for delinquency for either sex.

- There were no significant findings of impact on any of the outcomes for females.

Results

Table 1. Univariate Analysis of Variance of Criminal Behavior for Victims of Physical Child Abuse

		df	F
Male	Abuse	3	.528
	Parental Support	16	.704
	Abuse + Support	4	.924
Female	Abuse	3	1.634
	Parental Support	12	.945
	Abuse + Support	17	.988

Table 2. Univariate Analysis of Variance of Academic Achievement for Victims of Physical Child Abuse

		df	F
Male	Abuse	5	2.029
	Parental Support	17	3.731***
	Abuse + Support	17	3.350***
Female	Abuse	3	4.560**
	Parental Support	14	.884
	Abuse + Support	19	1.199

*p<.05 **p<.01, ***p<.001

Table 3. Univariate Analysis of Variance of Employment for Victims of Physical Child Abuse

		df	F
Male	Abuse	3	2.665*
	Parental Support	16	2.077*
	Abuse + Support	14	1.715
Female	Abuse	3	.356
	Parental Support	12	.197
	Abuse + Support	16	.223

Discussion

As found in previous literature, physical abuse made a negative impact on future criminal behavior. The protective factor of emotional parental support did improve outcomes in academic achievement for males but not in delinquency or employment. Parental emotional support did not impact outcomes for females who experienced physical abuse, which is contradictory to previous research.

- **Limitations**
  - Only measured one protective factor (parental emotional support)
  - Used self report measures which could include response bias

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Understanding Neuroanatomy in Naked Mole-Rats (*Heterocephlus glaber*): Dentition

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Introduction

Naked mole-rats (*Heterocephlus glaber*) are a subterranean species found in Northeastern parts of Africa. They have very small eyes and ears, but have fairly large external incisors (teeth). This rodent caught researchers attention due to the organization of their somatosensory cortex (S1). The somatosensory cortex receives all sensory input from the body. Naked mole-rats however, have a unique S1 that is in fact 50% larger than other rats and is primarily devoted to their incisors (30%).
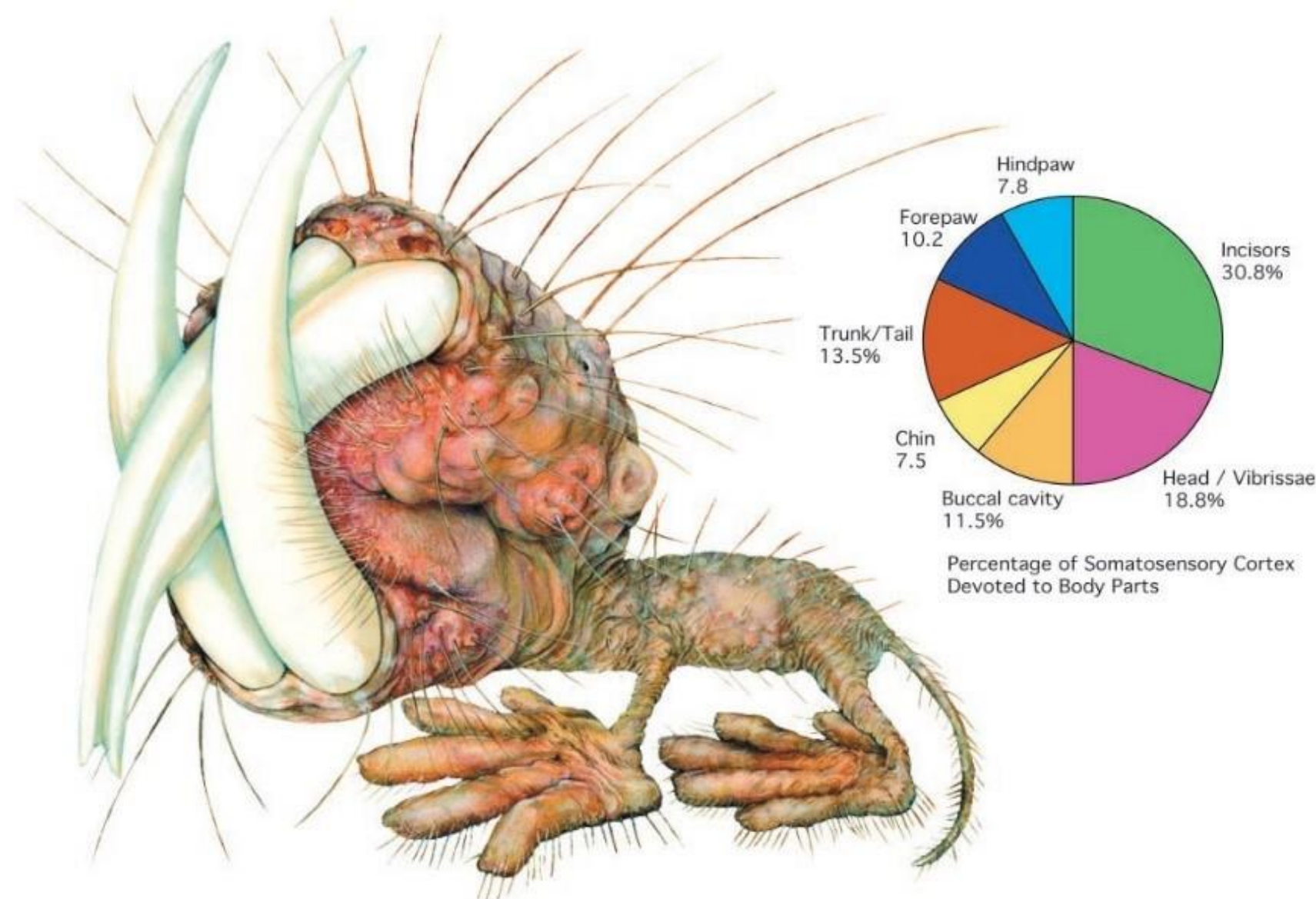
Purpose

Past researchers have mapped the **projections** in naked mole rats from the **brainstem to their incisors** and the **somatosensory cortex to the thalamus**. Therefore, in the present study, we investigated the **projections from the thalamus to the somatosensory cortex and brainstem**.

The data from this study will contribute to our understanding of the naked mole-rats sensory system which can then be extended to understand human tooth loss/pain.

Key Terms

Heterocephalus glaber
- *Heterocephalus* – "odd-looking" head
- *glaber* – smooth skin

Somatosensory cortex
- receives all sensory input from the body.

Neuronal tract tracers
- used to identify the location and to characterize the types of neuronal pathways.

Ventral posteromedial Nucleus (VPM)
- convey sensory information from the face and oral cavity.

Methods

Animals
- Two adult naked mole rats were used for this study. All procedures were approved by the SIU IACUC.

Surgical Procedures
- Animals were anesthetized and using glass micropipettes neural tract tracers were injected in the posteromedial thalamus of the animal's brain.

Choice of tracer
- Anterograde tracer BDA 10K to show projections from the thalamus to the somatosensory cortex and retrograde axonal tracer BDA 3K to show projections from the thalamus to the brainstem.

A stereotaxic atlas is used to plan tract tracing experiments. The highlighted circle indicates where the tract tracer was injected into the Naked Mole-Rat brain

Figure 1- Naked Mole-Rat.

Figure 2- Stereotaxic Atlas of Naked Mole Rat Brain.

Analyzing the Brain
- After 14 days, animals were sacrificed and brains were removed and sliced using a sliding microtome (approx. 40 µm).
- Tissue sections were mounted onto glass slides for microscopy.

A typical NMR brain/brainstem 14 days after tract tracing injection. Brains were frozen and sliced at 40 µm for histological staining, like CV (Figure 4).

Staining
- Sections were then stained with Acetylcholinesterase (AChE), Vector VIP Peroxidase (HRP) and Cresyl Violet Acetate.

CV-stained sections are used to identify brain regions. We made a CV series for each brain.
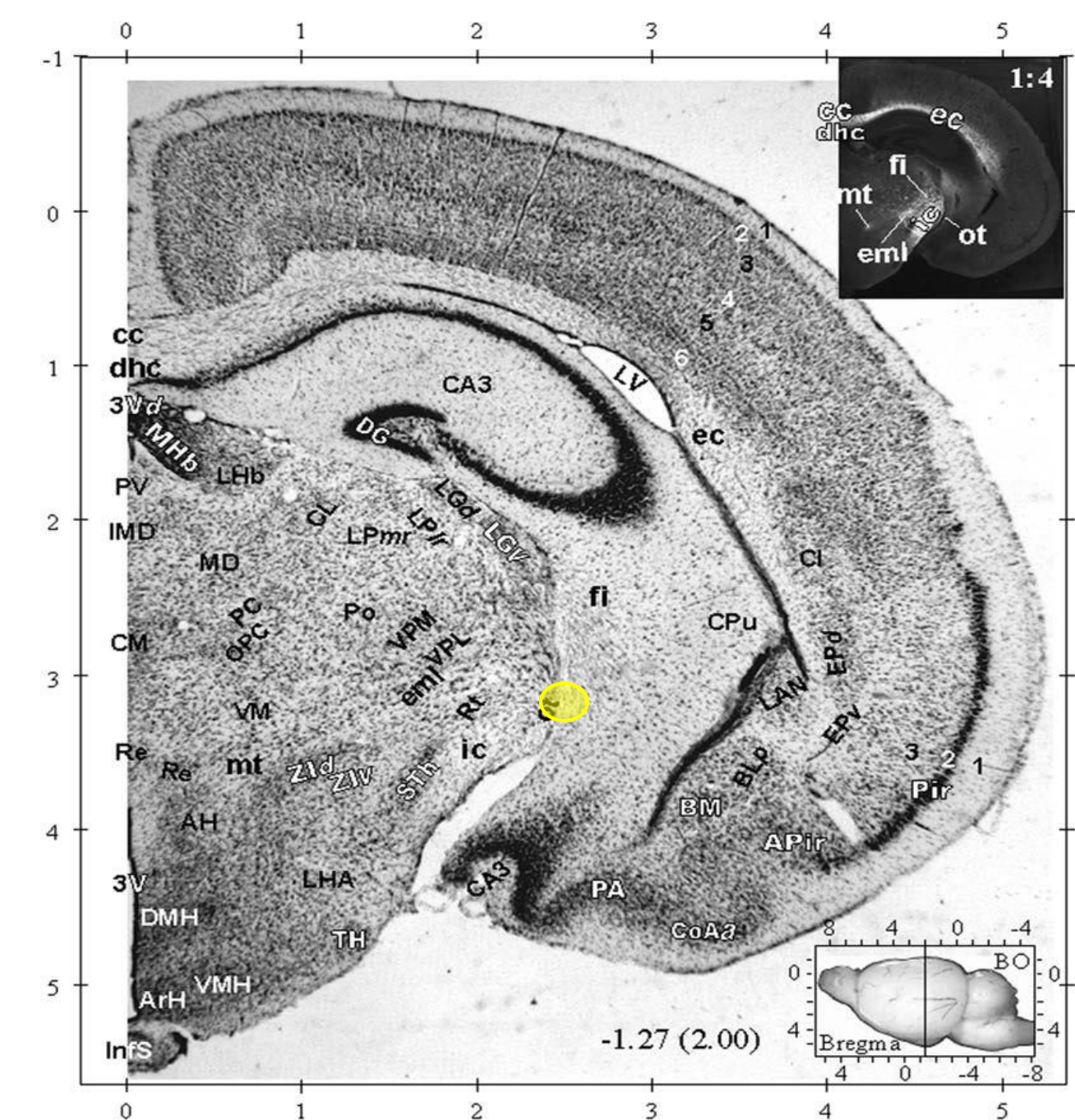

Figure 3- Naked Mole-Rat Brain.

Figure 4 - Cresyl Violet (CV) Stained Brain Sections.

Conclusions

During the McNair research experience, I have learned several important laboratory skills that I will continue to use in our future research:

- Working with Naked Mole Rats
- Histology
  - Preparing brains for cutting
  - Cutting brain tissue
  - Tissue-staining techniques
  - Mounting tissue sections
- Preparing laboratory solutions for perfusion and tissue processing

Limitations
- Our research is in a very early phase and our results were limited due to experimental constraints (time, new protocols, etc.). However, work on this project is ongoing.

Future Directions

- We plan to continue working with naked mole-rats as well as injecting neuronal tract tracing in their brains. Once we are able to complete our tract tracing experiments we will have laid down a foundation that we can now refer back to.

- In the future, we will remove an incisor in adult mole-rats as well and examine changes in innervation of the sensory structures in the cortex, thalamus, and brain stem. These experiments will rely on the current tract tracing studies.

- This is beneficial because it can help us better understand the plasticity of the cortex and gain a better understanding of tooth loss and phantom pain in adult mole-rats as well as humans.

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Acknowledgements

Examination of INSR and IGF1R Function in Murine Granulosa Cells

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ABSTRACT

The goal of this study was to examine the INSR/IGF1R signaling pathways within granulosa cells (GCs) in the rodent model. INSR is involved in primary follicle transition, while IGF1R is responsible for folliculogenesis. Determining the genes affected by the signaling pathway could allow us to understand what malfunctions can lead to infertility. This was done by superovulating three strains of mice: wild type, IGF1R knockout, and INSR/IGF1R double knockout (DKO) mice. The RNA of these mice was collected and isolated for RNA-sequencing. Differences in gene expression in the three strains of mice could represent the cause of ovulation failure. Many novel genes were identified in our analysis that await future characterization of their role in ovulation and insulin related diseases.

INTRODUCTION

Insulin signaling involves four ligands: insulin 1, insulin 2, insulin-like growth factor 1 (IGF1), and insulin-like growth factor 2 (IGF2). Insulin signaling has been well documented in reproductive systems. Mice with IGF1 null mutations are infertile with normal follicle development up to late prenatal stages (1). IGF1R is also essential for GC survival, and its deletion in early stages of follicular development results in increased apoptosis. Within these mice, folliculogenesis is blocked at the secondary stage, resulting in loss of fertility (2).

Preliminary work done by Dr. MacLean's lab has shown that double knockout INSR/IGF1R mice at the onset of ovulation are infertile and do not undergo normal folliculogenesis.
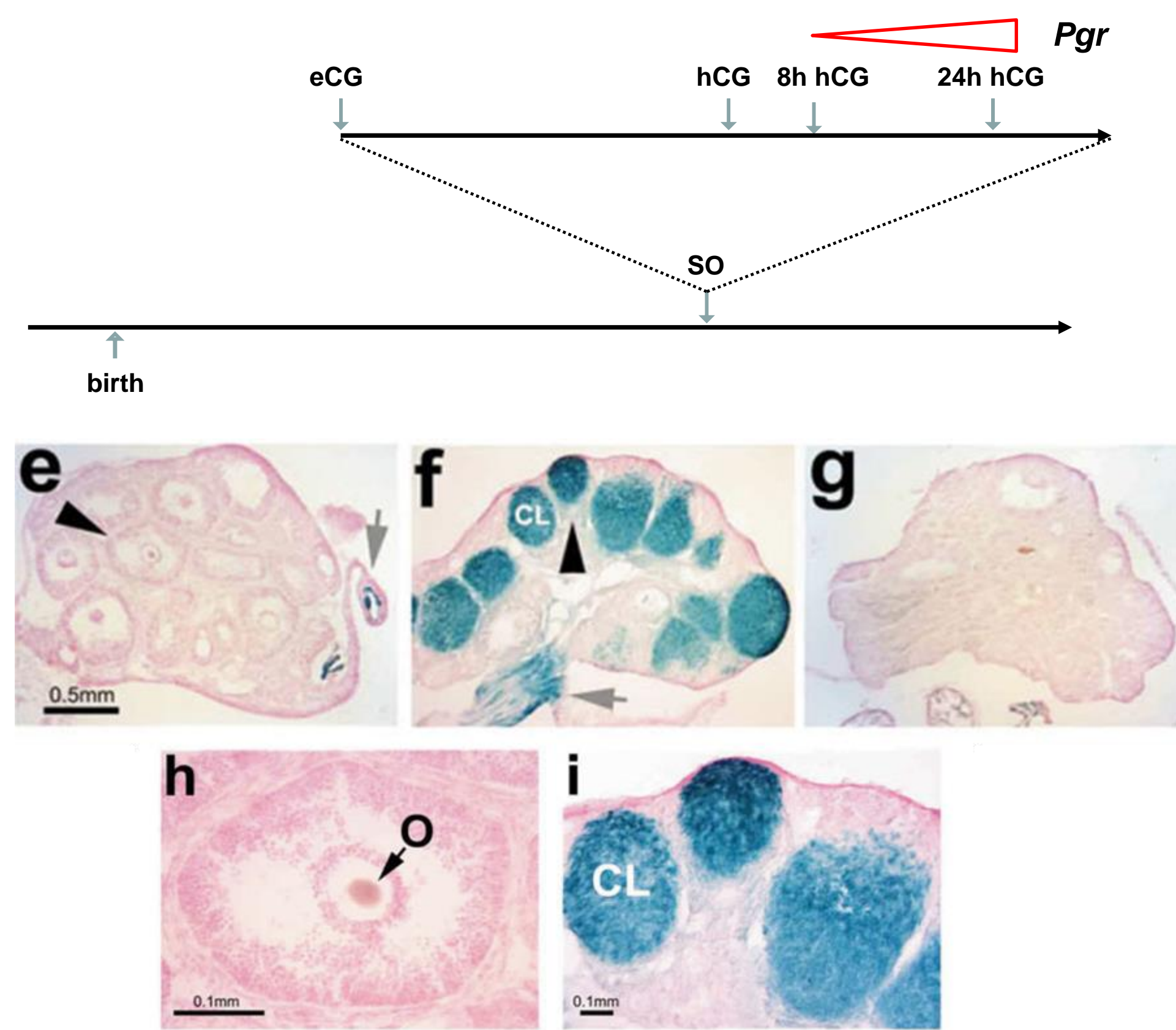
RESULTS

Figure 1. Superovulation process. Superovulation allows mice to ovulate a greater number of eggs. In the superovulation process, female mice are injected with eCG and hCG. *Pgr* starts being expressed at around 8h post hCG injection, and it steadily increases throughout ovulation and formation of Corpus Luteum.
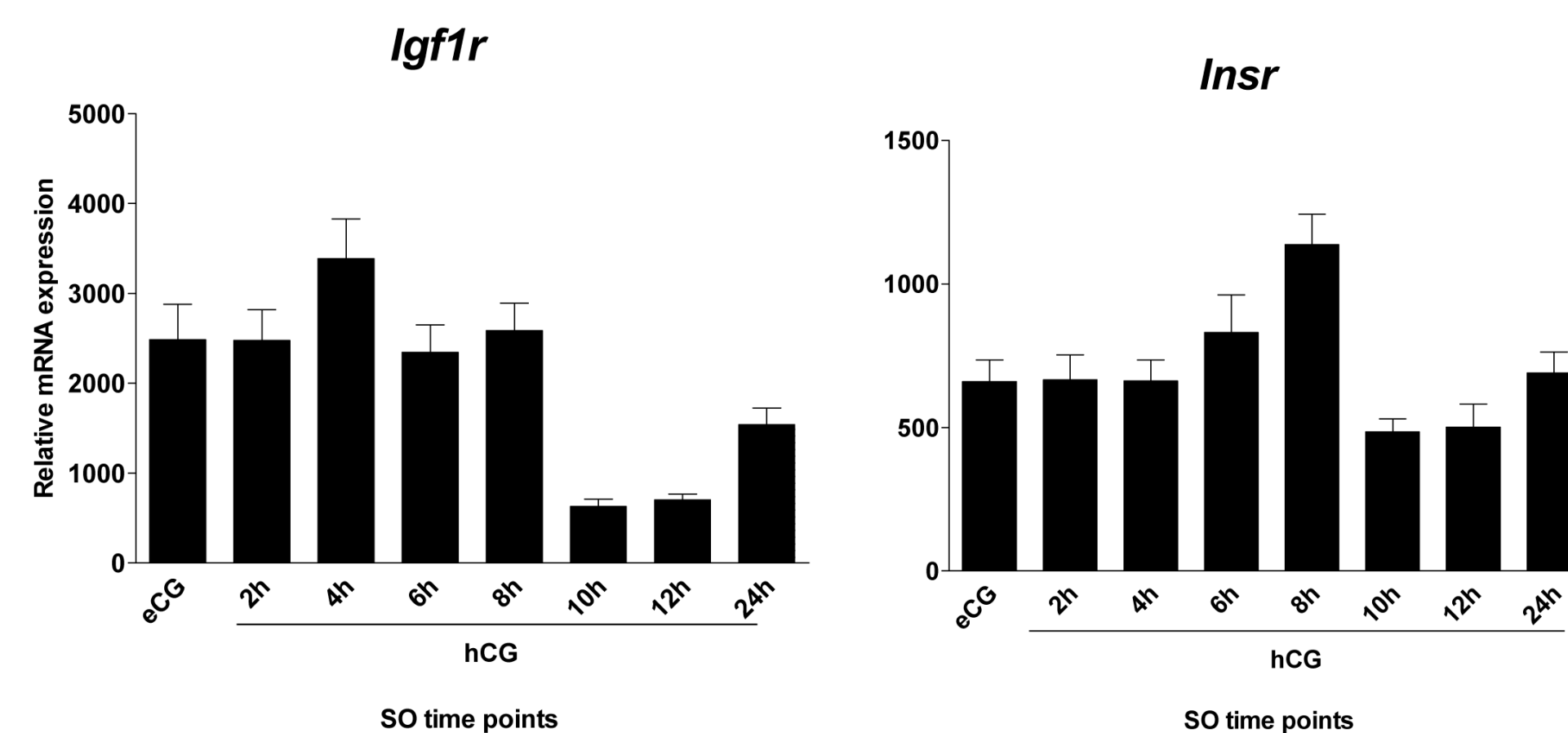

Figure 2. *Insr/ Igf1r* expression pattern. This expression pattern shows the time points at which *Igf1r* and *Insr* are most prominent. The time point with the highest expression was used for RNA-sequencing.
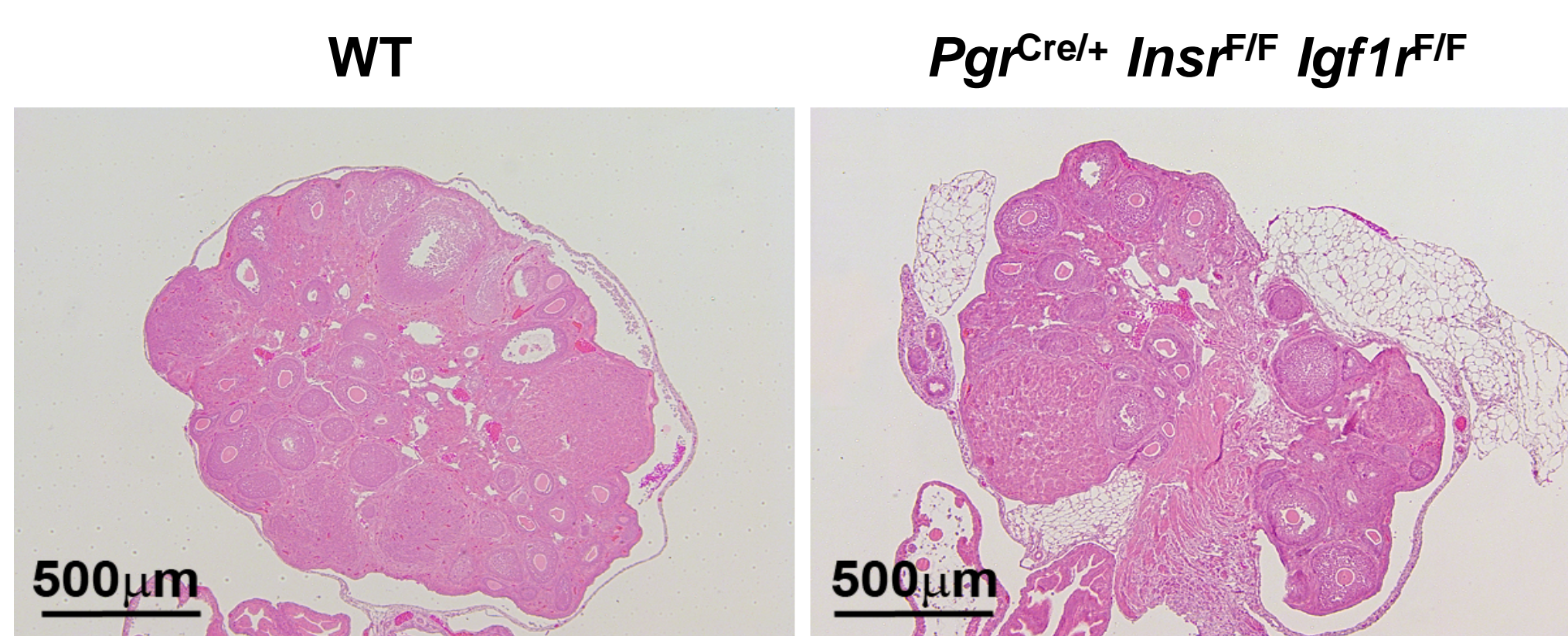

Figure 3. Ovarian histology of DKO mice. The ovarian histology of DKO mice shows that there is no visible change in the gross morphology of the ovary when INSR and IGF1R are knocked out.
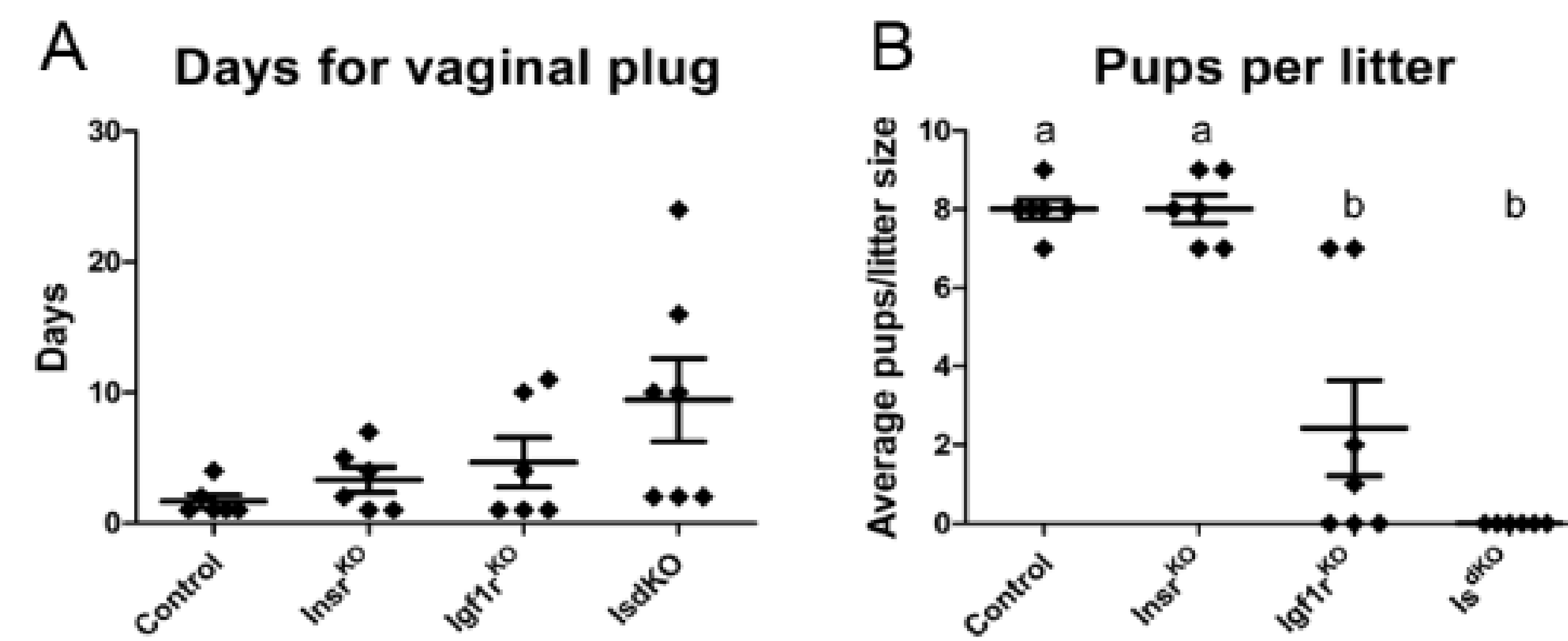

Figure 4. Breeding data. Breeding data showed that the control, INSR KO, IGF1R KO, and DKO are capable of mating. The control and INSR KO produce a normal amount of pups, the IGF1R KO are subfertile, and the DKO are infertile.
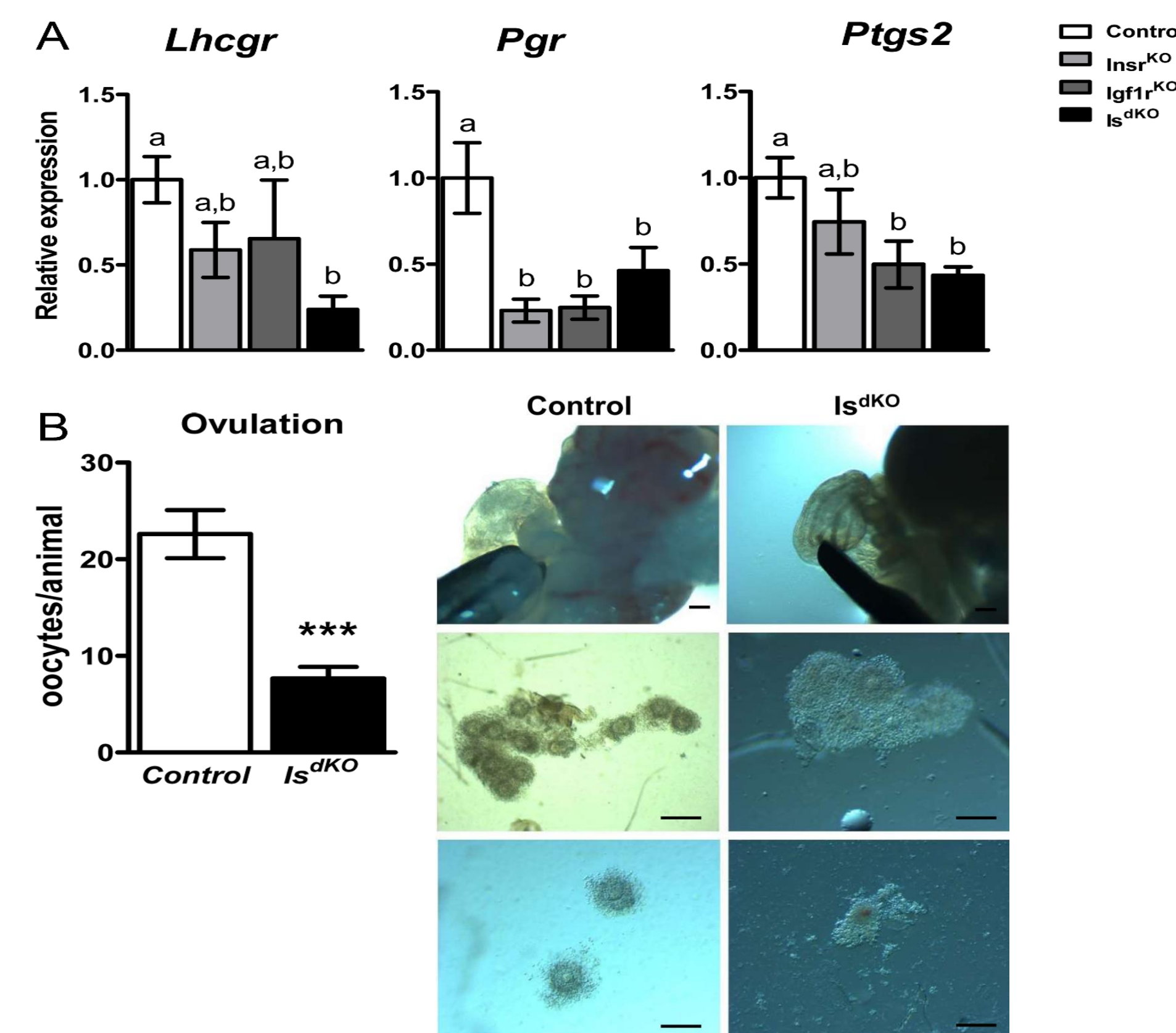

Figure 5. Disruption in ovulation. A) Gene expression important for proper ovulation is significantly reduced in the whole ovary. B) The amount of oocytes produced during ovulation is significantly decreased in DKO females.
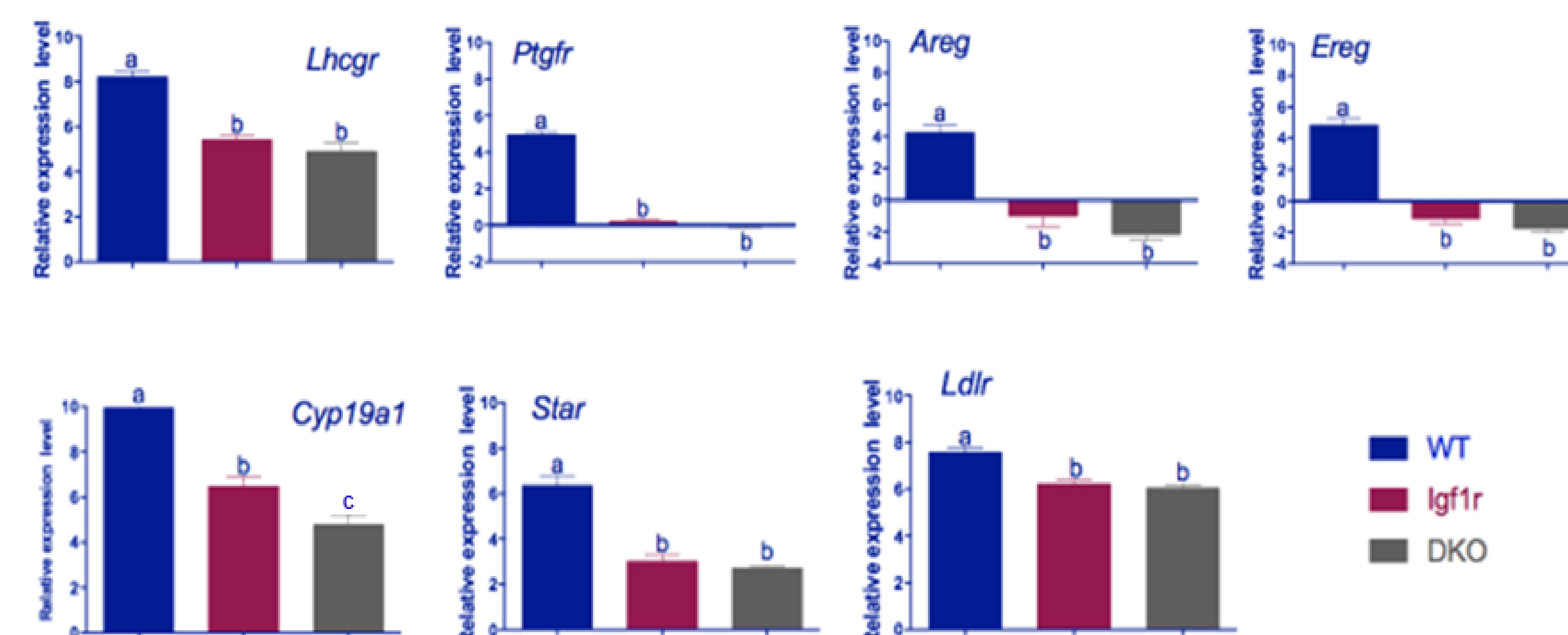

Figure 6. Select graphs of genes from RNA-sequencing. RNA-seq was performed on isolated granulosa cells from 8h post hCG. Seven genes are shown here out of 17,904 significantly changed genes in the DKO GC compared to the controls.

SUMMARY

This study is meant to examine the function of INSR and IGF1R in murine granulosa cells during ovulation. The study has shown that gene expression in IGF1R knockout and IGF1R/INSR KO is different than in wild type granulosa cells. This can be see in seven genes that are linked to ovulation.

1. *Lhcgr* encodes the receptor for both luteinizing hormone and choriogonadotropin (5).
2. *Ptgfr* may also be involved in modulating intraocular pressure and smooth muscle contraction in the uterus (3).
3. *Areg* is a bi-functional growth factor that may induce either cell proliferation or differentiation (9).
4. *Ereg* may be involved in a wide range of biological processes including inflammation, wound healing, oocyte maturation, and cell proliferation (6).
5. *Cyp19a1* activity results in increased or decreased estrogen levels (8).
6. The protein encoded by *Star* plays a key role in the acute regulation of steroid hormone synthesis (7).
7. *Ldlr* is crucial to steroidogenesis in the mouse ovaries (4).

ACKNOWLEDGMENTS

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