



McNair Journal

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On the Cover: Ashley Shaw,
Department of Nutrition and
Exercise Physiology, Nutrition
and Fitness Major

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Message from the Dean of the Graduate School



This year's University of Missouri McNair Journal contains articles across a range of disciplines, and therefore represents a unique and compelling contribution to the world of scholarship. The mix of disciplines and approaches reflects the diversity of subject matter and academic

methodologies used by top researchers across the university. All of these essays are written by talented undergraduates who have participated in the University of Missouri McNair Program, our long-standing (and very successful) project funded by the national grant named after Dr. Ronald E. McNair, who died in the Challenger space shuttle accident in 1986. Dr. McNair's accomplishments as a scientist and astronaut continue to inspire undergraduates across the country to dedicate themselves to research as undergraduates and, ultimately, bring their strong voices to academia and other aspects of our culture as intellectual leaders.

The University of Missouri Graduate School is committed to supporting and enhancing the careers of the promising undergraduate scholars who have worked with faculty

members on the research that underlies this issue of the *MU McNair Journal*. It is the close attention to the intellectual development of their undergraduate collaborators that makes the experience of participating in the McNair program so valuable—to the students *and* to their faculty mentors. The program's dedicated staff works diligently to prepare a year-long series of seminars and events to complement the research collaboration that lies at the heart of the program. Success in the McNair program is truly a team effort.

We are eager to recruit for their graduate educations McNair Scholars from other universities participating in this nation-wide program. Here in Missouri—and across our country—our great universities demonstrate our commitment to excellence in research, and to diversifying our faculties, through active participation in the McNair program. Congratulations to the students and their mentors whose fine work is represented in these pages.

George Justice
Vice Provost for Advanced Studies
and Dean of the Graduate School

The McNair Scholars Program

BACKGROUND

College students who are considering study beyond the baccalaureate level realize their dreams through the McNair Scholars Program at the University of Missouri-Columbia (MU). MU was one of the original fourteen universities selected to develop a program established by the U.S. Department of Education and named for astronaut and Challenger crew member Ronald E. McNair. The purpose of the program is to provide enriching experiences that prepare eligible students for doctoral study.

PROGRAM ELEMENTS

One of the most exciting aspects of the McNair Scholars Program is the opportunity for junior or senior undergraduate students to participate in research experiences. McNair Scholars receive stipends to conduct research and engage in other scholarly activities with faculty mentors from the areas in which they hope to pursue graduate study. These research internships are either for the academic year or for the summer session and are under the supervision of faculty mentors. For academic year internships, students work a minimum of ten hours per week during the fall and winter semesters. Summer interns work full-time for eight weeks.

McNair Scholars also attend professional conferences with their mentors, go to graduate school fairs, prepare for graduate school entrance exams, receive guidance

through the graduate school application process and obtain information on securing fellowships, graduate assistantships, and loans. Participants learn about graduate school life, advanced library skills, and effective ways to present their work. At the completion of the research internships at MU, McNair Scholars make formal presentations of their research to faculty and peers at the McNair Scholars Conference and submit papers summarizing their work. Students who participated as juniors the previous year continue in the program during their senior year for graduate school placement and to further develop their skills.

ELIGIBILITY

Participants must meet grade point average standards; be U.S. citizens or permanent residents; and qualify as either a first generation college student with an income level established by the U.S. Department of Education, or a member of a group that is underrepresented in graduate education.

All students who wish to be involved submit an application to the program. A committee composed of faculty members and representatives from both the graduate dean's office and the McNair Scholars Program selects participants and approves faculty mentors. Research internships are offered to those students who are juniors or seniors and are identified as having the greatest potential for pursuing doctoral studies.

Osteocalcin's role in the maintenance and regulation of glucose homeostasis in humans

BLOSSOM NWANERI

Pamela Hinton, PhD, Mentor,
Department of Nutrition and Exercise
Physiology



Diversity Scholar, Blossom Nwaneri hails from Kansas City, MO. and is a senior majoring in Nutrition and Exercise Physiology. As a member of MU's Track and Field team, Blossom has earned All Big 12 Status in the 600yd run and distance medley relay. Though a student athlete, she still found the time to participate in the African Students Association (ASA) and the Community About Raising Excellence (C.A.R.E) program. This fall, she will be attending New York University under the Steinhardt Graduate Scholarship where she will begin her doctoral work in Physical Therapy.

LITERATURE REVIEW

Leptin's Regulation of Bone Mass

The observation that obesity protects against osteoporosis spurred interest in the notion that bone and energy metabolism are connected in vivo. Moreover, significant advances in the understanding of remodeling have uncovered that bone formation and resorption involve molecules not classically associated in bone physiology (Shi, 2008). One such molecule is the adipose-derived hormone leptin. Leptin is a hormone with a central role in energy metabolism. It acts as an appetite inhibitor and as a signal to the brain that there is fat on the body. Thus, individuals with more body fat produce more leptin. What significant role does leptin have in bone? Studies using leptin deficient (*ob/ob*) mice and (*l/l*) mice with increased leptin signaling showed that leptin prevents bone mass accrual. The *ob/ob* mice had increased bone mass and, as expected, *l/l* mice had decreased bone mass. In one such study, vertebral sections showed that bone mass was significantly decreased in *l/l* mice at both 6 and 12 weeks of age; the noted osteopenia was not limited to the axial skeleton, but was observed in long bones as well (Shi, 2008). Thus, these findings solidified the role of leptin in limiting bone mass accrual in mice.

Once this was understood, further questions arose regarding the mechanisms by which leptin regulates bone mass accrual in vivo. Questions surrounded whether leptin simply had a direct affect on osteoblasts, the cells responsible for bone formation, or if leptin acted through neuronal means. To answer this question, *Lepr*, a gene receptor that midigates the effects of leptin was deleted in both osteoblast and neurons. Bone formation and bone resorption parameters were not affected in mice with *Lepr* deletion in osteoblasts. Yet, the mice lacking *Lepr* in neurons showed an increase in bone formation and bone resorption parameters, resulting in high bone mass formation similar to the phenotype exhibited in the *ob/ob* mice (Shi, 2008). From these tests, the authors concluded that leptin works through neuronal means to regulate bone mass in vivo. Essentially, testing the hypothesis that energy metabolism and bone mass could be regulated by the same hormones lead scientists to conclude that leptin regulates bone mass through a hypothalamic relay and using two neural mediators, the sympathetic tone and cocaine and amphetamine-regulated transcript (CART) (Karsenty, 2006).

Bone as Endocrine Organ

The finding that fat regulates bone metabolism suggested that bone might regulate some aspects of energy metabolism in a feedback loop (Lee, 2008). The connecting link between bone and energy metabolism was found to lie in the bone protein osteocalcin. Osteocalcin is a marker of bone formation

produced by the osteoblasts. Through mouse genetics studies, osteocalcin was found to act as a hormone on the pancreatic β -cells to enhance insulin production and on peripheral tissues to increase glucose utilization as a result of increased insulin sensitivity and to reduce visceral fat (Fukumoto, 2009). The first of these mouse studies involved mice lacking the *Esp* gene; (*Esp*^{-/-} mice). *Esp* produces osteotesticular protein tyrosine phosphatase (OST-PTP), which is a protein that decreases osteocalcin's bioavailability through the carboxylation of (Lee, 2008). Thus, it is believed that the uncarboxylated form of osteocalcin only may play a role in energy metabolism. Thus, any abnormalities observed in the *Esp*^{-/-} mice were assumed to be caused by the increased availability of osteocalcin. In summary, *Esp* inactivation caused hypoglycemia with decreased adiposity as a result of increased pancreatic β -cell proliferation, enhanced insulin secretion, and improved insulin sensitivity (Lee, 2007). To be sure that these effects were, in fact, due to increased osteocalcin availability, mice lacking osteocalcin (*Ocn*^{-/-} mice) were studied. It was hypothesized that the *Ocn*^{-/-} mice would exhibit opposite characteristics of the *Esp*^{-/-} mice. In fact this is what occurred. The *Ocn*^{-/-} mice had higher amounts of fat, lower insulin serum levels, decreased insulin sensitivity, and higher blood glucose levels than wild-type mice (WT) (Lee, 2007).

From these findings, the next question that arose was whether osteocalcin elicited these same affects in WT mice and not just genetically altered mice. Since WT mice are the mice typically occurring in nature, the significance of this question is that if osteocalcin has the same effects on WT mice, then these findings would be a better indicator of how osteocalcin might work in humans. To answer this question, scientists evaluated osteocalcin as a treatment of obesity complications in mice. In an experiment using diet-induced obesity, mice fed a high-fat diet and not receiving osteocalcin became obese over a period of 8 weeks and developed glucose intolerance and insulin insensitivity. By contrast, mice fed high-fat diets who were treated with osteocalcin gained significantly less weight, had significantly smaller fat pads, and were significantly less glucose intolerant and more insulin sensitive than the WT mice (Ferron, 2008). These findings coupled together suggest that osteocalcin plays an important role in energy metabolism and may protect against obesity and diabetes.

Regulation of Osteocalcin by Leptin

Due to the aforementioned roles of leptin, it should be apparent that the effects of leptin has on energy metabolism span multiple tissues. Along with its role in fat metabolism and bone metabolism, leptin regulates insulin secretion. This fact was further investigated to decipher whether leptin's effects on insulin were in any way related to osteocalcin's role in insulin regulation. Since findings confirmed that leptin regulates bone formation and resorption, it was rightly assumed that leptin also regulates markers of bone formation and/or resorption. In fact, it was found that, by way of osteocalcin regulation, leptin indirectly regulates insulin secretion. First, to confirm leptin's role in insulin secretion, serum insulin levels were measured in leptin deficient, *ob/ob* mice, at birth and 1 and 2 weeks of age. In the 2-week-old *ob/ob* mice, serum insulin levels were 2.5-fold higher, contributing to lower blood glucose levels than WT mice. To explain these findings it was observed that insulin expression genes in the *ob/ob* mice were up-regulated 50%

and β -cell proliferation was increased compared to the WT mice (Hinoi, 2008). Thus, without the presence of leptin, β -cell number increased, as did insulin production.

The next question to answer was, by what means does leptin regulate insulin secretion. To answer this question, *Lepr^{syn}*^{-/-} mice were studied; in these mice, the leptin gene receptor (*Lepr*) was deleted from the neurons. In these mice, it was observed that *Ucp1* expression, a gene mediated by sympathetic tone was low. This observation implicated the sympathetic tone as a possible mediator of leptin's regulation of insulin secretion. To decipher specifically how the sympathetic tone might mediate the effects of leptin, tests were done on 2-week-old mice treated with sympathomimetics that act through three different types of receptors: β -adrenergic (isoproterenol), *Adra1* (clonidine), and *Adra2* (phenylephrine) receptors. Of the three, only isoproterenol affected serum insulin levels. And, important to note, was that *Esp* expression was up-regulated 4-fold by isoproterenol in osteoblasts, whereas expression of osteocalcin was not (Hinoi 2008). This is significant, because *Esp* is a gene that controls production of OST-PTP, an enzyme that decreases osteocalcin bioavailability. In addition, mice genetically altered to lack the isoproterenol receptor (*AdreB2*^{-/-} mice), were found to have increased insulin secretion and low blood glucose levels. These results show that the sympathetic tone, which was also implicated in leptin's regulation in bone mass through its effects on osteoblasts, also affected protein products of osteoblast. But more specifically, in this case, the sympathetic tone by way of β -adrenergic receptors mediated osteocalcin bioavailability.

Further tests with leptin-deficient mice lacking the *Esp* gene (*ob/ob;Esp*^{-/-}) showed even higher levels of hyperinsulinemia, as would be expected due to an increase in osteocalcin bioavailability. Similarly, the correction of hyperinsulinemia in *ob/ob;Osteocalcin*^{-/-} mice and *ob/ob* mice treated with the sympathomimetic isoproterenol supports the view that osteocalcin is a significant mediator of the leptin-dependent sympathetic regulation of insulin secretion in vivo (Hinoi 2008).

To summarize:

No leptin = \downarrow *Esp* activity = \uparrow osteocalcin availability = \uparrow insulin secretion

No Leptin + no *Esp* = greater osteocalcin availability = greater insulin secretion

No Leptin + no Osteocalcin = cancelation of affects = normalized insulin secretion

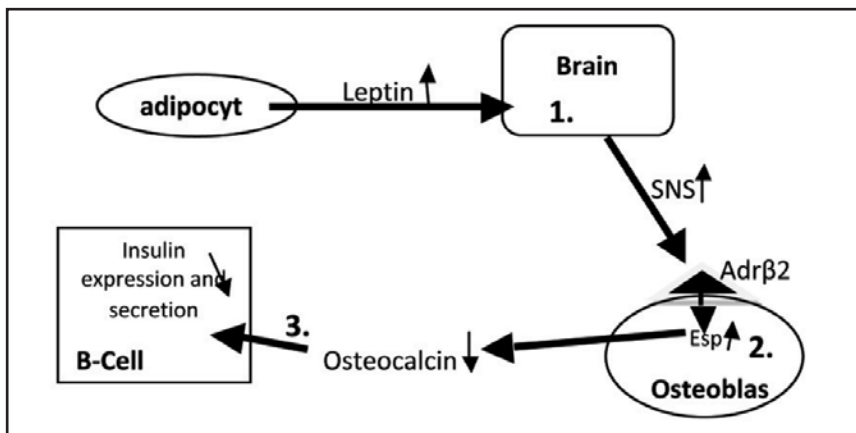
Similarly

No isoproterenol receptor = \downarrow *Esp* activity = \uparrow osteocalcin availability = \uparrow insulin secretion

No Leptin + treatment with isoproterenol = normalized (\downarrow) *Esp* activity = normalized (\downarrow) osteocalcin availability = \downarrow insulin secretion.

Essentially, leptin inhibits the endocrine function of the skeleton in 3 steps.

1. Leptin up regulation of sympathetic tone
2. Sympathetic enhancement of *Esp* expression in osteoblasts.
3. Decrease in osteocalcin bioavailability. Osteocalcin acts in this context by regulating insulin expression and secretion (Hinoi 2008).



Beyond linking two secreted molecules, i.e., leptin and osteocalcin, these observations establish that the metabolic connection between osteoblasts and adipocytes is tighter than originally thought (Karsenty 2006). Lastly, examining what important ramifications these findings may have in humans could prove to be quite beneficial in understanding the development of the Metabolic Syndrome.

Medical Implications of Osteocalcin Regulation of Energy Metabolism in Humans

The Metabolic Syndrome is a cluster of symptoms that, coupled together, have severe health consequences, promoting the development of heart disease, stroke, and diabetes, which are all among the top 5 causes of death in the United States. If an individual has any three of the symptoms they are considered to have Metabolic Syndrome. These symptoms include:

- A waist circumference greater than 35 in. in women and 40 in. in men (central or abdominal obesity)
- High blood pressure: >120/80 mmHg
- High serum triglycerides: > 150 mg/dL
- Impaired glucose metabolism; fasting glucose >110 mg/dL
- Low HDL (“good”) cholesterol: < 40 mg/dl in women and <50mg/dL in men

The two most important risk factors are extra weight, as indicated by central obesity, and insulin resistance, as indicated by impaired glucose metabolism. The aforementioned mice studies established that osteocalcin might be involved in the development of obesity and diabetes, so this notion spurred several experiments that evaluated the effects of osteocalcin in humans.

Several studies have shown a relationship between osteocalcin and insulin secretion and sensitivity in adults. One such cross-sectional study showed that older men and women with high serum carboxylated osteocalcin concentrations at baseline had smaller increases in insulin resistance, as assessed via HOMA-IR, over a 3-year follow-up period. In contrast, the serum concentrations of uncarboxylated osteocalcin were not associated with HOMA-IR in older men and women free of diabetes, nor did uncarboxylated osteocalcin predict 3-year changes in HOMA-IR. Essentially, the carboxylated form of osteocalcin was shown to be inversely related to HOMA-IR in adults (Shea 2009). Thus, these findings suggest that higher levels of serum osteocalcin lead to increased insulin sensitivity in older adults. Another study further evaluated osteocalcin’s role in insulin control in humans by looking at multiple parameters associated with

glucose metabolism. This study of post-menopausal women showed that serum osteocalcin levels were inversely correlated with glucose, HbA1c, insulin, and HOMA-IR. The women were divided into three groups as determined by fasting glucose levels: normal fasting glucose, impaired fasting glucose, or type 2 diabetes. It was observed that subjects with lower fasting glucose had higher serum osteocalcin. This led to the conclusion that serum osteocalcin was an independent factor associated with glycemic control (IM, 2008). There have been other studies indicating osteocalcin’s role in insulin regulation in humans, even proposing that osteocalcin represents the missing link in the

exercise-induced improvement in insulin sensitivity (Fernandez, 2009). Similarly, a study involving adult men and postmenopausal women with type 2 diabetes found serum osteocalcin levels to be negatively correlated with fasting plasma glucose and HbA1c, a measure of blood sugar control. In this particular study, serum osteocalcin levels were low in diabetics before treatment and elevated after treatment (Kanazawa 2009). But interestingly, a study that investigated osteocalcin in individuals with gestational diabetes (GDM) showed elevated osteocalcin levels when compared to women with the non-gestational type. It was hypothesized that the elevated osteocalcin levels seen in GDM could be an early adaptive mechanism for impaired glucose tolerance, which fails with the onset of overt type 2 diabetes (Winhofer, 2010). Other studies have shown links between osteocalcin and body fat in humans. Plasma osteocalcin was also shown to be a negative predictor of fat mass and trunk fat, but not fat on leaner individuals (Kindblom, 2009). This is in line with the idea of leptin’s regulation of osteocalcin, as depicted in mice genetic studies. Thus, it is expected that individuals with higher adiposity and leptin would have lower serum osteocalcin, while lean individuals would have lower leptin and higher osteocalcin concentrations.

However conclusive these findings may seem, there are several confounding questions that have arisen from these human studies. First, it has often been suggested that obesity in humans contributes to increased bone mass. Due to the fact that increased fat mass should mean increased leptin production, this idea seems contradictory to the finding of leptin limiting bone mass accrual in mice. For instance, a study on postmenopausal women actually found plasma leptin to be significantly positively correlated with bone mineral density (Yamauchi, 2001). There have even been some studies that suggest that there is actually a decrease in leptin production in obesity due to abnormalities in metabolic homeostasis (Jorge da Paz-Filho, 2009). So, obesity’s protective effects on bone mass may be contributed more so to other things like the increased load on bones from carrying extra weight. And, in postmenopausal women, estrogen use could be a possible determinant for extra bone mass. Multiple studies have suggested that estrogen replacement therapy is effective in preventing bone loss (Armamento, 1995). Another issue that arises when comparing human studies to the mouse studies is that many of the mice studies implicated the uncarboxylated form of osteocalcin as having effects on energy metabolism, while many human studies implicate the carboxylated form or

did not differentiate between carboxylated and uncarboxylated osteocalcin. Thus, these human studies have not yet solidified the role of osteocalcin in human energy metabolism, but they have implications in helping design new treatments for type 2 diabetes and possibly alleviating health complications associated with the metabolic syndrome.

INTRODUCTION

Osteoclastin is a protein produced by osteoblasts in bone. It is also a hormone regulator of glucose through its relationship with insulin, a hormone that regulates glucose uptake in the body. Mouse genetics' studies have shown that osteoclastin acts on the pancreatic B-cells to enhance insulin production and on peripheral tissues to increase glucose utilization as a result of increased insulin sensitivity (Fukumoto, 2009). The proposed study examined changes in OC in lean active adults during 3 days of inactivity, that resulted in reduced glycemic control, and examine changes after weight loss in fasting glucose, insulin, insulin resistance, and OC in sedentary overweight/obese individuals relative to active lean controls.

METHODS

Study 1:

Study Design and Study Participants. Blood samples were used from a study that examined if transitioning from an active to non-active lifestyle affected mean amplitude of glycemic excursion (MAGE) values in young, non obese physically active individuals (Thyfault et al., unpublished). Non-active was considered no exercise plus less than 5,000 steps a day. Active was defined as daily exercise plus at least 12,000 steps a day. The total sample number was 16, and these individuals were tested over three days of activity and then three days of inactivity. Body weight, measured to the nearest 0.05 kg, and height to the nearest 0.5 cm, were used to calculate body mass index (BMI, kg/m²). Body composition, i.e., percent body fat, was measured via whole body DXA scans (Hologic, Waltham, MA). Their average body mass index (BMI) was 23.5 kg/m² and average percent body fat 20%. Thus, the subjects fit the criteria to be considered lean as designated by a healthy BMI. The National Institute of Health (NIH) recognizes having a BMI between 18-24.9 as healthy. A BMI between 25-29.9 is recognized as overweight and a BMI of 30 and higher is considered obese. Maximal oxygen consumption (VO₂ max) was also accessed using a metabolic cart calibrated using a known volume of O₂. VO₂max was used as another indication of health status.

Outcome Measures. To evaluate MAGE, subjects wore a continuous glucose monitoring system, a pedometer, and accelerometer for the three active days and three days of inactivity. MAGE values were calculated from the minute to minute glucose response after every meal. Subjects consumed the exact same foods each day at the exact same time throughout the course of the 6 day study. A 75-g oral glucose tolerance test was also administered the morning after the last day of each phase. Two blood samples were taken from each subject during the active

and inactive phase: early morning fasted and 30 minutes after ingestion of 75-g of glucose. Serum and plasma were separated by centrifugation at 4 °C for 15 minutes at 2000g in a Marathon 2100R centrifuge (Fisher Scientific, Pittsburgh, PA) and stored in cryogenic vials at -80 °C. The concentrations of glucose and insulin in serum were measured using a commercially available colorimetric assay (Thermo, Arlington, TX) and a chemiluminescent immunoassay (Immulite 1000, Siemens, New York, NY) The concentrations of OC, Carboxy-terminal collagen (CTX), and bone-specific alkaline phosphatase (BAP) in serum were measured using commercially available immunosorbent assay (ELISA) kits (Quidel). Both CTX and BAP served as a negative control; like OC they are bone formation makers (Seibel 2005). To determine OC concentrations after using ELISA, a plate reader was used to read the optical density of the substrate solution.

RESULTS

Study 1

Table 1: Descriptive Statistics of subjects

	N	Minimum	Maximum	Mean	Std. Error	Std. Deviation
Age	16	24	41	30	1	4
BW	16	53.3	99.5	72.9	3.6	14.6
BMI	16	18.6	28.5	23.5	.7	2.8
VO ₂	15	36.8	70	53.04	2.71	10.5
BodyFat	16	8.6	34.8	20	1.7	6.8

Table 2: Correlations between OC, Glucose, Insulin, HOMA during Active and Inactive Phases

Active Phase	Glucose	Insulin	HOMA-IR
OC	R= -0.336 (p=0.204)	R=-0.522 (p=0.046)*	R=-0.533 (p=0.036)*
Inactive Phase	Glucose	Insulin	HOMA-IR
OC	R= -193 (p=0.473)	R=-263 (p=0.343)	R=-0.268 (p=0.334)

*, significantly different from Baseline mean within each study, p<0.05.

Table 3: Repeated Measures ANOVA to test for effects of Inactivity

Measure	ACTIVITY PHASE	Mean	Std. Error	P-value
GLU (mg/dL)	Inactive	87.916	3.397	0.582
	Active	86.411	2.401	
INS (μU/mL)	Inactive	6.376	.536	0.004*
	Active	4.204	.316	
HOMA	Inactive	1.422	.177	0.018*
	Active	.912	.070	
OC (ng/mL)	Inactive	13.268	1.684	0.156
	Active	12.151	1.383	
BAP (U/L)	Inactive	14.423	1.466	0.051
	Active	12.724	1.307	
CTX (ng/mL)	Inactive	.544	.057	0.203
	Active	.621	.067	

*, significantly different from Baseline mean within each study, p<0.05.

Study 2:

Study Design and Study Participants. The present study was a post hoc analysis of three previously published studies designed to examine the effects of weight loss on either serum markers of bone turnover (Hinton et al., 2010; Rector et al., 2009) or parameters of the metabolic syndrome (Thomas et al., 2010); only the women who participated in the earlier studies were included in this secondary data analysis to avoid confounding by sex differences. In addition, data from active, lean women were included as a normal reference (Hinton et al., 2007; Thyfault). Thus, the total sample (n=123) included both sedentary overweight or obese subjects (n=77) and active,

lean controls (n=46). All procedures involving human subjects were in accordance with the ethical standards of the University of Missouri Institutional Review Board, and with the Helsinki Declaration of 1975 as revised in 1983. Informed written consent was obtained from each subject prior to participation.

The duration and magnitude of the weight-loss differed among studies, as did participant BMI prior to weight reduction. All subjects were either overweight or obese prior to weight loss reduction, as denoted by a BMI over 25. In each study, weight loss was achieved via a combination of energy restriction and increased exercise-related energy expenditure. (Hinton et al., 2010; Rector et al., 2009; Thomas et al., 2010). In Hinton's Study,

over the course of three months, subjects followed a very-low-energy diet to foster weight loss (~500 kcal/d). After these initial three months subjects were on either a low-carbohydrate or low-fat weight maintenance diet (~1600 kcal/d) for an additional 9 months. All of these subjects had a BMI greater than 27 at the start of the study. They had an average weight loss of $19 \pm 3\%$ of body weight (Hinton et al., 2010). The Rector study took to the course of 6 weeks with subjects assigned to 3 different weight-loss intervention groups. Group 1 underwent only energy restriction in the form of calorie reduction of 1000-1200kcal/day. Group 2 underwent energy restriction plus nonweight-bearing exercise of cycling. And Group 3 underwent energy restriction plus weight-bearing exercise; running. Both of the latter two groups decreased energy consumption by 750kcal/day and increased energy expenditure by 250-300kcal. The subjects had an average BMI of 28 at the start of the study and had an average weight loss of 5% of body weight (Rector et al., 2009). In the Thomas study, subjects had an average BMI of 32 at the start of the study and throughout the course of 4-6 months lost 10% of body weight. To achieve weight reduction subjects underwent supervised walking/jogging at 60% of VO₂max five days per week, which increased energy expenditure ~400kcal/day. Subjects also underwent caloric reduction of 600 kcal/day. After weight loss, subjects underwent

RESULTS

Study 2

Table 4: Anthropometric characteristics of sedentary, overweight or obese women before and after weight loss compared with active, lean controls

Study	N	Weight Loss Intervention	Timepoint	Age (y)	Body weight (kg)	BMI (kg/m ²)	Body Fat (%)	VO ₂ peak (ml/kg/min)
Hinton et al. (2010)	24	-19% (12 weeks)	Baseline	50.1 ± 1.4	103.2 ± 2.2*	38.1 ± 0.7	NA	NA
			Weight Loss		83.5 ± 2.0*	30.8 ± 4.5*	NA	NA
Thomas et al. (2010)	17	-10% (24 weeks)	Baseline	40.0 ± 1.6	94.1 ± 2.6	33.6 ± 0.9	39.4 ± 1.1	23.4 ± 3.0
			Weight Loss		85.5 ± 2.4*	30.6 ± 3.8*	36.2 ± 1.1*	27.5 ± 1.6
Rector et al. (2009)	36	-5% (6 weeks)	Baseline	22.9 ± 0.8	75.9 ± 1.5	28.4 ± 0.4	37.4 ± 0.6	27.2 ± 0.8
			Weight Loss		72.1 ± 1.4*	26.9 ± 0.4*	35.5 ± 0.6*	29.1 ± 0.8
Hinton et al. (2007) Thyfault CGMS	46	Lean, active controls		23.3 ± 1.0	60.2 ± 1.6	21.6 ± 0.5	21.5 ± 0.7	47.2 ± 13.5 (n=6)

Table 5. Serum biochemistry of sedentary, overweight or obese women before and after weight loss compared with active, lean controls

Study	N	Timepoint	OC (ng/mL)	BAP (U/L)	Glucose (mg/dL)	Insulin (Pmol)	HOMA-IR	IGF-I (ng/mL)	Leptim (ng/mL)
Hinton et al. (2010)	24	Baseline	5.4 ± 0.8†	NA	100.1 ± 3.1†	12.7 ± 1.3†	3.37 ± 0.38†	NA	NA
		Weight Loss	6.7 ± 0.9*†	NA	91.7 ± 2.5*†	NA	NA	NA	NA
Thomas et al., (2010)	17	Baseline	6.6 ± 1.0†	13.3 ± 2.0†	93.0 ± 3.7†	12.7 ± 1.5†	2.98 ± 0.45†	NA	NA
		Weight Loss	8.3 ± 1.0*†	12.6 ± 2.0†	81.4 ± 2.9*	11.9 ± 1.5*†	2.39 ± 0.33*†	NA	NA
Rector et al. (2009)	36	Baseline	11.4 ± 0.9†	17.4 ± 0.7†	96.6 ± 2.6†	9.0 ± 1.1†	2.15 ± 0.31	257 ± 19†	26.4 ± 2.2†
		Weight Loss	12.5 ± 1.01*	17.6 ± 0.7†	86.9 ± 2.0*†	8.6 ± 1.0*†	1.90 ± 0.23*†	255 ± 17†	15.6 ± 2.2*
Hinton et al. (2007) Thyfault CGMS	46	Lean, active controls	14.4 ± 0.6	24.2 ± 1.2	81.5 ± 2.2	6.7 ± 0.9	1.35 ± 0.28†	382 ± 19	11.2 ± 2.0

Data are means ± SEM. NA, not assessed. BMI, body mass index; OC, osteocalcin; BAP, bone-specific alkaline phosphatase; HOMA-IR, homeostasis model assessment of insulin resistance; IGF-I, insulin-like growth factor-I. *, significantly different from Baseline mean within each study; †, significantly different from lean, active controls, P<0.05

programmed weight regain; gaining 50% of lost weight in an additional 4-6 month period. These subjects were randomly assigned to two groups; no exercise group and continued supervised exercise group. (Thomas et al., 2010). Blood samples taken prior to weight regain were used for our study.

Outcome Measures. Body weight, measured to the nearest 0.05 kg, and height to the nearest 0.5 cm, were used to calculate body mass index (BMI, kg/m²). Body composition, i.e., percent body fat, was measured via whole body DXA scans (Hologic, Waltham, MA). Blood was collected in the early morning after both an overnight fast and at least a 24-h abstention from exercise using a butterfly needle inserted into the antecubital vein with the subjects in the seated position. As in study 1, serum and plasma were separated by centrifugation at 4°C for 15 minutes at 2000g in a Marathon 2100R centrifuge (Fisher Scientific, Pittsburgh, PA) and stored in cryogenic vials at -80°C. The concentrations of OC, Carboxy-terminal collagen (CTX), and bone-specific alkaline phosphatase (BAP) in serum were measured using commercially available ELISA kits (Quidel). Both CTX and BAP served as a negative control. Serum IGF-I and leptin concentrations were also measured using commercially available ELISA kits (Diagnostic System Laboratories, Webster, TX). The concentrations of glucose and insulin in serum were measured using a commercially available colorimetric assay (Thermo, Arlington, TX) and a chemiluminescent immunoassay (Immulite 1000, Siemens, New York, NY), respectively. The homeostasis model assessment of insulin resistance (HOMA-IR) was calculated from fasting glucose and insulin concentrations, as previously described (Matthews).

STATISTICS

Data were analyzed using SPSS statistical software (SPSS/11.0, SPSS, Chicago, IL) and statistical significance was set at $p \leq 0.05$ for all tests. The effect of weight loss on outcomes measures within each study was evaluated using a one-factor (time, i.e., weight loss) repeated measures ANOVA; comparisons among weight-loss groups lean controls were performed using a one-way ANOVA with post hoc LSD pair-wise comparisons. Pearson's correlation and multiple linear regression were used to examine relationships between changes in BMI, body fat, OC, glucose, insulin, HOMA-IR, leptin, and IGF-I. Data are means \pm SEM.

DISCUSSION

Study 1. The lean active subjects had a mean body weight of 73.0kg, a mean VO₂ml/kg/min of 53.0, a mean BMI kg/m² of 23.6, and a mean body fat percentage of 20.0%. The measured values of BMI and body fat designate these subjects as lean according to the National Institute of Health (NIH) anthropometric standards.

The three days of inactivity impaired glycemic control in the absence of weight gain. Fasting glucose levels and serum osteocalcin did not significantly change during the subjects' three days of inactivity. But, the three days of inactivity did alter the relationship between the two. There was a significant increase in both insulin and HOMA-IR, as noted by their p-values below .05. During the active phase, osteocalcin was significantly correlated with insulin and HOMA, but not glucose. However, during the inactive phase, these associations were no longer significant (Table 2). As there is already an understood established

Fasting Glucose Decreased With Weight Loss

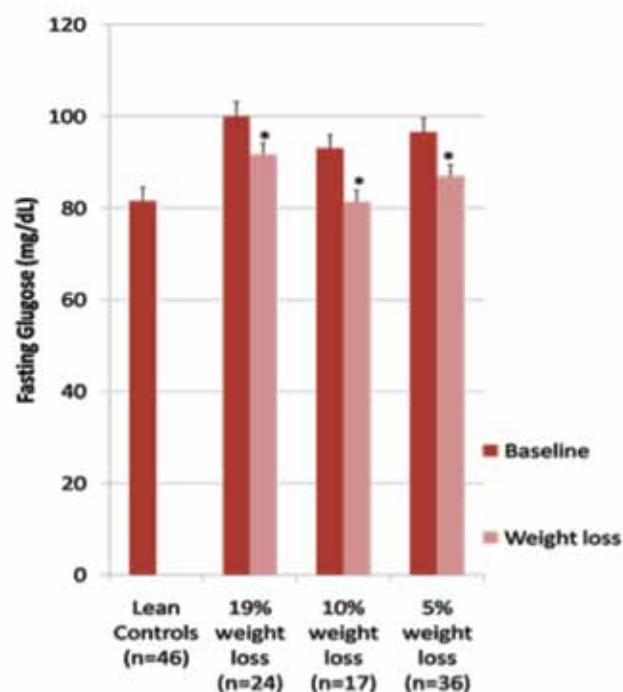


Figure 1: After weight loss there was a significant decrease in fasting glucose

relationship between insulin and glycemic control, it makes sense that a significant change in insulin corresponded to a decrease in glycemic control. The reasons for these changes cannot be substantiated. Furthermore, the only conclusion that can be drawn from this study is that inactivity may alter the relationship between serum OC, glucose, insulin, and HOMA-IR in humans.

Study 2. The lean individuals had significantly lower fasting glucose levels and significantly higher serum osteocalcin levels than the weight-loss groups. These higher osteocalcin levels in the leaner individuals may suggest that more osteocalcin production in the body is associated with lower body weight and/or lower body adiposity. Corresponding with this observation, after weight loss, the weight loss groups had significantly lower fasting glucose levels and also higher serum osteocalcin levels. Thus, after weight loss, fasting glucose and serum osteocalcin appear to be inversely related with one another. The observed increase in serum osteocalcin can possibly be explained by a decrease in leptin production that should result with a decrease in body fat, as leptin is a hormone indicator of body fat on the body. A study done by Hinoi et al., showed that genetically modified leptin deficient mice had abnormally high increase in serum osteocalcin bioavailability. Additionally, in numerous studies osteocalcin has been found to potentially act on muscle tissue to increase glucose utilization and improve insulin sensitivity, and on β -cells to increase insulin secretion. Moreover, the results from this study, suggest that osteocalcin might play a role in weight-loss-induced improvements in insulin resistance. Osteocalcin may be the link between increased fitness and better glucose metabolism. Similarly, in a study done by Fernandez-Real et al., it was observed that in subjects who had a mean weight loss of 16.8% with increased physical activity resulted in increased

Serum Osteocalcin Increased With Weight Loss

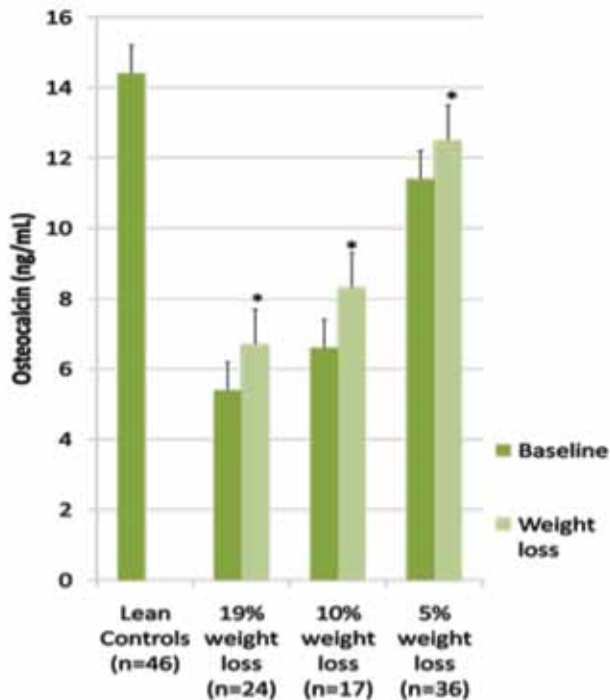


Figure 2: After weight loss there was a significant increase in serum osteocalcin

serum osteocalcin, and this increase in serum osteocalcin was associated with a decrease of visceral fat mass. Fernandez-Real et al arrived at a similar conclusion to ours, proposing that “osteocalcin represents the missing link in the exercise-induced improvement in insulin sensitivity.” A limitation to this study is that over half of the weight loss subjects are substantially older than the leaner individuals, as two of the weight loss groups had mean ages above 40 while the lean subjects’ age was 23. Age may have also played a role in the low baseline osteocalcin levels observed in these two older groups. Nevertheless, this study did not solidify the role of osteocalcin in human energy metabolism, but the results from study 2 establish that osteocalcin may have important implications in helping design new treatments for type 2 diabetes and possibly alleviating health complications associated with the metabolic syndrome. Perhaps, to clarify the role of osteocalcin on insulin resistance and sensitivity, further studies can be done in diabetic mice that are insulin resistant. Different doses of exogenous osteocalcin can be administered to these mice, to observe any effect the osteocalcin may have in treating the insulin resistance. If the osteocalcin treatment produces the desired effect of increasing insulin sensitivity in the mice, then further experiments could be done in humans who are pre-diabetic. Pre-diabetics are those with signs of decreased insulin resistance as noted by fasting glucose levels above normal, but not yet into the diabetic range. If these experiments are also successful, this could substantiate osteocalcin as a possible tool in the prevention and treatment of diabetes.

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Amazons in the Ozarks: Exploring intersections of genders, spaces & sexualities

DAKOTA RAYNES
(Liese Harvel)

Wayne Brekhus, PhD, Mentor,
Department of Sociology



Dakota is a senior from Jefferson City, MO, who is majoring in Sociology and Women's and Gender Studies. Dakota is very active in social justice work on campus and in the community, and is a founding member of the TransAction team, co-facilitator of Fluidity, a Safe Space Trainer, and a regular OutReach panelist. This fall, Dakota plans to begin a graduate program in Rural Sociology at MU.

A DIALOGUE: REVIEWING THE LITERATURE

In order to develop a grounded theory approach to the exploration of rural lesbian femininities, it is imperative first to lay a foundation that situates identity as a specifically social phenomenon complicated by spatial contingencies. Second, an investigation of contemporary academic discourse(s) that attempts to explicate the influences of geography, sexuality, and gender with regard to social identity is necessary. Third, we must situate her; not only the individual rural lesbian woman or groups of such women, but also the role that this particular study plays in the expansion of current theoretical understandings of genders and sexualities. Finally, with the aggregation of all of these discreet bits of information, we can begin the journey of examining the broader implications of historical location and everyday application.

The Social Self

Mead (1934), played a central role in developing the groundwork for contemporary studies of identity with his social-psychological framework for understanding how the self is constructed. He argues that, "the self...arises in the process of social experience and activity" (2007: 25), reaching "full development by organizing [the] individual attitudes of others into...organized social or group attitudes" (2007: 30), and, then, reflecting those systematic patterns of behavior. He compares social interaction to an organized game in that there are rules that players must follow and these rules not only dictate how the game is played, but also, player's attitudes, activities, and behaviors toward one another.

Goffman (1959) utilizes a "dramaturgical" analogy to further explicate the performative nature of identity. He notes, "the general notion that we make a presentation of ourselves to others is hardly novel; what ought to be stressed...is that the very structure of the self can be seen in terms of how we arrange for such performances in our Anglo-American society" (2008: 348). Goffman identifies the individual both as a performer or a "fabricator of impressions" (2008: 348) and as a character embodying the qualities associated with the performance. Goffman further argues that the self is created from the whole scene of his action and that, which makes this scene interpretable. In his discussion of identity management, Goffman argues that self-expression is actually the transmission of impressions about the self. Humans give off impressions about themselves in a variety of ways but Goffman's focus was on those related to performance. Thus, he was concerned with cues, tests, expressive gestures, and status symbols arguing that these could be used as devices of prediction. He also describes how identities are managed according to culturally specific standards of social interaction, among those he mentioned are politeness and decorum.

While Mead and Goffman have both made useful and lasting contributions to the field of sociology, their respective analogies regarding social interaction as similar to a game, and identity within social interaction as a performance can make it seem

as if we play at this thing called life. As they were both white, educated, heterosexual men, there is a severity that is missing from their analogies. More specifically, Mead had no experiential understanding of being excluded from the game of social interaction and Goffman had little understanding of what it is like to have one's performance of identity questioned at every turn.

Gay Ghettos: Spatialized Selves

As Bell and Valentine illustrate throughout their anthology *Mapping Desire: Geographies of Sexualities*, "the complexities of assuming any sexual identity are spatially contingent, and often contested" (1995: 30). The articles contained within this anthology address a variety of sexual identities, simultaneously discussing the significance of the diversity of the spaces in which these identities are lived out. Notably, Knopp (1995) identifies an issue that is central to both the anthology and the research topic of this paper. He asserts that there has been "a focus on urban gay male and lesbian identities and communities" (1995: 150), thus the freedom of sexual diversity has been inextricably linked to the anonymity and multiplicity of resources that are available in dense, culturally complex urban areas. Examples of such work include but are certainly not limited to Levine's (1979) efforts to describe the "gay ghetto" in San Francisco and Castells' and Murphy's (1982) explication of the nature of gay identity in relation to spatial structure, also centered on the Castro area of San Francisco.

Castells (1983) implies that there are essential gendered differences that affect how individual men and women relate to space. He utilizes a method of contrast and comparison, thus, suggesting that men, in their dominance, are inclined to be spatially territorial. Women, on the other hand, orient themselves to space through social networks and personal relationships. While there may be some validity to Castells' observations and arguments, there is a lack of attention to the wider historical, political, economic, and cultural trends that have exacerbated the differential abilities of women and men in their relations with the space around them. Women have historically been deprived of the political/economic power and resources necessary for property ownership and maintenance (Rich 1980). Yet, many studies exploring public metropolitan displays of sexual identities will inevitably miss opportunities to explore the diversity of sexual identity performances that do not stake their claim on consumption practices encouraged by what hooks (1989) calls a white, male, patriarchal, capitalist society.

These initial studies of gay identity housed in the center of the metropolis and performed by male researchers laid the foundations for an academic focus not only on gays in the city but gay males in the city. Some of the inherent problematics involved in this narrow approach, now visible thirty years later, include not only the focus on men over women, but also the focus on the masculine over the feminine. For instance, these researchers concentrated on the public evidence of collective and individual gay identity. Thus, there was a focus on those aspects of identity performed in public and/or marked by the public consumption of space, products, or services.

Locating Lesbians

Binnie and Valentine also point out "until very recently, lesbian urban communities had been very much neglected in these studies of male space" (1999: 176). Indeed, one of the first studies to look beyond the metropolitan gay male to the metropolitan lesbian woman was that of Adler and Brenner (1992). Their findings expand our understanding of metropolitan lesbian identities by countering Castells' argument. They suggest

that lesbians do concentrate in and make use of specific city spaces; one must simply know where to look and what one is looking for. When one stops looking for the hallmark bathhouses, clubs, cruising spots, cafes, bookstores, shops, etc. that were classified as the markers of a metropolitan gay (male) identity, one can begin to see the markers of a metropolitan lesbian existence.

Lesbian women are dually stigmatized by their identities as lesbians and women. As women have historically been denied the access and resources necessary to increase their own capital, far more gay men own their own homes and businesses. Therefore, one of the markers of the presence of metropolitan lesbians is "the clusters of lesbian households amongst heterosexual homes, recognised only by those in the know" (Bell and Valentine 1995). The details of such micro-neighborhoods are passed along from one lesbian friend, lover, or partner to another as is illustrated in Tamar Rothenberg's "And She Told Two Friends" (1995). This study explored notions of community among lesbians in the Park Slope neighborhood of Brooklyn and the realities of this community's influence on members' sense of individual and collective lesbian identity. At the time of her study, there was "... no formal lesbian-designated space in the neighbourhood..." (1995: 173). Yet, Rothenberg spoke of the large community that had formed due "to the power of lesbian social networking" (1995: 177). This informal community provided lesbian women with an environment that felt safe and supportive. It was where they had found adequate and affordable housing, many of the services and amenities necessary for daily city life were close at hand, and most importantly, this was where their friends lived – in short, Park Slope felt like home. While Rothenberg's article brings awareness to the existence of lesbians in the metropolis and highlights the significance of lesbian social networking skills and efforts, her sample consists primarily of white, educated women in their 20s and 30s. Thus, the image, experiences, and issues of the metropolitan gay man or lesbian woman are those that resemble the dominant culture. We have yet to locate an exploration into the complexities that are encountered when one leaves the city to research lesbian women and gay men in rural, semi-rural, or suburban environments.

This urban focus presupposes that the social scientist can learn all they need to know about the relationships between genders, sexualities, and spaces by studying queer city folk. As Binnie and Valentine show throughout their review, even the international academic community has highlighted queer experiences within major metropolitan areas such as London's Soho, Manchester's 'Gay Village', and Amsterdam (1999: 177).

Rural Regions

Currently research on queer identities suggests that the spectrum of socially acceptable gay identities is more vibrant in urban, middle- to upper- class environments than in rural, working environments. Binnie and Valentine illuminate the "upsurge of interest in the rural as a specific focus for work on sexual geographies" timing this expansion with what is known as the queer cultural turn of the mid-1990's (1999: 178). Kramer's (1995) study of queer life in rural North Dakota and the anthology edited by Bell and Valentine (1995). Kramer (1995) discusses the relationship between geography and the development of sexual identity. He notes that rural gay men often come out later in their lives than urban gay men. He also found that rural gay men were more likely than their urban counterparts to internalize dominant hegemonic stereotypes of homosexuality and gay identity. It is both intriguing and notable that Kramer was so certain that he would not be able to locate rural queers that he instead decided to

interview North Dakotans who had migrated to the metropolitan area of Minneapolis-St. Paul.

Bell and Valentine (1995) researched rural gay life looking at cultural representations, interviewing rural gays, and surveying rural gay recreation. They found that a majority of rural gays expressed that they felt like their social environment was unsupportive, lacking structural services and facilities that meet the needs of gays, and that this led to feelings of extreme isolation. Bell and Valentine also discussed the difficulties that rural gays face with regard to accessing up-to-date and unbiased information about homosexuality, whether that be safe sex education, social networking information, gay pop culture, or anything else deemed gay. Bell and Valentine argue that this hinders an individual's ability to identify with the basic political issues that are central to the larger 'imagined community' of gays (see Anderson 1991). They also stress that these constraints inhibit rural gays from developing a sense of commonality with other rural gays as well as the larger gay metropolitan community within the US.

Binnie and Valentine (1999) also discuss the implications of Weston's (1995) study, which found that "the urban/rural dichotomy is crucial to how many make sense of their lesbian and gay identity" (1999: 179). Additionally, D'Augelli, Collins, and Hart (1987) in their search to identify patterns of social support among rural lesbians found that such networks are unusually invisible. They further described these social groups as highly interdependent. They attribute this to the fact that the flow of social change has historically taken longer to reach and influence daily lived realities within rural environments. Again, we are shown that the experiences of rural queers are bleak and dismal when compared to the freedom and progressiveness experienced by their metropolitan counterparts.

Could it be that this evidence of dichotomous influence is in part generated by the power of mainstream ideas, beliefs, and attitudes about where the real queers live? Isn't it possible that we, have strengthened the dominant ideology that true queers live in the city by focusing so much of our research on urban lesbian and gay identity formulation, maintenance, and performance? There is a binary and oppositional ideological framework that underlies nearly every conceptual model that we have for thinking about, exploring, analyzing, and making sense of the world around us. That serves to delimit the expansion of social scientific theoretical and methodological approaches. By highlighting either geographical extreme while neglecting the mundane middle (Brekhus 1998) we are limiting ourselves to extreme understandings of genders, sexualities, and spaces. These extremes may not, in fact cannot, be representative of the complexities of queer experiences, identity(s), and interactions that occur in the everyday lives of small town LGBT populations.

Investigating Identity

Brekhus' (2003) addresses the phenomenon of social identity from a grounded theory perspective, utilizing Zerubavel's (1980) framework for conducting analytic fieldwork. Brekhus contributes to the field of knowledge and understanding about identity by defining three distinct categories of identity work: construction, maintenance, and performance. In addition, Peacocks, Chameleons, and Centaurs (2003) focuses on gays outside the Village and the Castro developing a typology of identity that explicates how identities are performed across and through the dimensions of space and time. Notably, while his theory developed out of previous work on aspects of identity, the ethnographic study focuses on gay males, and thereby contributes to the overpowering

amount of voices discussing issues of male concern.

Brekhus (2003) developed a typology of identity positing that one relates to one's self (and one's self-identity) through the act of performing identity(s) in certain ways. A trinary typology highlighting the similarities between identity performances and grammatical patterns of linguistics emerged in which, the term "peacock" referred to those individuals whose gay identity, "is the essential defining feature of who one is and how one lives (2003: 35); the term "chameleon" referenced those individuals who "use travel to make a transition between identities" (2003: 49); and, finally, the term "centaur" indicated those whose gay identity "defines only a small part" of who they are and how they move in the world (2003: 74). These notions and their implications regarding the construction of identity, its ensuing performance, and the strategies utilized for identity maintenance are further explicated by Brekhus. He explored the manifestation of such identities by measuring characteristics of density, duration, and frequency. Through an analysis of the relationship between these characteristics, Brekhus developed a theory of identity based on the notion of "social grammar." Thus, peacocks identity is likened to a noun, it is a master identity and it says everything that you need to know about them, all the time. In other words, the identity performance remains rather stationary. The chameleon identity is most similar to a verb as it describes what they do and varies accordingly. This type of identity performance is far more fluid and malleable. Whereas the centaur identity is akin to an adjective, one of many descriptors, about whom they are and how they move in the world. This last category, being more inclusive and versatile, experiences and manifests some variance depending on the salience of the particular identity to the situation at hand, yet does not often vary to the extremes present in the chameleon category nor is it as dense as that of the peacock.

In a work published the year before Brekhus' (2003) influential book, Williams (2002) also highlights the influence of history and geography on the formation of identity in her longitudinal exploration of adolescent females and their construction of feminine identity. Borrowing the concept of "gender regimes" from Connell (1987), Williams puts a feminist geographical twist on the term and utilizes it as the foundation for an analysis focused on developing a means of systematically measuring place-specific effects on gender process. She found that local class and gender systems intertwined with other particularities to limit or expand young girls opportunities to experiment with gender. Specifically, she explicates the manner in which a middle- to upper- class town with a large university allowed girls the space to "try on" a variety of identities along a spectrum of femininity. Some of these identities conformed to societal norms while others offered sites of contestation or resistance. The other town included in her study was comprised mainly of poor- or working-class people with a few middle-class families sprinkled in. This environment offered young girls far less space along the spectrum in which to play.

Williams' (2002) study of adolescent constructions of feminine identity suggests that young women get to play with their identity as females. While some young women do get to explore a variety of options concerning feminine identity and expression, I hardly think that this can be construed as mere "play." There are definite social, physical, and psychological repercussions attached to gender variance, especially for youths. There have been many stories that have made national news headlines in which a young person is brutally beaten or even murdered for venturing beyond the bounds of heteronormative gender expression.

CONCLUSIONS DRAWN FROM THE LITERATURE

As has been demonstrated throughout this review of literature, rural lesbian social support groups are not the only things that remain invisible within the rural or urban environment. In fact, it could still be argued that lesbians, their experiences, and issues of importance to them remain invisible or marginally discussed within academia as a whole and even within the social sciences in particular. In addition, the rural environment still remains somewhat of a mystery, as many researchers prefer to do their research in the city where more participants can be located, contacted, and interacted with in relative ease.

METHODS

Participants

The present project is part of a larger investigation of the intricacies of intersecting identities. The scope of this section of the study is specifically limited to self-identified lesbian females who grew up and/or currently live in towns with a population of less than 125,000 located in the area of the United States commonly known as the Ozarks. This area includes parts of Arkansas, Kansas, Missouri, and Oklahoma (for more information on this geographical delineation see Rafferty 1988). Individuals who meet these criteria were initially located by utilizing informal social connections. As someone who has identified as a bisexual, a lesbian, a baby dyke, a stone butch, and most recently a queer tranny boi, I have established and continue to maintain a variety of positions in and connections with a diverse sampling of queers in the U.S. Much like Gilmartin (1996) and McCarthy (2000), I made use of my connections with other queer individuals in order to develop a purposive sample.

The interview pool consists of six women all of whom are between the ages of thirty-five and fifty-five. Three of the six have college degrees and each earn what would be considered a middle-class income. One has recently retired and makes less than \$10,000/year and another suffered a debilitating back injury a short time ago and is just now earning more than poverty wages. All of the women identify with some form of spirituality, but only one identifies with any sort of formal, organized religion. All of the participants identify as some form of Caucasian with the exception of one woman, who identifies as Black Irish.

Procedures

Initial participants were contacted personally and asked if they would be willing to contribute their voices and experiences to a study of rural lesbian femininity. Those who were willing engaged in an initial interview lasting anywhere from 15 - 60 minutes. Some of these participants were also involved in a secondary, follow-up interview lasting 15 - 30 minutes. The nature of this secondary interview was to clarify or expand upon topics discussed in the initial interview. Each of the participants in the initial pool was willing to pass along information about the study and how to contact me. Thus, purposive snowball sampling (see Biernacki & Waldorf 1981) created a pool of participants ranging in class, age, education, and income, but rather homogeneous regarding geographic location, sex, gender, and sexuality.

Additionally, this study relies on data obtained in the course of ethnographic fieldwork as a participant observer. Fieldwork was primarily conducted during two weeks of immersion within the Ozark community, one week in December of 2009 and the other in March of 2010. As I live near the central Ozarks, participant observation continues to be ongoing in a variety of loose-knit communities in this locale. Mental field notes were accumulated during social interactions that occurred and/or were observed

throughout the course of the fieldwork. As soon as it was feasible to do so, these mental notes were jotted down and then expanded upon through the use of fieldwork memos.

Measures

The interviews were conducted according to a loosely structured format. All participants were asked to provide their age, ethnicity, highest level of education completed, current occupation, and to locate themselves on a chart bracketing annual income in increments of \$10,000/year. All participants were also asked to identify their gender and sexuality in their own words, state how long they had claimed this identity, and describe their current relationship status. After this initial demographic data had been collected, the interviews became far less controlled. A template of conversation starter questions was used in order to ensure that the same topics were covered in each interview but the order of the questions and the nature of follow-up questions varied from one interview to the next.

I then transcribed each of these interviews in its entirety. My mentor, Dr. Wayne Brekhus, and myself then coded interviews collaboratively. Initially, we analyzed each interview separately, line-by-line. Then, as common themes began to emerge, we compiled discreet bits of data from the individual interviews into chunks of related phenomenon occurring across interviews. Next, we examined these chunks looking for conceptual similarities and differences. Data collection continued throughout these initial phases of analysis and secondary interviews were utilized as opportunities to verify the validity of the analyses as the findings were developed. After conceptual commonalities were identified, they were given appropriate names and sets of criteria delineating the boundaries of the categories that were created. Finally, all the data was again coded according to the classifications of the conceptual categorizing schema. Field notes and memos were similarly analyzed alongside the rest of the data.

ANALYSIS AND DISCUSSION

Surprising Gender Self-Identifications

One of the most interesting things that I noticed as I interviewed these individuals was that, when I asked them for their gender identity, all but one claimed butch, lesbian, or dyke before they would claim any other identity that is commonly thought of as gendered (such as woman or man). In fact, I often had to ask probing questions in order to better determine how these individuals perceived themselves as gendered beings. Indeed, I even made a few blunders in the way that I approached such probing questions. For example, in the interview with Renee I essentially corrected her after she responded to the gender identity question by telling me that she was a lesbian, when I said "... you already gave me your sexual orientation as lesbian." However, when I asked some of the women to elaborate on what their claimed gender identity as butch, dyke, and/or lesbian meant, Billie described herself as "... a woman who loves women but not really a lesbian..." She followed up this statement with this "... I identify and understand the male point of view better than I do the female point of view." In this way, Billie related her identity as a dyke to both her gender and her sexuality simultaneously.

Hollie, on the other hand, expanded upon her gender identity as a butch lesbian with the following description: "I am independent... I am strong... I can do anything for myself..." adding that she "... doesn't need a man..." because she "... has the skills that [she] need[s]." Thus, unlike Billie, Hollie connects her butch lesbian identity more directly to gender, rather than sexuality,

through self-affirming qualities and the empowerment that she feels as a result. It is interesting that all of the women interviewed claimed what I would consider to be a sexual orientation as their gender identity, yet their descriptions of what this meant for them varied greatly. I found it to be particularly peculiar that Billie tied her gender identity as a dyke to her ability to positively relate to what she terms “the male point of view”, while Hollie is very clear that her gender identity as a butch lesbian is at least partly delineated by her lack of need for a man. A similarity between these two interview excerpts is that they both define themselves in opposition to other women. Billie does this in an explicit manner by saying that she does not understand “the female point of view;” later in the interview she elaborates on this saying, “women are a mystery to me.” Hollie is less explicit, but implies that she is different from other women who are less independent and therefore more dependent on a man.

While Billie overtly relates her gender identity as a dyke to her sexual desire for women, she also makes it obvious that she identifies as a dyke and not a lesbian. She simultaneously connects the term dyke to that which is masculine and the term lesbian to that which is feminine. She explains why she identifies as a dyke and not a lesbian saying, “. . . I just started identifying as a dyke because I, I couldn’t claim lesbian and feel 100% comfortable with it.” When asked for further clarification she said, “I can be as feminine as the next woman. Uh, the problem is I, I can only do it for a certain amount of time comfortably and then it becomes uncomfortable and unnatural.” This passage further illustrates how a butch, dyke, and/or lesbian identity has, at least for those interviewed, less to do with sex and more to do with gender, less to do with how one performs in bed and with whom and more to do with how one performs in society and how others view this performance. Thus, we see that the clear-cut distinctions theorized to exist between sex, gender, and sexual orientation are not nearly so clear when one attempts to apply them to an analysis of embodied experiences.

Not A Girl

Several of the collaborators in this project emphasized how their butch, dyke, and/or lesbian identity was tied to their childhood development, an explicit view of themselves as something other than a girl, and others’ perceptions of their gender beginning in childhood and continuing throughout their experiences as an adult. When Billie told me, “. . . I have never . . . never been one of the girls,” I asked her to explain what she meant. She replied, “You know how girls will do, uh, let’s play dolls. No! Uh, I wanted to go out and shoot my gun. Uh, girls play house. Yeah, when the girls included me in their games of house, I was always either the monkey or the daddy.” She also told me about how she “. . . used to burn [her] dresses . . .” and how this “. . . drove [her] mom nuts.” She spoke of the arguments with her parents and other family members that occurred throughout her childhood, they would tell her “you know, girls don’t do that,” and her reply was “watch me!” Billie provided further explanation saying, “I get told all the time and I have been told from a very early age that I walk like a guy, that I talk like a dyke [sic], that I posture like a guy.” Thus, we see how Billie began to identify herself as different from other females and similar to other males based on the fact that her childhood interests did not match mainstream expectations of gendered performance. She explicitly states that she has “. . . never . . . never been one of the girls” and directly relates this to both her own reflections on the differences between her and other girls and the feedback that she has gotten from others about walking, talking, and posturing “. . .

like a guy.”

Similarly, when I asked Lori to elaborate on the development of her identity as a lesbian, she too began with a description of her experiences as a child, noting that she was something other than a girl, and that this identity was influenced by her own self-reflection and others’ feedback. Lori says, “. . . I was pretty much a tomboy and I had a lot of people ask me . . . why do you dress like a man? Or, you know, why do you do boy things?” She expanded upon this saying, “. . . I . . . hung out with the boys . . . and I noticed the girls would do the makeup thing and play with the dolls and here I was playing football and, you know, building forts in the woods.” These excerpts demonstrate that Lori, like Billie, realized early on that her interests marked her as different from other girls and that this view of self as different from other girls was also influenced by repeated interrogation of her gender performance by family, friends, peers, and strangers. Lori’s narrative resembles Hollie’s in that they both tie their identity, as a lesbian and a butch lesbian respectively, more to their gender performance than their sexual orientation. In fact, Lori clearly states that she “. . . never really related it [her tomboy identity] to [her] sexuality,” she did not come out as a lesbian until her late teens and did not experience sexual intimacy with a woman until a year or two later.

It is noteworthy that Billie was definitively told that she was doing things that girls don’t do and that the doing of these things made her less like a girl and more like a guy while Lori was questioned about why she chose to “dress like a man” and “do boy things.” This difference could be influenced by the fact that Billie grew up middle-class in a very small, very conservative Roman Catholic town in northern Missouri and Lori grew up working class in the smallish bayou towns of Texas and Louisiana. These socio-geographical peculiarities may be an influential reason that Billie describes her family as very conservative while Lori describes hers as liberal. The similarities between Billie and Lori’s experiences far outweigh the differences though. The most remarkable parallel is that they both (and all the other women interviewed) define their identity in a historical manner that contrasts an affirmative identification with masculine activities in early childhood against a negative identification with feminine activities.

Shared Social Experiences

In addition to the similarities mentioned above, Billie and Lori also shared nearly identical narratives about the experience of being interrogated in a bathroom. Billie described her experience as follows:

I played baseball because the team that I was on didn’t have enough boys and so, I played on the boy’s team. And I went to go use the bathroom and, uh, the women wouldn’t let me in the girls bathroom because they said I was a boy and I was like, ‘no, I’m a girl’ and they were like, ‘no, you’re a boy’. And, uh, I had to go in the men’s bathroom.”

According to her recollection, she was between the ages of ten and twelve when this happened and she remembers “. . . being angry and confused and happy all at the same time.” It is fascinating that the women in the restroom assumed that because Billie played boy’s baseball she must be male, even though Billie was old enough to assert, in counter-argument that she was indeed in the correct restroom. Again, Lori’s narrative is both like and unlike Billie’s. Lori said, “. . . I can remember, uh, being in high school and somebody saying ‘why are you in the girl’s restroom’ and, and raising a little stink about that. Uh, but I just, it didn’t

really hurt me” While Billie was told once again that she did not belong, Lori was once more questioned as to whether or not she belonged. These examples further show how others compare one’s presentation of a gendered self to the social norms and cultural customs of the time and place. This continuous feedback from others informs and influences one’s self-identification.

It is important to note that all of the participants had experienced or witnessed some sort of verbal harassment as a direct result of homophobia, racism, heterosexism, or sizism. Yet, in contrast to what much of the contemporary literature suggests, all of these women had positive things to say about the small towns, cities, and communities they live in. Renee spoke of the more than 25 lesbian owned/operated business in her city of 77,000, noting that many of them are considered to be among the best in their respective areas of expertise. Billie noted that, while it was once dangerous to be a queer in the small town that she is from, the town is now much more diverse, less hostile, and more open.

Future Directions

This study further emphasizes how adult gender and sexual identity are tied to complex relationships between innate, social, and historical influences. The presence of as many variances as similarities among these narratives suggests that more research could be done to continue advancing knowledge about and understandings of queer identities, experiences, and issues. Future research projects could ask what, if any, implications these data have for canonical understandings of identity in general. More specifically, these data suggest that the representation of a dichotomous and oppositional relationship between the metropolitan queer experience and the rural queer experience needs to be readjusted in order to more adequately reflect current conditions.

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APPENDIX A: SAMPLE QUESTIONS

- What is the earliest memory that you directly relate to your knowledge, understanding, and/or experience of gender?
- What are the feelings you associate with this experience when it happened? And now?
- What is the earliest memory that you directly relate to your knowledge, understanding, and/or experience of sexuality?
- What are the feelings you associate with this experience when it happened? And now?
- Have you historically identified as the gender or sexuality that you currently identify as?
- If not, can you briefly describe how you came to claim to the current identity?
- How does your current gender or sexual identity inform and/or affect your everyday activities, your everyday life?
- If you have not always claimed your current identity, what similarities or differences exist between the experiences of the previous identity as compared to the current one?
- How does your current gender or sexual identity inform and/or impact your relationships with others?

Parents' and adolescents' expected timing of autonomy and the influence on adjustment

KELLI KING

Nicole Campione-Barr, PhD, Mentor,
Department of Psychological Sciences



Kelli King is from Garden City, MO and is senior majoring in Psychology, with Women's and Gender Studies and Social Justice minors. Kelli is a member of the Psychology Honor's Society Psi Chi, and throughout her undergraduate career has been an active researcher by participating in projects in the Family Relationships and Adolescent Development Lab and in the Memory and Cognitive Aging Lab in the Department of Psychological Sciences. Next fall, Kelli will be attending the University of Missouri-Kansas City to obtain a Master's degree in Social Work.

Adolescence is a time of change in the arena of autonomy expansion, and gaining this autonomy is a major developmental focus during the teenage years. Parents often desire to keep their children from participating in certain activities and making certain decisions until they reach the 'appropriate' age, even if the adolescent feels they are capable of making such decisions. It would be expected that parents would make decisions unilaterally (or perhaps with some adolescent input) when their child is younger, and for parents to consent to their child making certain decisions unilaterally at a later age. Feldman & Quatman (1988) measured parent and adolescent future expectations of autonomy and found that the essential disagreement between the generations was over the precise timing of specific autonomy related events. Therefore, children generally have earlier autonomy expectations, while parents have more conservative (i.e., later) expectations.

Besides noting the difference of parent and adolescent age expectations for autonomy, the present study wants to discover the actual level of agreement between parents and children about what age they believe is acceptable for independence. Parents and adolescents may expect autonomy to occur on different developmental trajectories during the teenage years. A way to measure these age-related expectations is through the use of "Teen Timetables" (Feldman & Quatman, 1988). Timetables not only reveal parents' implicit developmental theories, but they may form the basis upon which parents evaluate and respond to children's behaviors (Feldman & Quatman, 1988). The use of timetables in the study of adolescent autonomy can help us determine parent and adolescent expectations of age-related autonomy in the future. For example, a parent may report that their child should not drink alcohol until they are twenty-one years of age or older, whereas adolescents may report that when they go to college is the appropriate time to begin consuming alcohol – at the age of eighteen or nineteen. We would then be able to find where the discrepancies lie and how close or far apart parent and adolescent expectations really are.

Parent and adolescent enforcement and expectations of autonomy can effect a child's adjustment as well. Unilateral parent decision making, especially in very early adolescence, can be anticipated out of a parents' concern for their child's safety and healthy adjustment. Although their child may be okay with this when they are younger, as the child ages they may express a desire to make decisions on their own, or at least play a part in making decisions about issues. Several studies (Dornbusch et al., 1985, 1987; Dornbusch, Ritter, Mont-Reynaud & Chen, 1990; Steinberg, 1987; Lamborn et al., 1996) indicate that either extreme (parent-alone or unilateral adolescent decision making) throughout development has been found to have a negative impact on adolescent adjustment, and that joint decision making seems to be the best option for healthy autonomy development. For example, stricter parenting practices appear to restrict the psychosocial development of youth, frequently

of European-American descent, who generally live in safer and more affluent communities (Baumrind, 1991a; Bronfenbrenner, 1986; Ogbu, 1981; Portes, Dunham, & Williams, 1986; Lamborn et al., 1996). In accordance with Teen Timetables (Feldman & Quatman, 1988), we would anticipate that parents and children would have differing expectations of autonomy based on which parenting style is apparent in the household. For example, because stricter parents would be less willing to grant their children freedoms, we would expect that parents would have much later expectations for autonomy in an effort to maintain control over their child's decision making. Unilateral adolescent decision making, which correlates with a permissive parenting style, is associated with lower academic competence. In addition to a higher involvement in deviant behavior and increased susceptibility to antisocial peer pressure (Dornbusch et al., 1985, 1987; Dornbusch, Ritter, Mont-Reynaud & Chen, 1990; Steinberg, 1987; Lamborn et al., 1996). In this case, we anticipate that parents and adolescents would have closer age expectations – a permissive parent would grant their child freedoms much sooner, and it seems likely that the adolescent would have the same early age expectations for autonomy. Joint decision making, which is correlated with an authoritative parenting style, is associated with higher achievement and less deviance (Lamborn, Dornbusch, & Steinberg, 1996). Parents and children are likely to actively discuss autonomy expectations together in this instance; therefore, we would expect that their expectation scores would be much closer together.

In addition to examining discrepancies in family member reports of autonomy expectations, the focus of the present study is to find out what these discrepancies mean for adolescent adjustment. If parent and child expectations are closer together, they will see autonomy timelines similarly. Does this similarity lead to better adjusted adolescents? If a parent feels a child should wait much longer to make certain decisions, what impact does this have on the child's adjustment? Furthermore, gender effects may cause differences in autonomy expectations, especially with regard to parent scores. Feldman & Quatman (1988) found that parents have later, more conservative expectations of adolescent autonomy. This study was limited because it only examined scores of parents of adolescent boys; however, Feldman & Quatman expected that "had the sample included parents of girls as well, it would be expected that the generational differences would have been even more pronounced, given parents' generally more conservative guardianship of female adolescents" (1988). Although parents may guard female children more closely than male children, female adolescents may have the same autonomy expectations as their male counterparts. Therefore, we want to determine if there is a gender effect in parent and adolescent scores of autonomy expectations – if parent and female adolescent expectations are farther apart (i.e. parents have much later expectations than do their daughters) than parent and male adolescent expectations, we could confirm this theory.

Autonomy is seen in a wider context than just a child's freedom from the rule of their parents. In a five-year longitudinal study, Smetana, Campione-Barr & Daddis (2004) explored different domains of autonomy among African-American adolescents, which included: prudential issues (safety of child), conventional issues (social norms), personal issues (personal choices and privacy), and multifaceted issues (a combination of either personal and conventional issues or personal and prudential issues). The findings indicated that parent involvement in decision making is consistently greater across adolescence for conventional and prudential issues than for other issues and, conversely, that

adolescent autonomy is greater for personal issues than for other issues (Smetana, Campione-Barr & Daddis, 2004). This study indicates that adolescents have more freedom to make decisions about issues *parents* deem as personal. However, a study conducted by Smetana (1989) indicates that parents treat some issues (such as when the adolescent's bedroom should be cleaned) as conventional or prudential, causing it to be under the parent's jurisdiction of decision making. The adolescent, however, may see such issues as personal and feel they should be able to make autonomous decisions on these issues.

Adolescent autonomy over different domains at certain points in adolescence can have either a positive or negative impact on adjustment. Smetana, Campione-Barr, & Daddis (2004) suggest that granting adolescents too much autonomy over multifaceted issues too early in development (in early adolescence, according to adolescent reports, and in middle adolescence, according to maternal reports) is associated with poorer adjustment – such as lower school grades, greater deviance, and poorer self-worth in early adolescence and with more deviance and more depression in late adolescence. This may be, because if children are given more decision-making authority at a young age, they are more likely to experiment with groups of friends and different types of behaviors, thus making it more likely that they will participate in deviant behaviors.

With regards to positive adjustment, Smetana, Campione-Barr, and Daddis also found that autonomy over personal issues may influence more positive aspects of adjustment (i.e. better self-worth). They also found that increases in African-American adolescents' ratings of autonomy over multifaceted and personal issues from middle to late adolescence predicted better self-worth and less depression in late adolescence. The findings also suggest that less autonomy in early adolescence, coupled with increasing autonomy in middle to late adolescence predicted optimal adjustment for African American youth (2004). Therefore, if parents and adolescents agree that freedoms should be relinquished at an optimal age, the adolescents will be more likely to adjust in healthy and positive ways.

It is important to note that autonomy is a complex issue, because in the present study, one aspect we are examining is the level of agreement for autonomy expectations between parents and their children. Because autonomy is so multi-layered and varying, there is no straightforward answer to this question. Parents cannot simply respond that they think age fifteen is appropriate for adolescent decision making over all issues, and their child cannot simply respond that age thirteen is appropriate. It depends what *type* of decision making is taking place. The results of the Smetana et. al study (2004) indicated that healthy decision-making autonomy differs by domain and shifts with age across adolescence. Thus, unilateral adolescent decision making about personal issues may occur in early adolescence, and as they age they are more likely to be able to make decisions on their own regarding issues in other domains.

In the present study, we are attempting to find out when parents and children think it is appropriate for autonomy. As mentioned previously, parents tend to have a more conservative view of age-appropriate decisions than their children do, so we hypothesize that a parent will have a later age expectation for autonomy than will the adolescent. Furthermore, we are interested in uncovering not only the discrepancy between parental and adolescent reports of autonomy, but if they change according to whether the adolescent is male or female. Essentially, we assume there would be a greater discrepancy of expectations between parents and girls than there would be

between parents and boys because of the “more conservative guardianship of female adolescents” (Feldman & Quatman, 1988).

In addition, parents and children may have different expectations when it comes to certain domains of decision making. If parent-adolescent expectations are similar over conventional and prudential issues, we would expect that they agree that these issues are under the parental domain of decision making. Expectations over personal issues may be the same in both parent and adolescent scores – if this is the case, we would expect that both parents and their children agree that this domain is under the adolescent’s jurisdiction. Multifaceted issues are where we expect to see a discrepancy in the level of expectations, because parents and adolescents have difficulty agreeing on which issues are conventional/personal or prudential/personal. That is, if a parent views an issue as prudential, they would have a later autonomy expectation for that issue because it is not solely under the child’s decision-making domain. If the adolescent views the same issue as personal, they may expect to be able to make that decision earlier, without parental guidance. Therefore, we would expect to see larger discrepancies between parent and child autonomy expectations for multifaceted issues.

Finally, we would expect more agreement when children are younger because they still believe more decisions are under the parent’s legitimate authority (Smetana, Campione-Barr & Daddis (2004). As the adolescents age, however, we believe they would desire more control over what they consider to be within their personal domain. While parents have been shown to relinquish authority with age, adolescents have been found to desire greater autonomy at a faster pace (Feldman & Quatman, 1988). Therefore we would expect to see a greater discrepancy in autonomy expectations between parents and older adolescents versus parents and younger adolescents.

METHOD

Participants/Sample

Participants were 145 families with two siblings and at least one biological/adoptive parent from each family. Families that were recruited had an eldest sibling in 8th, 10th, or 12th grade with a second eldest sibling less than five years younger. As part of a larger study, dyads were recruited by the four gender compositions (sister-sister, brother-brother, older sister-younger brother, and older brother-younger sister) with participants divided relatively equally among the age groups. Older siblings ranged from 12 to 18 years of age ($M = 14.97$, $SD = 1.69$ years); younger siblings ranged in age from 9 to 17 years ($M = 12.20$, $SD = 1.90$ years). The mean age difference for siblings was 2.77 years. For each family, one parent attended the lab session, and for about half of the families, a second parent completed online questionnaires at home. The majority of parents that attended the lab session were mothers (139 mothers).

The sample primarily included European Americans (91.7%), with the remaining families African American (5.6%) or other ethnicities (2.8%). 74.8% of parents reported being married with both birth parents still intact and 14.7% of parents reported being single, divorced, or separated. 43.1% of parents specified their education as a college degree (29.2% with a graduate degree and 22.2% with some college experience). The median income families reported was between \$70,000-84,000 (13.2%).

Procedures

Participants were recruited from three Midwestern schools within a suburban district. Letters describing the nature of the study were sent to families with an eldest adolescent currently

in 8th, 10th, or 12th grade. Some families also received reminder phone calls for further recruitment. All interested families called the investigators to schedule a visit in the lab. Inclusion criterion were that the eldest sibling had to be in 8th, 10th, or 12th grade, and the second eldest sibling had to be less than five years younger. Families had to have at least one parent attend the lab visit with the two siblings and were paid honoraria for their participation (\$20 for each adolescent and \$10 for each parent that participated). As part of a larger study, families participated in a two-hour visit at the university laboratory during which the parent and adolescents completed questionnaires and participated in a one-on-one interview with a trained investigator. Siblings also participated in two 8-minute videotaped interactions – a conflict task and a cooperation task. If a second parent within the home chose to participate, questionnaires were completed at home on the Internet. A paper version of the questionnaire was available if necessary.

Expectations for behavioral autonomy. This 20-item measure, adapted from Feldman and Quatman (1988), assessed at what age children and parents believe a child should be able to decide different issues for themselves (e.g., “At what age do you think you should be allowed to stay out past midnight?”) Originally, the scale values ranged from 1 (indicating that the child could decide that issue before the age of 14) to 5 (indicating the child could decide at 20 years of age or older). There was also an additional scale choice of “never,” indicating that the child would never be allowed to decide the issue for themselves. Because the early adolescents in this study were 12-13 years of age, the scale was modified to indicate that the parent or child believes a particular issue could be up to the child before 12 years of age (scored as 1), or could be decided by the child between 12 and 14 years of age (2), between 15 and 17 years of age (3), between 18 and 20 years of age (4), and could only decide after 20 years of age (5). The “never” scale choice was dropped due to the confusing nature of this response. Means of parent ($\alpha = .05$) and adolescent ($\alpha = .05$) reports were used in the analyses.

Depressed Mood. Both older and younger siblings completed the Center for Disease Control – Depression Scale (CES-D; Radloff, 1977), a well-known 20-item measure of depressed mood. For each item, participants responded about how they felt during the past week on a four-point scale ranging from 1 (rarely or none) to 4 (most or all of the time).

Problem Behavior. Adolescents rated their involvement in problem behavior using the Problem Behavior Survey (PBS; Mason, Cauce, Gonzales, & Hiraga, 1996; Smetana, Campione-Barr, & Daddis, 2004). They rated items focusing on drug and alcohol use, gang activity, vandalism stealing, truancy, sexual activity, and fighting with or without a weapon on a 7-point scale. This scale ranged from 1 (never happens) to 7 (happens very often). Mean adolescent reports ($\alpha = .05$) were used in the analyses. Adolescents were also administered a 20-item inventory assessing the frequency and types of alcohol and drug use, including beer, wine, and different soft and hard drugs (Winters & Henley, 1989; Smetana, Campione-Barr, & Daddis 2004). Adolescents rated the frequency of use of each 10 items on a 4-point scale ranging from 0 (never) to 3 (often) and then indicated how many times each was used on a scale from 0 (0 times) to 3 (11-19 times). Means of adolescent ($\alpha = .10$) reports were used in analyses.

Anxiety. Youths completed the 28-item Revised Children’s Manifest Anxiety Scale (Reynolds Richmond, 1978) by rating each item on a 5-point Likert scale.

Academic Performance. Parents reported on the adolescent’s

grade point average on a scale of 1 (mostly As) to 5 (mostly Fs).

RESULTS

Descriptive Statistics

Parent and adolescent reports of an appropriate age for autonomy were congruent with our expectations that parents would report a later age for autonomy expectations than would their children. We know this because the difference score between parents and adolescents is positive: expectation differences were found by subtracting teen age expectations from those reported by their parents. However, our hypothesis that the greatest discrepancy between parents and adolescents autonomy expectations would be over multifaceted issues was not confirmed.

A 2 (Gender) x 3 (Grade) x 4 (Domain) mixed model ANOVA was conducted to investigate the domain differences among the parent-adolescent expectations discrepancy scores. A significant main effect of domain was revealed, $F(3, 378) = 6.98, p < .001$. Although parents still had later expectations over all issues than adolescents, parents and children disagreed most often on expectations for conventional issues ($M = .87; SD = 1.39$), followed by age expectation discrepancies for multifaceted issues ($M = .45; SD = .56$) and prudential issues ($M = .45; SD = .78$); parents and adolescents agreed most often on issues within the personal domain ($M = .24; SD = .72$). See Table 1 for a complete list of means and standard deviations.

Mean differences among domains were significantly and moderately correlated with one another (see Table 1). These results show that all domains are related to adolescent autonomy expectations, but given that there is not a perfect correlation among the different types of domains, it suggests that it is still important to consider them as distinct domains.

Effects of domain type on adjustment measures

Hierarchical regression analyses were performed to investigate the relationship between differences in parents' and adolescents autonomy expectations and adolescent adjustment (see Table 2). At step 1 of each analysis, adolescent age and gender were included as controls. At step 2, difference scores between parent and adolescent expectations over the four domains (multifaceted, prudential, personal, and conventional) were entered. Four measures of adolescent adjustment (depression, problem behavior, anxiety, and academic performance) were investigated as dependent variables.

Results showed that the greater the discrepancy of autonomy expectations between parents and adolescents over personal issues, the greater number of depressive symptoms adolescents reported feeling (marginally significant). When the discrepancy between parents and adolescents was higher over prudential issues, the amount of delinquency adolescents reported being involved in approached significance. Interestingly, we found a significant association between expectations for conventional issues and anxiety. That is, when parents and adolescents agreed less over conventional issues, adolescents reported feeling less anxiety.

Table 1.
Correlations among demographic and study variables

	M	SD	1	2	3	4	5	6	7	8
1. MFdiff	.45	.56	-							
2. PEdiff	.24	.72	.42**	-						
3. PUdiff	.45	.78	.42**	.31**	-					
4. CNdiff	.87	1.39	.46**	.40**	.38**	-				
5. Prob Behavior	1.41	.60	.18*	.19*	.25**	.13	-			
6. Depression	1.96	.26	.00	.14	.11	.02	.24**	-		
7. Anxiety	2.33	.68	-.17*	.01	-.03	-.19*	.19*	.50**	-	
8. G.P.A.	1.52	.81	.16	.19	.22**	.17*	.44**	.16	.07	-

Note: + = $p < .10$, * = $p < .05$, ** = $p < .01$. MFdiff = Differences in agreement about multifaceted issues, PEdiff = Agreement about personal issues, PUdiff = Agreement about prudential issues, and CNdiff = Agreement about social-conventional issues.

Table 2.
Associations between Parent-Adolescent Agreement and Adolescent Adjustment

	Depression			Problem Behavior			Anxiety			Academic Performance		
	ΔF	ΔR^2	β	ΔF	ΔR^2	β	ΔF	ΔR^2	β	ΔF	ΔR^2	β
Step 1	0.41	0.01		1.81	0.03		2.58+	.04+		7.26**	.10**	
t1Age			0.08		0.12				0.11			.16*
Tsex			-0.01		-0.07				0.16			-.25*
Step 1	1.19	0.04		2.60*	.07*		2.13+	.06+		2.43*	.063*	
MFdiff			-0.09		0.04				-0.1			-0.05
PEdiff			.17+		0.14				0.12			.18+
PUdiff			0.1		.18+				0.06			0.12
CNdiff			-0.06		-0.02				-.21*			0.06

Note: + = $p < .10$, * = $p < .05$, ** = $p < .01$. β represents the final step of the analyses. MFdiff = Agreement between parents and adolescents over multifaceted issues, PEdiff = agreement over personal issues, PUdiff = agreement over prudential issues, and CNdiff = agreement over conventional issues.

In general, older adolescents and boys reported a higher G.P.A. than younger adolescents and girls. Finally, when there was a larger discrepancy between parents and adolescents for autonomy expectations over personal issues, adolescents reported higher academic performance.

DISCUSSION

The present study examined the discrepancy between parents' age expectations and adolescents' age expectations for autonomy over issues taken from social domain theory (Smetana, Campione-Barr, & Daddis, 2004). These issues fell in the prudential, conventional, personal, and multifaceted domains. The study then examined the impact these discrepancies had on adolescent's adjustment, and if agreement in specific domains differentially affected adjustment. Adolescent adjustment was assessed through examining depression, problem behavior, anxiety, and academic performance.

Expectations for behavioral autonomy

The present study used "Teen Timetables" adapted from Feldman and Quatman (1988) to assess parent-adolescent age expectations. Parent and adolescent reports of appropriate age for autonomy were congruent with our expectations that parents

would report a later age for autonomy than would their children. Expectation discrepancies were found by subtracting teen expectations from parent expectations and the resulting difference scores were consistently positive.

The present study also assessed parent-adolescent expectation agreement by domain. We hypothesized that the largest discrepancy would be between parent and adolescent age expectations over issues in the multifaceted domain, although this was not confirmed. Initially, we believed the discrepancy would be largest in this domain because of the essential disagreement about the issues that fall in this domain (such as how tidy the adolescent's bedroom is or where the adolescent should go when they hang out with their friends). However, this hypothesis not being confirmed could be because of this same fact. If parents and adolescents disagree on what issues are multifaceted to begin with, it may be difficult for them to agree or disagree over issues in this domain. Additionally, parents and adolescents disagreed most often over expectations for issues in the conventional domain. Since conventional issues can include social norms such as table manners and whether or not to call teachers by their first names, parents and adolescents disagreeing on these issues may simply be a sign of 'good' parenting. Parents may feel as if calling teachers by their first name is improper, whereas the adolescent may feel it is not an issue – although they may still address teachers properly because all of their peers do. However, the remaining domains were ordered appropriately based on social domain theory. Age expectations were somewhat closer together for issues in the multifaceted and prudential domains, while parents and adolescents agreed most often on age expectations over issues in the personal domain. This was expected given that according to social domain theory, the personal domain is made up of issues that should be solely up to the individual to decide, and from a relatively early age (Smetana, 2006).

Since parents may tend to be more protective of female adolescents (Feldman & Quatman, 1998), we expected that parents' age expectations for daughters would be later than their expectations for sons. Thus, we examined whether parents and sons would have closer expectations than parents and daughters. Results indicated that there was no difference in age expectations between parents and sons and parents and daughters. This does not necessarily mean that this particular sample of parents was less protective of their daughters. It could mean that parents and daughters both had later expectations than parents and sons, thus the discrepancy score was similar, so no significant difference by sex was found.

Smetana, Campione-Barr, and Daddis (2004) found that older adolescents tend to desire more freedoms than younger adolescents, because younger adolescents still see decision making as under the parents legitimate authority; thus, younger adolescents may be willing to let parents make decisions for them. Following from these findings, we expected that there would be a larger discrepancy between parent and older adolescent expectations than between parent and younger adolescent expectations. This hypothesis was not confirmed. Parents and older adolescents had similar discrepancies in expectations than parents and younger adolescents. Thus, there were no significant findings by age. Adolescents will always desire freedoms earlier than parents are willing to give them, regardless of what age they are. This means that adolescents are always pushing the boundaries to see what freedoms they can get throughout their teenage years, while parents are required to catch up. They must relinquish freedoms at a rate that is comfortable for both themselves and for their children, and as the teenager gets

closer to adulthood, parents must be willing to almost totally relinquish freedoms and let their child make decisions for themselves. While parents may always be behind adolescents in their perceptions of what is age appropriate, parent expectations may change at the same rate that the adolescent expectations do. In this way, the discrepancy scores remain the same as the adolescent gets older, so no significant findings by age were found.

Level of agreement and adolescent adjustment

The present study also examined the impact that the discrepancy between parent-adolescent expectations had on adolescent adjustment. We expected that a larger discrepancy between parent-adolescent expectations would lead to more problem behavior, and this was confirmed. If parent and adolescent age expectations for autonomy are closer together, it is likely that these dyads have less conflict over autonomy issues, which would, overall, lead to better adolescent adjustment.

The adjustment measures examined (depressed mood, problem behavior, anxiety and academic performance) were dependent on the level of agreement by domain type. When parents had later expectations over personal issues than adolescents, adolescents reported more depressive symptoms. Although there is still a discrepancy between parents and adolescents over personal issues, this discrepancy is smallest. Perhaps if a parent were to invade an adolescent's privacy (for example, reading the adolescent's diary), this could lead to adolescents reporting more depressive symptoms as a result of feeling as if they cannot trust their parent(s)

When parents' expectations were later over prudential issues than adolescent's expectations, adolescents reported more delinquency. While on the surface this may be surprising, it likely means that adolescents may be simply be involved in delinquent behavior, regardless of the fact that their parents think they should not be. Thus, the involvement in problem behavior is probably not a result of the discrepancy between parent and adolescent expectations over prudential issues – it may simply result from the adolescent already being involved in problem behaviors.

When parents reported later expectations over conventional issues than adolescents did, adolescents reported significantly less anxiety, which was an interesting finding. As mentioned before when discussing the reason for highest disagreement over conventional issues between parents and adolescents, perhaps this disagreement is just a sign of good parenting, thus the adolescent feels less anxious.

Finally, when parents reported later expectations over personal issues than adolescents, adolescents reported higher academic performance. The reason for this finding could be opposite of the finding for parent-adolescent disagreement over personal issues leading to depressive symptoms. This is related to previous research on authoritarian parenting (Lamborn, Dornbush, & Steinberg, 1996) that indicates while authoritative parenting seems to be the best option for healthy adolescent adjustment in general, authoritarian parenting among middle-class African-American adolescents is positively associated with adolescent adjustment. Perhaps an authoritarian parenting style is at play here – if parents keep control even over issues that should be under the adolescent's authority of decision making, it is likely that these parents wield enough authority in the household that high academic performance is simply expected by parents, and adolescents conform to these expectations.

As previously mentioned, an authoritative parenting style

has been shown by research to consistently be the best option for healthy adolescent adjustment (Lamborn, Dornbusch, & Steinberg, 1996). Smetana, Campione-Barr, and Daddis (2004) found that parent involvement in decision making was greater across adolescence for conventional issues and prudential issues and that adolescent autonomy was greater for personal issues than other issues. The present study had similar results, in that parents and adolescents disagreed most often over age expectations for conventional issues, followed by prudential and multifaceted issues, which is indicative of higher levels of parent involvement in decision making over issues in these domains.

The results found by Smetana, Campione-Barr, and Daddis (2004) that adolescent autonomy was greater for personal issues than other issues was confirmed by the present study. Since parents and adolescents had the closest agreement over age expectations for personal issues, this indicates that adolescents are allowed the most freedom on issues that fall in this domain.

As previously mentioned, an authoritative parenting style can lead to healthy adolescent adjustment, since parents and adolescents that make decisions together are less likely to have conflict over these issues. Additionally, perhaps authoritative parenting would lead to similar parent-adolescent age expectations for autonomy. This could be because these dyads discuss what they expect of each other, what is appropriate and what is not, and thus the conflict over autonomy issues is kept at a minimum.

Limitations and future directions

One limitation of the present study was that the sample was overwhelmingly Caucasian and middle class. Thus, the results can only be generalized to a small subset of the larger population. Future studies could address this issue by studying groups in other socioeconomic categories and families of different ethnicities. That way, the results could be generalized over a much larger subset of the population. It would also be interesting to discover if the parent-adolescent expectations for autonomy from this study are similar for African-American families or Hispanic families. The specific agreement of parent-adolescent expectations across specific domains, and how this agreement across domains affects adolescent adjustment, would also be interesting to discover across different groups.

For example, Fuligni (1998) studied adolescent autonomy and parent-adolescent conflict and cohesion among families of Mexican, Chinese, Filipino, and European backgrounds. Results of this study indicated that adolescents of non-European backgrounds held beliefs that were consistent with greater parental respect and less of an emphasis on individual autonomy. Also, adolescents with Filipino and Mexican backgrounds are less likely to openly contradict their mother and fathers, respectively. Chinese adolescents believed that they would gain autonomy at a later age than their European counterparts.

The results from Fuligni (1998) indicate that if the present study was conducted on adolescents from these different ethnic groups, the analysis would yield similar results to those just described. Adolescents from these backgrounds in general would probably agree more often with parents over age expectations for autonomy, thus making the discrepancies in each domain smaller. It would be interesting to see if the discrepancies by domain were similar to the domain discrepancies found in the present study. For example, a study of this sort could attempt to discover if adolescents from non-European backgrounds also disagree with parents most often over issues in the conventional domain, or if disagreement in one of the other domains would be more

apparent.

According to Fuligni (1998), the adolescents in his study reported a small amount of conflict with mothers and fathers, although older adolescents reported less cohesion with parents than younger adolescents. This suggests that non-European adolescents are more accepting of their parent's authority, but older adolescents are still trying to 'break away' from this authority, so less cohesion among older adolescents and parents makes sense.

An additional limitation of the present study was the cross-sectional nature of the data analyzed. Longitudinal data, collected over a period of several years, would enable researchers to confirm the direction of the effects and infer more causal relationships.

Conclusion

Overall, parents and adolescents do have differing ideas of autonomy. Adolescents generally desire autonomy earlier than parents are willing to relinquish this independence. Additionally, adjustment of the adolescent depends on the level of agreement by domain type. It seems that parent-adolescent disagreement in some domains can have a negative impact on adjustment, and disagreement in other domains can have a positive (or at least not a negative) impact on adjustment.

Although parents and adolescents do have differing ideas of autonomy, this could mainly be because parents want to protect their children and have a hard time giving adolescents freedom. This is typical among parent-adolescent relationships, so some disagreement over age expectations for autonomy is to be expected. The discovery of disagreement by domain indicates that parents and adolescents disagree more over some types of issues than others. Perhaps parents can take the information learned by the results of this study to communicate their expectations with their children more efficiently, realizing that agreement by domain effects the adolescent's adjustment for certain internalizing and externalizing symptoms. Noting that larger age discrepancies over personal issues can lead to higher depressive symptoms in adolescents (and higher academic performance), perhaps parents could take care to give the adolescent their privacy and authority over issues that are personal to their child. Doing so could lead to lower depressive symptoms among adolescents.

If parents and adolescents have closer expectations over prudential issues, perhaps this would lead to adolescents reporting less delinquency. Maybe if the disagreement over age expectations is smaller, parents and adolescents would communicate better over their expectations for adolescent engagement in delinquency. For example, if parents explain to their child that drinking before the age of twenty-one is illegal and irresponsible, maybe the adolescent would feel less inclined to engage in this behavior. Also, when adolescents go out with friends it is important that the parent know where they are going and what they will be doing. This parental monitoring will allow the parent to actually know what their child is doing when they go out, thus it is likely that the adolescent would engage in fewer delinquent behaviors because they do not want their parents to know they are doing it and/or respect their parent's wishes that they do not engage in such behavior. It is reasonable that parents worry about their child's safety and engagement in delinquent activities, but this concern may cause parents to be overprotective. Some adolescents, in an attempt to either gain more freedoms or rebel against their parent's authority, may engage in more problem behaviors. If parent's expectations are more reasonable

for their children, perhaps these adolescents would not feel the need to engage in these behaviors in an attempt to assert this authority. Perhaps they would feel as if their parents trust them, and maybe this would lead to the adolescent desiring to give their parents a reason to trust them – possibly leading to less problem behavior.

The result of an increased level of parent-adolescent disagreement over conventional issues leading to less anxiety is not necessarily a spurious finding. It would be ideal for parents and adolescents to have closer expectations among all domains, but parents' later expectations may also lead to them teaching their children about proper social norms more often, thus leading to less anxious adolescents.

Finally, the disagreement over personal issues that lends to the result of higher academic performance among all adolescents can be due to the parents giving their child privacy. It would be wise for parents to allow their child some domain of independent decision making; thus, they should continue to give adolescents their privacy, noting that it does yield positive results.

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Validation of DC skinfold prediction equation

ASHLEY SHAW

Stephen Ball, PhD, Mentor,
Department of Human and
Environmental Sciences - Extension



Ashley is a native of Kansas City, MO and is a junior majoring in Nutrition and Fitness. She is a very active member of the campus community serving as President of the Nutrition and Wellness Association, co-founder of the Mizzou Black Women's Initiative (MBWI) and runway instructor for the Visions Fashion and Community Service organization. Ashley is the recipient of the Diversity scholarship and will spend this summer at MU as a summer research scholar for the Alcohol Research Training Summer School Program. Upon graduation next May, Ashley looks to pursue a graduate degree in Health Education.

INTRODUCTION

Obesity is defined as a body mass index equal or greater than 30 (6). Over the past several decades there has been a significant increase of obesity in the United States (6). Also, excess body fat is linked to disease (3). Therefore it is important that obesity or excess body fat is accurately measured. There are several accurate laboratory methods of body composition including Dual Energy X-Ray Absorptiometry (DXA), Air Displacement Plethysmography (Bod Pod), and Hydrostatic weighing. However, these methods are expensive and not readily available. Therefore, most clinicians are forced to use less expensive and available methods such as skinfolds (SK).

A skinfold (SK) is a fold of skin formed by pinching the skin and subcutaneous layers in order to estimate the amount of body fat underneath the skin. Since there is dissimilarity between the right and left side of the body, measurements are usually only taken on the right side of the body. The two major causes of inaccuracy in skinfolds include: inaccurate measurements when performing the skinfolds and not choosing the appropriate predictive equation for the client, which is typically based on ethnicity, age, and gender (1). Many prediction equations exist so it is often difficult to determine which equation is most suited to the population. One important factor to consider when selecting an equation is the Standard Errors of Estimate (SEE). The SEE is used as a measure of a skinfold equation's predictive accuracy. The lower the SEE the better an equation is at estimating BF. The following example helps illustrate the importance of having a low SEE. Consider Equation X predicts Subject A's BF to be 20% with a SEE of 3%. This means there is only a 67% certainty that Subject A's BF is 17-23%BF (± 1 SEE). There is a 95% certainty that Subject A's BF is 14-26%BF (± 2 SEE). It is apparent from this example that having a low SEE is critical to an equation's success at predicting BF. A slight improvement in SEE will dramatically increase the performance of an equation. Most skinfold prediction equations have SEE greater than 3.0% (1). The DC equation (1), which is being investigated in the current study, has a SEE of only 2%, a significant improvement over previously recommended equations. When using skinfolds other sources of error include equipment, technician skill, subject factors, and anthropometric prediction equations (4). Depending on the type of equipment/caliper used to perform the skinfolds will determine the accuracy of the skinfold. Technician skill is a minor source of measurement error, but can be a factor if the technician lacks the proper skills in locating measurement sites and applying tension during measurements (4). Subject factors can be a factor if the subjects are obese or heavily-muscled because accurate measurements may be difficult to determine. Using improper anthropometric prediction equations will produce error in estimating body composition (4).

The Lange and Harpenden calipers are currently the most accurate calipers to use when performing skinfolds. This is because the same amount of tension is applied to the fat fold making for more consistent and accurate measurements (1). Also the Harpenden calipers are known for giving a faintly

lower reading than the Lange calipers because of the slightly greater pressure on the skin (1). Skinfolds can be measured at many different sites but most equations use a combination of the following seven sites, (abdomen, chest, midaxillary, triceps, thigh, supscapular, and suprailliac). To obtain accurate results the same caliper should be used when tracking BF.

Most SK equations were based on hydrostatic weighing (HW). HW uses body density to determine two components of the human body: fat mass and fat free mass. Since the human body is made up of more than just those two components, the accuracy of HW is limited. The HW procedure is also arduous and difficult for many people to perform. The procedure requires subjects to maximally exhale while being submerged into water and requires subjects to remain motionless while being underwater to obtain an accurate reading. This test must be repeated many times to obtain accurate results.

In addition, residual lung volume (V_R) must be measured to guarantee an accurate measure of the ratio of body mass to body volume (V_b) from HW. RV requires special and costly equipment and is not easy to measure. Estimating RV from height and gender is not accurate and therefore complicates the HW procedure and determination of BF. Due to these limitations, HW is no longer considered the "Gold Standard" or method of choice for body composition assessment. Since most common skinfold equations were based on HW, an outdated criterion measure of body fat assessment, it makes sense that the currently employed SF equations are also outdated (2).

In 2006, for the first time, SF equations were developed from a more sophisticated and current criterion measure –Dual Energy X-Ray Absorptiometry (DXA). Dual energy X-ray absorptiometry (DXA) measures fat mass, lean mass, and bone mass. DXA is safe and only takes 6-20 minutes to complete. DXA has replaced HW as the criterion method of choice in most settings because it is able to account for bone mineral density, something that HW must estimate. Obviously, the more components a technique can account for, the higher the theoretical accuracy (1). The subjects are instructed to lie on the table in a fixed position while the DXA machine passes over their body. As the machine crosses the body it sends an invisible beam of low dose x-rays through the bones to measure bone, fat mass, and lean mass.

Although DXA is the new practical "Gold Standard" it is not without limitations. The principal limitation of the DXA scan is that large patients have to be scanned in a cramped position, which may hinder the analysis (3). Another limitation of DXA is that the hydration of lean body mass is set at 0.73 mL/g. (5,6). Also DXA underestimates body fat mass by a standard deviation of 4.07 (3). DXA is unable to accurately measure the body composition of soft tissue, which is important in determining abnormal growth, normal growth, and disease within soft tissues (3). The DXA measurements of bone are sensitive to the anteroposterior thickness of the body and may affect soft tissue determination (Laskey et al. 1992; Jebb et al. 1995 a,b). Despite these limitations DXA is still very accurate at estimating BF (3).

It makes sense that the new SF equations created from DXA should be more accurate than those created from HW. However, until now these equations have not been validated against independent populations.

It is important to point out that the most precise model of body composition is a four-component model, which estimates bone mineral mass, fat mass, total body water, and residual (2). Although theoretically this is the true "gold standard" in body composition, it is costly and impractical. Therefore DXA has been called the "Practical Gold Standard" and is the most accepted

criterion measure among researchers. Currently no SF equations have been created from the 4C model. The difference between the 2C model (HW), 3C model (DXA) and the 4C model in body fat percentage accuracy, ranges from 3-4%.

It makes sense that the new SF equations created from DXA should be more accurate than those created from HW. In 2006, Ball et al. created a new SK equation based on DXA. The new equation called the DXA Criterion (DC) equation was the first SF prediction equation based on the criterion method DXA for men. The equation appears to accurately predict BF for men with a low Standard Error of Estimate. However, before the scientific community will embrace this new equation, it is important that researchers validate and test it on multiple samples of men. The current study is the first step in testing the efficacy and accuracy of the DC equation.

The purpose of this study is to determine if the DC equations accurately predict body fatness in men.

METHODS

Subjects

Forty-five men (18-30 years old) were recruited to participate in the study. All participants signed a consent form with the policies in concurrence with the University Human Subjects Institutional Review Board before entering the study.

Anthropometric Measurements

Subject's body weight was taken to the nearest 0.5 lb using (Toledo scale, Mettler-Toledo Inc., Columbus, OH, USA) while the height was measured to the nearest 0.25 inch using (Seca 216, Seca gmbh & co. kg., Hamburg, Germany). The circumference of the waist (narrowest point between the umbilicus and rib cage) and hip (largest protrusion of the buttock) was taken to the nearest 0.5cm using a Medco Tape Measure (Medco Sports Medicine, Tonawanda, NY, USA). Body mass index (BMI; kg/m²) and waist to hip ratio (WHR) was calculated as descriptive data.

Dual Energy X-ray Absorptiometry

The subjects were instructed to wear minimal clothing and remove all metal objects before being scanned. Each subject was scanned once. They layed on the table in a fixed position while the DXA machine passes over their body. As the machine crossed the body it sent an invisible beam of low dose x-rays through the bones to measure bone, fat mass, and lean mass. Body composition was estimated using computer software (QDR Software for windows XP, Version 12.4, Hologic, Inc., Bedford, MA). Bone mass, fat mass, and lean tissue mass was represented in grams. BF was calculated by software that represented fat mass (g)/ total mass (g) x 100.

Skinfold

Each subject was given a skin fold exam on the right side of the body. Skinfolds were measured with a Lange caliper, which lightly pinched the skin and measured the subcutaneous fat underneath the skin. The skinfolds were measured at seven different sites, (abdomen, chest, midaxillary, triceps, thigh, supscapular, and suprailliac). There was three readings taken for each site and recorded as the average of the closest two measurements.

Statistical Analysis

The SPSS version 17.0 was used for statistical analysis. Pearson correlation and coefficient of determination, R², was assessed in order to determine the reliability of the measures.

A one-way ANOVA was run in order to determine significance ($p=0.01$)

RESULTS

The results showed that the DC equation had a mean of 16.2 ± 4.9 %BF compared to DXA, which had a mean of 16.3 ± 4.7 %BF. Also the Jackson Pollock 7 equation had a mean of 12.3 ± 5.3 compared to DXA. The reliability of the DC equation, R^2 was 0.79.

Table 1. Recommended generalizable antropometric equations for men

Equation	Site	Formula
JP7	Chest, midaxillary, triceps, thigh, subscapular, suprailiac, abdomen	Body density = $1.112 - 0.00043499 (\sum 7SF)^2 - 0.00028826 (\text{age})$
DC	Chest, midaxillary, triceps, thigh, subscapular, suprailiac, abdomen	Body density + $0.465 + 0.18 * (\sum 7SF) - 0.0002406 * (\sum 7SF)^2 + 0.06619 * (\text{age})$

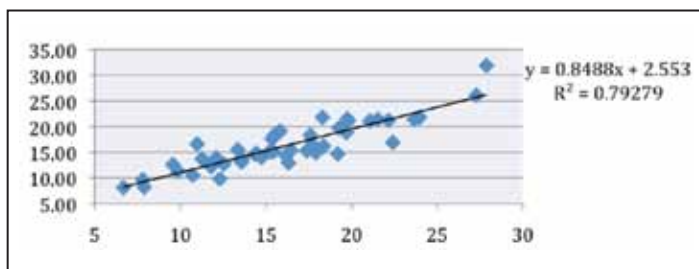
Table 2. Descriptive Characteristics

	N	Mean	SD	Range
Age (yr)	45	21.0	± 1.2	18 - 23
Height (in)	45	70.6	± 2.7	64.5 - 77
Weight (lb)	45	182.6	± 29.3	123.5 - 279.5
BMI	45	25.8	± 3.7	19.4 - 40.8
DXA (%BF)	45	16.3	± 4.7	8.2 - 31.9

Table 3. Agreement between %BF by DXA and the DC equation

	N	MINIMUM	MAXIMUM	MEAN	STD DEVIATION
DC	45	6.7	27.9	16.2	4.9
DXA	45	8.1	31.9	16.3	4.7
JP7	45	2.5	25.2	12.3	5.3

Graph 1. DXA Correlation vs. DC Equation



DISCUSSION

The objective of this study was to determine if the DC equation accurately predicts body fatness in men. The results indicated that the DC equation accurately predicted %BF compared to DXA. The DC equation had a mean of 16.2 ± 4.9 %BF compared to DXA which had a mean of 16.3 ± 4.7 %BF. The results supported the hypothesis that the DC equation will

accurately predict body fatness in men. The DC equation more accurately predicted fatness compared to the commonly used equation by Jackson and Pollock (mean = 12.3 ± 5.3). The current results also support the finding by Ball et al. (2004). The major limitations of the study is the small age range of subjects. It is not known if the DC equation will work as well on older individuals. Further research should focus on older individuals as well as special populations.

Despite the accuracy of the DC equation compared to DXA, practitioners must consider the many factors that influence skinfold equations prediction accuracy (i.e. technician error, caliper differences, subject factors). A prediction equation's accuracy is heavily influenced by many factors and it is important to control these factors when possible. In addition, it is important to realize that DXA is not a perfect criterion measures and also has flaws. Nevertheless, the DC equation appears to be a more suitable equation that the previously recommended equation by Jackson and Pollock. It is my recommendation that practitioners should employ the DC equation when appropriate.

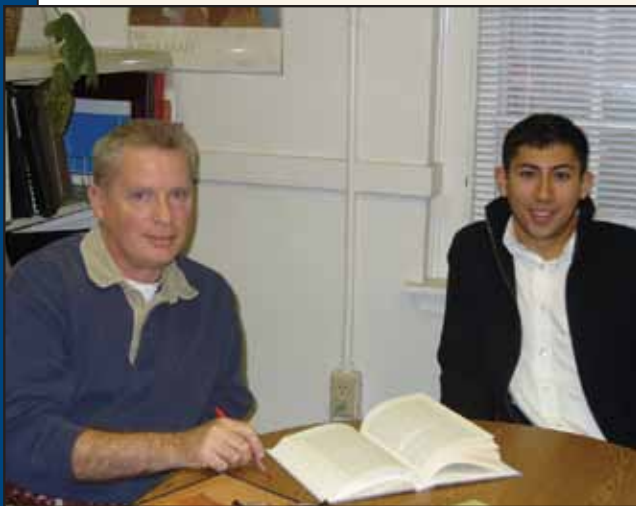
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Outside the barrio: Latino/a elected officials in non-Latino areas

MICHAEL SCHRANTZ

L. Marvin Overby, PhD, Mentor,
Department of Political Science



Michael Schrantz is a senior from Berkeley, CA undertaking a dual major in Print Journalism and Political Science. He is active in the School of Journalism serving as a member of the Investigative Reporters and Editors. Upon graduation, Michael seeks to work for a non-profit doing demographic research and data analysis before attending a doctoral program in Political Science.

THE STATE OF LATINO POLITICAL RESEARCH

In the last generation, Latino politics has blossomed as a field in political research. Original datasets have been developed and new theories have emerged to explain political access, incorporation and participation. Through this, racial and ethnic politics has seen its prestige rise and garnered respect as a cross-national discipline. However, Latino politics has been a geographically restricted study, confined by immigration patterns that lured immigrants to either coast. In 2008, 71 percent of Latino lived in California, Texas, Florida, New York, Arizona or Illinois. Only slightly more than 20 percent of all U.S. Latinos lived outside of the top 10 states (Pew Hispanic Center 2010).

Despite this continued geographic polarity, there are indications that some dispersal is underway. In 2000, the states with the top five Latino populations mentioned above accounted for 73.6 percent of the total U.S. Latino population. The 2.6 percentage point change is not a dramatic exodus, but California, Texas and New York all saw drops in their share of the Latino population. The move towards new immigrant destinations and dispersal began in the 1990s and continues to build momentum (Massey 2008, 36). While the percentage increases in new destinations may be small, the rise in absolute numbers is drastic to the communities that find themselves adapting to a new Latino population.

One area that is experiencing Latino population growth is the Midwest. Economic development and industrial restructuring are most useful in explaining the demographic shifts taking place (Massey 2008, 7). The commercialization of agriculture, development of wage labor markets and growing low-skill service sectors all contribute to geographic diversification. After the initial impetus, the process of cumulative causation ensures continued growth for new destinations (Massey 2008, 7). Two decades have passed since the nature of Latino dispersal began to shift. Now is an appropriate time to address new Latino destinations in the study of Latino representation.

PRESENT LITERATURE ON LATINO REPRESENTATION

To set the background for a discussion of Latino representation, I will review the topics discussed in previous literature and evaluate demographic trends. I will then address the expansion of Latinos into previously non-Latino/a areas. Lastly, I will theorize how concepts from previous research can inform the future of Latino representation in non-Latino areas.

Most literature on Latino representation starts with a discussion of the rapid growth of the Latino population in the U.S. and the disparity between this growth and current levels of Latino representation. It is considered a tenet of pluralism that the distribution of representation matches the distribution of the population they govern. This is meant in a descriptive sense; the elected official should look like and have the same

interests as their electorate. Descriptive representation is also used to gauge a group's clout in the American political system. According to Browning, Marshall and Tabb (1984), "the most widely used indicator of a group's position in a political system is the presence of that group in elective offices."

In 2008, Latinos had a population of almost 47 million, or 15.4 percent of the nation's total population (Pew Hispanic Center 2010). This is a substantial increase from just over 35 million Latinos in 2000, or 12.5 percent of the national population. While the Census Bureau lists most of this growth as coming from native-born Latinos, there is reason to believe the number of foreign-born Latino is vastly underestimated because of their traditional aversion to the census and surveys. Despite this tremendous growth in the Latino population, Latino representation at the highest levels remains lacking. Over two thirds of all Latino elected officials serve at the municipal level or on school boards, and Latino members of Congress equal less than five percent of the total (NALEO 2007, 2009).

The pluralist viewpoint on political power holds that separate centers of power allow smaller groups equal access to political decision-making. Resource-rich groups should not dominate those with few resources. This is contrary to the pre-voting rights act period and remains elusive even in the current era. Individual victories for Latino candidates have not equated to systemic access to power. The apparent failings of pluralism prompted researchers to reevaluate their theories about the American political system (Fraga et al. 2006).

The political climate in the 1970s gave rise to internal colonialism to describe the unequal relationship between Latinos and the Anglo majority in the U.S. (Garcia and de la Garza 1977). Similar to classic colonialism, internal colonialism refers to a relationship "where one group of people dominate and exploit another, and, generally the relations occur between culturally different groups" (Garcia and de la Garza 1977). Minority members have the same legal status as the dominant group in internal colonialism, but the dominant group reinforces cultural differences and oppresses the minority in overt or subtle ways.

Rodney Hero (1992) introduced the theory of two-tiered pluralism that suggests a legal declaration of equality often masks a different experience for members of a minority group. The advertised formal inclusion for minorities is stigmatized and limited. By setting a separate standard or policy for minorities, a cycle is established that allows the group some inclusion or power, but they accept a label in return. The label is a manifestation of racialization, which is a recurrent theme in Latino politics. Acceptance of the label, and its promise of marginal inclusion, indicates that the minority could not have political access without the help or generosity of the dominant group. This is the lower tier of pluralism.

Both of these theories explain a lack of access to political power. As quoted above, representation is an excellent indicator of power. Empirical studies of representation seek to accurately depict the status of Latino inclusion in the political process by describing the experiences of Latinos/as who hold office.

There is a proliferation of localized and issue-focused case studies on Latino representation. Macro studies of Latino representation are not as common but present a generalizable view of Latino elected officials. Because most Latino elected officials represent traditionally Latino areas, the studies draw heavily from those areas in an attempt to accurately portray the greatest number of Latino elected officials.

Some of the observations in the literature seem simple but are worth noting. The Latino population skews towards the

Democratic Party. Because of this, most Latino elected officials are Democrats. Latino congressional members normally come from heavily Latino districts. In 2009, there were two Latino senators and 23 Latino representatives. All 25 members of Congress came from states in the top 10 of Latino population sizes (NALEO 2009). Latino officials tend to be better educated and wealthier than the Latino community as a whole (Geron 2005, 194). Given these common sense descriptions of Latino elected officials, the factors leading to their election do warrant some explanation.

As most Latino candidates need a strong Latino base to be competitive in a race, characteristics of the Latino electorate have sizable ramifications for the candidates' ability to win. The Latino population skews younger than the general population and much younger than the Anglo population. Thirty-four percent of the Latino population are under 18 years old with a median age of 27. Only 20.8 percent of white, non-Hispanics are under 18. The median age for whites is 41. The difference between native-born and foreign-born Latinos is just as stark. The median age for native-born Latinos is 17, compared to 37 for foreign-born Latinos. More of the Latino population falls below the voting age than whites, blacks or Asians (Pew Hispanic Center 2010). This is especially true for the native-born population. Even of those that are voting age, most fall into groups with the lowest rates of voter registration (Pew Hispanic Center 2010; Geron 2005). With these obstacles to voter mobilization, it is difficult for a Latino candidate to win by only courting the Latino community.

The makeup of a district is the main determinant of the type of campaign the candidate must run. Geron (2005) breaks districts into four groups: predominately Latino, mixed, growing Latino influence and predominately non-Latino. Also important is whether the district is urban, suburban or rural. Coalitional politics are a requisite for winning most offices, even in a predominately Latino district. Crossover politics have also allowed Latinos to win in districts with marginal Latino populations and strong Republican ties. While candidates running in Latino-majority districts find it advantageous to emphasize their ethnicity (and often national origin), crossover candidates tend to use mainstream campaign messages and omit ethnicity. In urban areas, candidates may use biracial, multiracial, multiple issue or labor-Latino alliances (Geron 2005, 117).

Geron also divides candidates into types based on their general characteristics: strong ethnic identification, combination candidate/officeholder and crossover candidate. The group continuum from most ethnic emphasis to least mirrors the list of potential districts and makes it obvious which candidates are best suited for each district.

Once an official has reached office, they have the potential for different levels of representation. These levels include formal, descriptive, symbolic, substantive and surrogate (Pitkin 1967; Geron 2005; Mansbridge 2003). Formal representation is the basic level where a representative is given the authority to act on the behalf of others. Descriptive representation involves shared characteristics between the representative and his or her constituents. In the case of Latino elected officials, it most often means ethnic identification, Spanish language use and a Hispano origin surname. The relevance of descriptive representation shows the official has reached a certain level of visibility in the community (Geron 2005, 190).

Symbolic representation is the next level. At this level, the official becomes a community role model or an ideal citizen. If the official is held up as a figure to emulate, symbolic representation has been reached. Substantive representation refers to an issue dominated relationship between the official and their community.

At this point, the official has gone beyond outward forms of representation and is fighting for tangible community benefits. This is vital to maintaining the support of the community and their trust in the political process.

The last form is surrogate representation (Mansbridge 2003). When this level is reached, the official acts for those beyond his or her district. In this form, the official has not entered into formal representation with those beyond the district. Mansfield refers to formal representation as promissory. An election signifies a promise to act on behalf of those who voted for the official. In surrogate representation, there is no electoral relationship (Mansbridge 2003, 522). This form is similar to Burke's "virtual" representation but is broader in application. In addition to collective will and static interests, a surrogate representative may be a liaison to an ethnic community in another district or be the de facto representative for the ethnic community as a whole in the region.

How officials reach office and what levels of representation they have attained will determine the amount of time they spend on issues most salient to the ethnic community. Crossover candidates in Republican districts or candidates that needed a broad multiracial coalition to win election will be less likely to divert resources to the Latino community. For those in heavily Latino districts or who campaigned on ethnic issues, the composition of the elected officials they serve with and their ability to generate influence determines how successful their ethnic agenda, if they have one, will be. An official who reaches office only to meet stiff opposition from other elected officials, or who is unable to affect the political agenda, will run into problems such as budgetary concerns and development pressure that can waylay campaign promises. These are the issues I anticipate affecting Latino elected officials in traditionally non-Latino areas and the issues I propose researching.

The road is already paved for Latino elected officials in California, Texas and the Southwest to affect change through a history of local Latino leadership and a major Latino population. As I have previously noted, these areas already contain Latino elected officials at the highest levels of elected office. These officials have set up Latino caucuses in the House for both Democrats and Republicans. Their experience will have challenges, but it can be considered mainstream for Latino elected officials and typical of ethnic representatives. As the Latino population disperses from the coasts and sets up roots in fly-over states, the number of Latino elected officials in these states should increase as the Latino community becomes dissatisfied with operating outside the local political machine and seeks substantive benefits for their community and a measure of self-determination.

While most of the Latino representatives interviewed and surveyed for other studies come from traditional Latino areas, some principles in those studies stand out as potentially important for non-Latino area research. In urban areas, forming a multiracial coalition may be enough to ensure a competitive race, but a coalition with white liberals has a much better chance of success in areas with only small minority advantages (Geron 2005). In suburban and rural areas with Republican majorities, crossover candidates can use issue-focused campaigns to attract white voters concerned with property values, crime and improving schools (Geron 2005).

Economic factors are the most germane when detailing the rise of new Latino destinations. The transformation of the American economy from a well-paid, unionized workforce to a low-wage foreign workforce can be labeled as industrial restructuring

(Massey 2008, 8). Certain industries became less attractive to native workers as global competition pressured American manufacturers to recapture the competitive advantage. Jobs that were not moved overseas entirely are likely to pay less and have fewer benefits in an attempt to cut costs. As native workers left these industries, foreign workers filled the vacated positions. Positions created as a result of industrial restructuring are most likely located in rural Midwestern and Southern locations with low prevailing wages (Massey 2008, 8-9). Many Latinos who come to the Midwest are specifically seeking meatpacking jobs or have family who work in the meatpacking industry (Massey 2008, 182). As new Latino destinations grow and time passes, the employment opportunities expand to include construction, food preparation and other entrepreneurial activities (Massey 2008, 181-183).

Agricultural labor or jobs in food processing may lure Latinos to the Midwest, but the demographic features of the Latinos involved in these industries — young, poorly educated, newly arrived — are hallmarks of low voter participation (Massey 2008, 7; Geron 2005). The number of non-citizen Latinos that immigrate to take low-wage positions also affects the amount of support available to Latino candidates for office. Without majority-minority districts or strong Latino voting bases, Latinos who are potential candidates for office must solicit support from the entire community. Latinos who choose to seek elected office must do so in issues based campaigns and challenge non-Latino incumbents. While the number of Latino elected officials in the Midwest is not staggering, the precedent they can set for future Latinos in the region is promising from an empowerment standpoint and also for working against the idea of "two-tiered" pluralism and the negative connotations it carries.

METHODS

In my study of Latino elected officials, I will be using qualitative research methods. The specific method I have chosen is the personal interview. For the scope and purpose of my study, interviews are the most economical way to reach my research goals.

Qualitative research lends itself to explanatory studies. My study focuses on Latino elected officials in non-Latino areas. I seek to explain the experience of a Latino elected official in the context of where he or she live, relates to the constituents and how his or her experience fits into the larger Latino political context. That larger context is built mainly from research in Latino majority areas. Interviews give me a greater ability to let my participants tell how they view this new frontier of Latino leadership in their own words.

Richard Fenno defends the use of personal interviews during certain situations in an appendix to his book *Home Style: House Members in Their Districts*. In the book, Fenno conducted interviews with Congressmen, in their home districts, with an outlook I have adopted. "Participant observation seems less likely to be used to test an existing hypothesis than to formulate a hypothesis for testing by others or to uncover some relationship that strikes others as worth hypothesizing about and testing," Fenno writes.

This kind of method may be useful in a setting where a fresh outlook is needed, according to Fenno. Research on Latino representation has been so focused on the symbolic representation of minority-majority districts that little has been done to explore the instances where Latinos are elected without large ethnic constituencies. It is my goal to produce a fresh perspective of Latino representation that expands on basic tenants of Latino

politics but also incorporates the experiences, divergent or not, of a new breed of Latino elected official.

I obtained a roster of Latino elected officials in the U.S. from the National Association of Latino Elected Officials (NALEO). The association compiles a roster with some descriptive data every year. One of the officials I interviewed had to contact the association to be included in their membership and roster because her married name was not of Latino origin. Because NALEO does rely partly on surname origin to identify officials to contact, I could have an incomplete list of officials to draw from. However, this does not affect the outcome of my research because I still had an adequate number of officials to choose from.

I am limiting the scope of my research to the midwestern states of Kansas, Missouri, Iowa and Nebraska. These states do not have a history of sizable or active Latino populations. In addition, I am looking for a mix of officials from rural, suburban and urban areas, and a mix of male and female officials. By striving for diversity in my interviews, I hope to obtain a more holistic view of Latino officials in the Midwest.

After narrowing my list of potential participants to seven candidates, I contacted each by phone and through e-mail explaining who I was, what I was doing and requesting an interview. Some were timely in responding, and others took repeated requests to acknowledge my message. I volunteered to send an outline of my questions to any official that accepted my invitation. The reasons for this were twofold: the officials would not be apprehensive about what I would ask and may be more willing to be interviewed because of it, and it would give them time to consider the questions. Some of the questions ask about representation in a broad or abstract way, and by letting them rehearse I hoped they would winnow their answers. The questions asked were formulated to touch upon the major points in mainstream Latino representation research. Coalitional politics, ethnic agendas, forms of representation, pluralism and the future of Latino politics were all included.

Ultimately, five candidates agreed to speak with me. All were from either Kansas or Missouri. The candidate in Nebraska was no longer in office and I never received any response from the candidate in Iowa. Each interview started from the same basic set of questions but evolved based on the areas that were most salient for each official. This allowed the officials a greater ability to tell their personal stories and fit them into the larger Latino political context.

It is my intent to contrast the answers given with conventional wisdom about Latino officials. By doing this, I hope to explore the differences between Latino representatives from traditionally Latino areas and Latino representatives in non-Latino areas.

FOCUS ON ETHNIC ISSUES

The officials interviewed were of higher educational and socioeconomic status than Latinos in their home states, when compared to data from the U.S. Census Bureau. Only one official said Spanish was his first language. Few of the others had any childhood exposure to Spanish. All three male officials interviewed are veterans of the U.S. armed forces. Four out of five officials have graduate degrees. The officials were overwhelmingly second-generation, or later, and of Mexican descent. Most were also active in their communities, having some knowledge of how to communicate with the Latino population.

The differences between the officials and the Latino populations in their regions are similar to conclusions about Latino representation in traditional areas. The major anomaly is the lack of Spanish as a first or primary language. The officials

interviewed who now speak some Spanish and use it while interacting with constituents either took classes later in life or obtained informal knowledge through social interaction. Some still use translators for written material or if they need help in certain situations. Two officials did not use any Spanish in their roles as elected officials. Demographic factors made its use unnecessary.

The communities the officials interviewed serve in do not meet the standards of being new Latino destinations. None of the communities have meatpacking or agricultural industries. However, the Latino populations that are present work in areas associated with secondary migration. Secondary migration normally implies stable legal status, English-language ability and more education (Massey 2008, 182). This difference in Latino populations bodes well for Latino voter involvement even if the population is statistically small.

The majority of the officials entered politics as single-issue candidates. They were likely encouraged to run by others involved in the same issue and had not planned on running for office before receiving encouragement. As issue candidates, these officials ran with a focus separate from what are normally considered ethnic concerns. All but one official eventually melded their core issues with ethnic concerns, expanded their interest sets after reaching office, or reached some level of issue confluence.

Officials who had similar answers regarding ethnic concerns represented districts with corresponding demographic features. The official who served in the district with the highest concentration of Latinos weighted ethnic issues heavily. Her path to office and political concerns were closely aligned with the traditional view of Latino representatives. She had political connections and mentorship in the area prior to seeking office. These contacts alerted her to an upcoming vacancy and offered advice on planning her campaign. She had the most initial volunteers of any official interviewed and specifically targeted the Latino community. During her first campaign, she made appearances at Latino cultural events and had Spanish language door hangers. She was unopposed but still ran a full campaign for experience.

The issues she campaigned on were health care, education and jobs. She said her agenda was not specifically Latino but she did include labor issues and increasing knowledge about HIPA laws. Immigration is a policy area she has become especially knowledgeable in. She prepares information for other legislators and they seek her advice on immigration related issues. Legislators now come to her with questions about other issues considered owned by Latinos.

The most atypical representative was a Republican who said he favored “color-blindness” in politics. As such, he did not see ethnic issues as deserving special attention. “What is good for Missouri is good for Latinos in Missouri,” the representative said. This official represents a district that was less than 1 percent Latino according to the 2000 Census and said he was the only Puerto Rican in his district that he knew of. He said he is proud of his heritage but does not make an effort to champion specific Latino issues.

Other officials had a narrower scope of concerns or worked to achieve what they saw as balance between ethnic and general concerns. One official was highly focused on one issue while advocating changes that positively benefitted the Latino community. He grew up in the community he serves and is willing to be a resource for its residents, but his influence may be restricted by the nature of his position and the dominance of one policy area during his discussion of political concerns.

Most sought to deliver proportional attention to the Latino community in their districts. The majority of their time was spent on general concerns, but they also made time to reach out to Latino population and were able to name Latino business owners they kept in contact with, prominent area Latinos and focal points of the community. One official said the grocery store near her office was known as the Mexican supermarket in the region. Latinos from outside the area come to that grocer, and the official took advantage by placing posters and literature there encouraging Latinos to participate in the census. The same official also targeted a specific apartment complex that has a high percentage of Latinos for financial education classes. Financial education; her highest priority for the Latino community. As Mayor, she said she “feeds it to the council in small portions,” referring to issues regarding Latinos and plans for the future of Latinos in her city. She expressed gratitude for how open her council has been. She has received support to join multiple Latino leadership organizations and attend conferences on Latino issues. On a white board across from her desk was listed her top three priorities for the immediate future. The issues listed on the board were general, citywide issues that affected the majority of her constituents, but directly below the board were stacks of literature and posters from NALEO, HELO and other Latino organizations that she was planning on distributing while she traveled that day.

LEVELS OF REPRESENTATION

Among the officials interviewed, examples were available for multiple levels of representation. Each was formally elected and therefore fulfilled the requirement for the most basic level of representation, and all admitted that in some way they also filled the role of descriptive or symbolic representation. Some went farther and reached the level of surrogate representation.

The representative in the most heavily Latino district said she is overwhelmed at times with the number of calls she receives. She does not ask if callers are from her district nor send them to another representative. She knows she helps more than her own district, but she suspects many times she is the only resource available. Questions about immigration laws constitute a large part of her call volume. She has immigration attorneys who she forwards callers to. She works with these attorneys on a regular basis and requires that they allow payment plans for the callers she refers to them. Being unconditionally available has become a “double-edged sword” for her. She is grateful for the support of the community but her personal priorities have suffered.

The official who had a strong, single-issue focus has also become a surrogate representative to the larger Latino community. He was more comfortable in Spanish than other officials interviewed and said he is a de facto liaison for the Spanish-speaking community. He was content in this role but expressed hope that more Latinos become self-sufficient. The Latinos in his community need to “fly on their own.” He was able to give specific examples of municipal boards and positions he felt needed more Latino input. While he does function as an informational resource, he is also dedicated to encouraging increased Latino involvement in local politics.

2010 CENSUS

Every official interviewed acknowledged the potential for a significant increase in Latino population figures after the 2010 Census. Most treated the potential increase as a reaffirmation of what they already knew rather than new information, but the final numbers were still valuable as evidence to show others. The officials saw the reaffirmation of the census as a tool they could

use to motivate colleagues and Latinos and accomplish policy ends. For the officials, the number and percentage of Latinos in their districts is important, but the growth rate of individual counties may be the most interesting figure for future research. According to 2008 census bureau estimates, counties in the Kansas City metro area and Iowa are among the fastest growing Latino populations in the nation. The Kansas City metro area does have an above average level of Latino leadership for the Midwest, but Iowa is still far behind in numbers of Latino elected officials. An area that warrants further research is the growth, or lack of, Latino leadership and grassroots Latino organizations in rural Iowa, Nebraska and parts of Arkansas. After census data has been made available, the counties with the highest growth rates in the Midwest should be examined for number of grassroots organizations, number of members in the organizations and any history of Latino leadership. Looking for community activists and conducting regular interviews would also be beneficial to tracking the growth of Latino political involvement in non-traditional Latino areas.

CONCLUSION

The level of awareness Latino elected officials have of their roles in the larger Latino community seems to be correlated to the number of Latinos in their districts and how visible that community is. While many believe there are more Latinos in their districts than are represented by current figures, they respond to the population they can see or reference statistically. As the Latino populations in these areas grow, the concerns of Latino elected officials in these areas should respond to the demographic shift. Either traditional ethnic concerns will become a larger share of midwestern political agendas or emerging Latino populations will adapt the traditional Latino issues to fit the unique economic and geographic circumstances of the Midwest.

Also tied to the roles of Latino elected officials is the level of representation they reach. The number of Latino officials becoming surrogate representatives should increase in the foreseeable future. Typically minority representation lags behind the growth of the minority population. A small group of Latino elected officials will become liaisons to a growing Latino population. Increased surrogate representation should also increase the attention paid to ethnic concerns by Latino officials and their prominence in the Latino community.

FUTURE RESEARCH

There are counties with high Latino growth rates in Iowa, Missouri, Kansas and Nebraska that still lack Latino representation. One official interviewed, who had few Latinos in his own city, talked about the large number of Latinos in the neighboring town where he attended Mass. Most of the Latinos he comes in contact with come from the neighboring town, but there is no Latino representation there. When asked if he believed an increase in Latino representation there were possible, he answered that it was unlikely significant changes would take place in the foreseeable future. Even though the town is diverse and minority candidates have run for office — not including Latinos — they were either defeated on their initial attempt or not reelected for a second term. The official saw the Latino population as dormant, lacking community organization.

An area of research that appears promising is the study of dormant Latino populations versus active Latino populations in rural, midwestern towns. The purpose would be to find factors that lead to increased political involvement in first-wave immigrant populations and second-wave migrant populations.

Using prolonged and periodic interviews, the study may be able to provide insight into grassroots organizations that are particularly effective and community activists that are successful at motivating Latino communities.

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- Interviews with elected officials:
- Adrienne Foster. Mayor of Roeland Park, Kansas
 - Brian Nieves. Missouri House Representative for the 98th District
 - Delia Garcia. Kansas House Representative for the 103rd District
 - John Mendez. Wynadotte County Commissioner-at-large for District 2
 - Juan Alonzo. Mayor of Raymore, Missouri

Featured Scholar



JENNY ELIZABETH TONE-PAH-HOTE, PHD
Post doctoral Research Associate, American Studies
University of North Carolina-Chapel Hill

Participating in the McNair Scholars Program as an undergraduate helped me to define and start working toward my long-term career goals. It played an important role in introducing me to American Indian history, a field that I still work in as postdoctoral researcher. I also gained skills in the McNair Scholars Program that smoothed the transition from college to graduate school and that I continue to use as a scholar and teacher.

The McNair Scholars Program has played a significant role in my career because it gave me the opportunity to engage in the original, archival research that led me to pursue a doctoral degree in American Indian and U.S. history. Through the McNair Program, I completed a research project that explored the intellectual life of Henry Roe Cloud, an early twentieth century, American Indian educator. This project was invaluable because it showed me how to do historical research and writing. By having discussions with my mentor, Dr. Jeffrey Pasley, a historian, I learned how to negotiate and engage debates in the literature in Native history and formulate research questions. The McNair project also taught me how to navigate archives and construct historical arguments. I returned to these lessons throughout graduate school for assignments and later my dissertation.

Not only did the McNair Scholars Program introduce me to the idea of becoming a professor of American Indian history, it also provided me with a set of tools in public speaking, crafting applications, and professionalization that prepared me to attend graduate school. The workshops that I took part in focused on creating polished applications, GRE preparation, and time management, all of which gave me resources to draw from as I completed my graduate education. In addition, as a McNair Scholar, I took a course in teaching techniques. Later, as a teaching assistant, I borrowed strategies from this class to generate discussions for my own courses.

The McNair Scholars Program has been critical in my development as a researcher. As a Postdoctoral Research Associate in American Studies at the University of North Carolina-Chapel Hill, I still use and refine the skills I developed as a McNair Scholar. And, I hope to continue engaging them as professor of American Indian and U.S. history.

2009-2010 Research Topics

Scholar	Major	Title	Mentor
Lorien Hayden	Physics	Calibration of an infrared pyrometer in the presence of interviewing materials	Paul Miceli
Dakota Raynes (Liese Harvel)	Sociology and Women & Gender Studies	Amazons in the Ozarks: Exploring intersections of genders, spaces & sexualities	Wayne Brekhus
Kelli King	Psychology	Parents' and adolescents' expected timing of autonomy and the influence on adjustment	Nicole Campione-Barr
Braydon Medlin	Marketing	Financial Literacy and Its Correlation to Student Debt	Robert Weagley
Blossom Nwaneri	Nutrition and Exercise Physiology & Pre Physical Therapy	Osteocalcin's role in the maintenance and regulation of glucose homeostasis in humans	Pamela Hinton
Ashley Price	Biological Sciences	The Tool of inequality in advertisement: How the medical tourism agency uses cyclical state of inequalities to continue business	Amit Prasad
Sydney Redwine	Marketing	Major choice as an indicator of materialism and credit card use in college students	Lori Franz
Jaqui Rogers	Secondary Education English	Trenchant transitions: The effects of school transitioning on the budding high school English student in Columbia public schools	Peggy Placier
Michael Schrantz	Political Sciences and Journalism	Outside the barrio: Latino/a elected officials in non-Latino areas	L. Marvin Overby
Ashley Shaw	Nutrition and Fitness	Validation of DC skinfold prediction equation	Stephen Ball
Lezlie Taylor	Agriculture Education	4-H members in competitive livestock exhibition	Anna Ball
Ryan Torack	Sociology	College choice in the context of McDonaldization	Wayne Brekhus Paul Weirich
Brittany Vickers	History and Journalism	The state of black-Owned companies in the African American hair care industry	Robert Weems
ChaToyya Walker	History	Black marriages in Boone County, MO: 1865-1881	LeeAnn Whites
Amanda Watkins	Religious Studies and Anthropology	Magic, religion, and disdain in post-reformation Europe	Rabia Gregory
Solida Wise	Sociology	Constructing social identity online: Hegemonic femininity and Facebook	Joan Hermsen
Devin Woodson	Communication	Recognizing the reality of success: An analysis of African American male success images in television media	David Brunsmas

2009-2010 McNair Scholars



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Fifth row: Sydnea Redwine, Solida Wise, Jeremy Bloss (Student Service Advisor),
Fourth row: Blossom Nwaneri, Deidre Brookins, Jaqui Rogers,
Third row: Lezlie Taylor, Amanda Watkins, Ashley Shaw, Dakota Raynes,
Second row: Diliana Stoimenova, Braydon Medlin, Devin Woodson, Ryan Torack
First row: Kelli King, Brittany Vickers, Ashley Price, Lorien Hayden
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536 Clark Hall
Columbia, MO 65211