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From the McNair Program Director
Patricia Quinn

Ambitious but attainable. That edgy formula drives the objectives of every McNair Program. With each annual report to the Department of Education and to our respective institutions McNair Directors exhibit indicators that the learning communities they head up produce results. In the case of the University of Wisconsin-Eau Claire these results prove impressive ones. This publication, for example, presents evidence of the quality hypotheses, methodologies, analyses, and new knowledge that University of Wisconsin-Eau Claire McNair Scholars generate with their faculty collaborators. Already well on their way to joining the American Research Community, the fourteen student authors of this Astra tackle topics ranging from stellar winds and asteroids' shapes to the evolutionary components of moral decisions. They probe immigration's impact on marriage ceremonies, contrast the use of portraiture in the novels of two Victorian authors, and reveal secrets about ancient climate change that lay hidden in something so humble as burned blades of grass. Other Scholars probe the elements of positive human relationships—what environment motivates positive choices on the part of pre-teen girls? What initiates effective mentor-protégé relationships? What kinds of interactions among therapists and preschoolers diagnosed with autism assist these children's social development? Two Scholars parse language, one tracking the rate of linguistic shifts in French and German through the lens of subject-pronoun agreement, while another portrays how computerized answering systems quickly focus callers' queries. Finally, a McNair Scholar describes a novel high-tech procedure for measuring soil water content, while constructing a low-tech but highly effective simulator to test and customize the former.

These articles echo the rich discourse that typifies UW-Eau Claire's McNair learning community during each of its to date eleven years of existence. The finished articles persuade their readers of the student authors' intellectual talent. An accurate conclusion this, yet an assessment that only partially gauges the achievement these Scholars realize. McNair Scholars hail from a demographic that produces few baccalaureate holders, much less successful pursuers of the ultimate advanced degree. First generation students from low-income households and students from targeted racial and ethnic groups (African-Americans, Latino/Hispanics, Native Americans, Native Hawaiians/Pacific Islanders) demonstrate less than a 12 percent chance of attaining a bachelor's degree. Yet over 85 percent of UW-Eau Claire's McNair Scholars enter impressive graduate programs in the fall immediately following their undergraduate graduation. Of the ninety-nine who have enrolled in graduate school to date thirty-four now hold the doctorate, and an additional forty hold master's degrees. All ninety-nine receive(d) funding for their graduate work.

Along with advanced degrees, our Scholars collect honors--prestigious fellowships with names like Truman, Mellon, Woodrow Wilson, Fulbright, Mitchem, Newberry, Abraham Lincoln, Phi Kappa Phi, Gilman, Boren, Ford, and Deutsche Paedigogische Austauschdienst. Others have served in internships at the Los Alamos National Laboratory, the Mayo Clinic, the Natural Park Service, the NSF Inter-American Observatory (Chile), the Woodrow Wilson Center, the Department of Health and Social Services, the National Aeronautics and Space Administration, the Prokofiev Archiv (Russia), the British Museum (England), the National Center for Drug Control, the State Department, the Peace Corps, VCU-Doha Campus (Qatar), the National Institutes of Health, and the Forschungsinstitut fuer Physicalische-Chemie (Austria), to name a few.

On April 1, 2000 when I began as Director of UW-Eau Claire's McNair Program, the path ahead looked exciting though challenging. Yet in the intervening years UW-Eau Claire McNair Scholars' success stories could fill many volumes. (One of the best took place this academic year when Dr. Carolyn Otto, Cohort 6 McNair Scholar, hired on as an assistant professor in our own Department of Mathematics.) Does the success of our "pioneers" make reaching goal all the more attainable for their successors? Yes and no. Current UW-Eau Claire McNair Scholars enjoy many homegrown role models to inspire them, plus a network of insiders at close to sixty graduate institutions. Still, that goal of McNair Programs—to invigorate the American Research Community with talented newcomers—becomes ever mores ambitious today. Ever more ambitious not because we lack talented underrepresented students, but because reduced public commitment to graduate school funding, accompanied by new impediments such as graduate students' ineligibility for federally subsidized loans, make the economics of advanced degree acquisition downright daunting. Things looked like a long shot back in April 2000, but our students came into their own. Things look tough in 2012, but I suspect this current brain trust will yet again find the way.

Patricia A. Quinn, Ph. D.
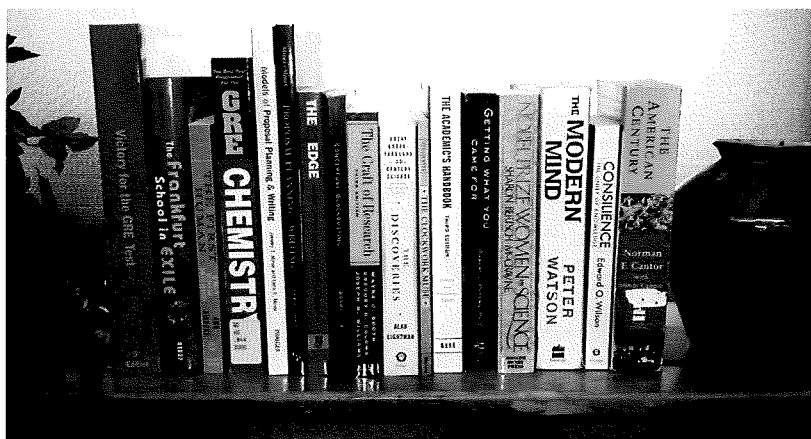Director, Ronald E. McNair Postbaccalaureate Achievement Program

Figure 1. Texts from McNair Seminars (present and past).
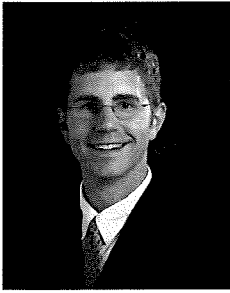
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Three-Dimensional Characterization of Soil Water Content and Electrical Conductivity Using Ground Penetrating Radar Groundwave Techniques

by

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Faculty Mentor: Katherine R. Grote Ph.D

Department of Geology

1. Introduction

Accurate characterization of near-surface soil water content is important for many agricultural applications, such as optimizing crop yields, determining the scheduling and volumes of irrigation, and preventing groundwater degradation from agrochemicals leaching through the vadose zone. Soil water content must also be determined for geotechnical applications and climate change modeling. Characterizing the near-surface soil water content using conventional methods can be difficult, as this parameter is highly variable both spatially and temporally, and most conventional methods obtain only a limited number of point measurements. One method of characterizing soil water content that overcomes this limitation is Ground Penetrating Radar (GPR) groundwave technique. Several researchers have shown that GPR groundwaves can be used to estimate soil water content (Huisman *et al.*, 2001), but the efficacy of this technique is limited by the uncertainty of the groundwave penetration depth; it is often unclear if the water content measurements describe the zone of interest for a particular application. In this study, we seek to experimentally determine the penetration depth of GPR groundwaves in dry sand.

2. Background

The GPR groundwave is a direct wave which travels between the transmitting and receiving antennas in the near subsurface (Figure 1).
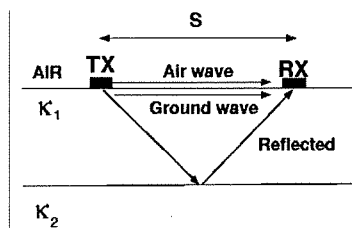
Figure 1: Schematic travel paths of the airwave, groundwave, and reflected wave. TX is the transmitting antenna, RX is the receiving antenna, and S is the separation distance between antennae. K_1 and K_2 are the dielectric constants of the first and second soil layers.

Currently, there is no general consensus for the penetration depth (z) of the groundwave. Some researchers have used the similarity between GPR and seismic data to approximate z as half of the Fresnel zone, as is accepted for seismic groundwaves (Van Overmeeren *et al.*, 1997). Applying this approximation to GPR data:

$$z = 1/2 \ \sqrt{(vS/f)}$$

where v is the electromagnetic velocity in the soil, S is the separation distance between the trans-

mitting and receiving antennas, and f is the central frequency of the GPR signal. Other researchers have suggested that z depends only on wavelength (λ). Du (1996) suggested that z ranges from $\lambda/2$ to λ, where λ is the wavelength corresponding to the dominant frequency transmitted into the subsurface, while Sperl (1999) suggested that z is approximately equal to $0.145\lambda^{0.5}$. Figure 2 shows the predicted z for each of these models for 250-MHz data over the range of dielectric constants normally observed in dry to saturated soils. This figure shows that the models predict significantly different z values, especially for drier soils (lower dielectric constants).

Estimated Depth of Groundwave Penetration, 250-MHz

Figure 2: Models that predict the penetration depth of GPR groundwaves vary widely in their depth estimates, especially for penetration depths in dry soils (low dielectric constants).

This experiment investigates z using the groundwave velocity, where velocity can be estimated using the groundwave travel path (assumed to be the distance between the transmitting and receiving antennas) and the arrival time of the groundwave. Under low-loss conditions, the velocity is primarily dep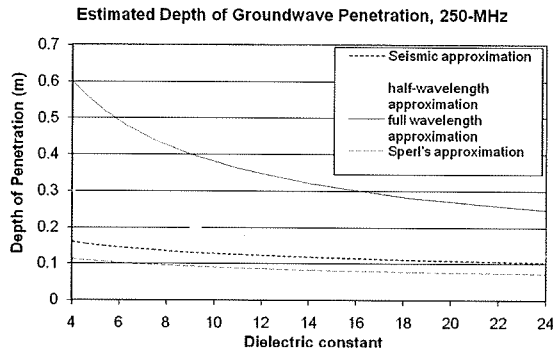endent upon the soil water content, although other factors such as soil texture, temperature, and pore fluid composition may also influence velocity. In this experiment, we use layers of saturated and dry sand to create differing electromagnetic velocities.

3. Data Acquisition and Analysis

This experiment investigates z using sand layers with contrasting electromagnetic velocities within a large tank. A layer of saturated sand (low velocity) was placed in the tank, and GPR data were acquired over this layer. Then, thin layers of dry sand (high velocity) were incrementally added to the tank, and GPR data were acquired after each additional layer. The groundwave velocity was calculated for each GPR survey, and z was determined by noting the thickness of dry sand at which the velocity ceased to change as more dry sand was added.

3.1 Tank Preparation

The experimental tank was designed to optimize GPR data quality. The tank dimensions (3.6-m long by 2.4-m wide by 1.2-m deep) were chosen to provide adequate room to collect GPR groundwave data without interference from the walls of the tank. Only non-conductive materials (industrial-grade fiberglass) were used to construct the tank (Figure 3).

The soil used in this experiment was a medium- to well-sorted sand with medium grain size and a porosity of ~30%. To prepare the dry sand, over 7-m^3 of sand was dried in an industrial oven at 115°c for 24 hours (Figure 3). The sand was stored in airtight drums after drying. The saturated sand was prepared by placing an additional ~1.5-m^3 of sand in a large mixer and adding sufficient water to obtain a volumetric water content of 30% (Figure 4). After the sand and water were thoroughly mixed, the saturated sand was also stored in airtight drums.

Figure 3: An industrial oven was used to remove moisture from the sand used in the dry soil layers.
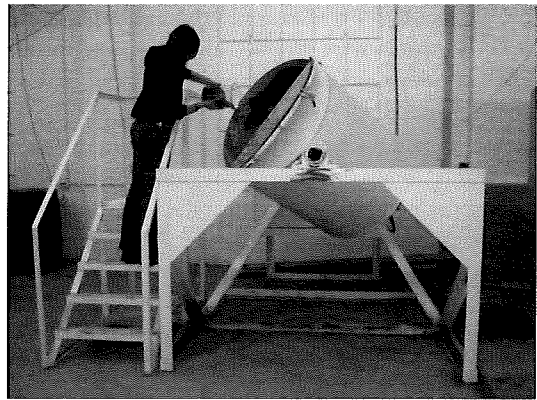
Figure 4: A large mixer was used to ensure that the water content in the saturated sand was homogeneous.

3.2 GPR Data Acquisition

The experiment began by placing 15-cm of saturated sand in the bottom of the tank. To prevent migration of moisture from this layer, two thin plastic tarps were placed over the saturated sand and were sealed to the sides of the tank. Multi-frequency GPR data were collected over the saturated sand using antennas with central frequencies of 100-, 250-, 500-, and 1000-MHz. Three variable-offset surveys were acquired with each frequency; a common-midpoint survey was performed in the middle of the tank, and two wide angle reflection and refraction (WARR) surveys were collected, where each of the WARR surveys began at opposite ends of the tank. Next, a level 6-cm layer of dry sand was placed in the tank, and the GPR surveys were repeated as described above (Figure 5).
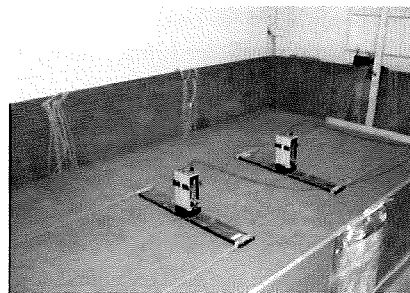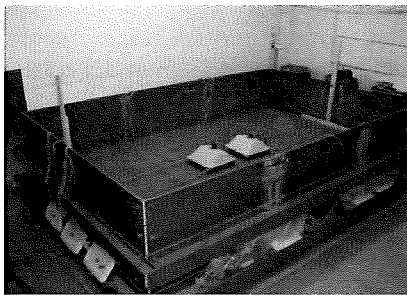
Figure 5: Common-midpoint surveys were performed in the middle of the tank for each GPR frequency (left, using 250-MHz antennas; right, using 100-MHz antennas). To avoid compaction of the soil, no one entered the tank after the soil was added. Instead, the antennas were moved remotely using ropes.

For the remainder of the experiment, level 3-cm layers of dry sand were incrementally placed in the tank, and GPR data collection was repeated after each additional 3-cm layer. The groundwave velocity was estimated for each survey, and data collection with each GPR frequency continued until the groundwave velocity for that frequency remained constant for at least three 3-cm layers of dry sand.

3.3 Monitoring Soil Water Content

To monitor any changes in the soil water content within the tank, time domain reflecto-metry (TDR) probes were installed around the perimeter of the tank for each layer of sand. Probes were installed at six stations around the tank at vertical increments of 6-cm, where three TDR probes were installed in each 3-cm layer of sand. The TDR probes measured the electromagnetic velocity of the sand once an hour. Figures 6a and 6b show the velocity estimates from TDR probes for two stations along one side of the tank; these figures show that the water content in the saturated sand remained high throughout the experiment and that no indications of moisture leaching upward into the dry sand were observed.
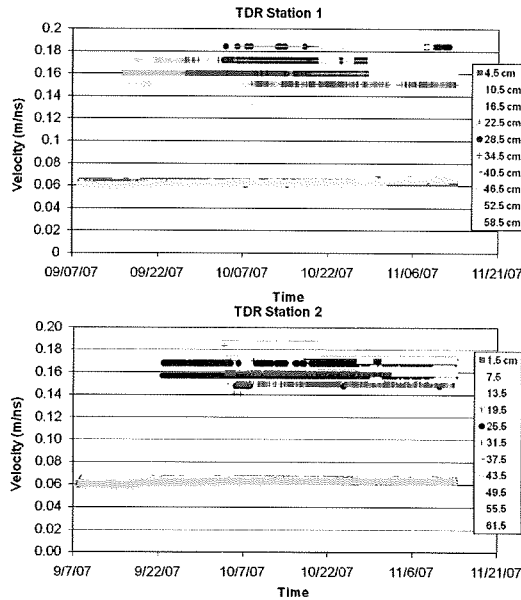
Figure 6: TDR probes were installed at six stations around the tank in 6-cm vertical increments. The TDR probes showed little change in water content in either the wet or dry layers throughout the experiment.

3.4 Data Analysis

The first step in analyzing the data was to observe the power-frequency spectrum for each survey and to design an appropriate bandpass filter that removed low-frequency induction effects and high-frequency airwave noise. Then, the groundwave was identified based on velocity estimates and amplitudes. Although modeling studies sometimes show the groundwave as a single negative-amplitude event, our data show the groundwave to be a wavelet with multiple peaks (positive amplitudes) and troughs (negative amplitudes) centered around a high-amplitude trough. Picking any of these peaks or troughs as the groundwave results in the same velocity, provided that there is no interference from the airwave or reflections. Interference from the airwave usually affects the earliest portion of the groundwave wavelet and results in an inaccurately high velocity. Interference from reflections is more likely to affect the later portions of the groundwave wavelet and may result in either a higher or lower velocity, depending how the groundwave and reflection wavelets super-impose. Superimposition with a reflection wavelet may also cause the amplitudes of the "ground-wave" to increase with increasing antenna separation and may cause the "groundwave" to appear to be non-linear at large antenna offsets. An optimal peak or trough of the groundwave wavelet was

chosen for each frequency based upon: 1) the groundwave velocity during the first (saturated sand) surveys, when the velocity was known from TDR measurements and no interference occurred, 2) decreasing amplitudes with increasing antenna separation, and 3) a linear relationship between travel time and antenna separation. For the 1000 MHz data, the peak above the main groundwave trough was chosen to minimize reflection interference. For the 250 MHz and 500 MHz data, the main groundwave trough was chosen (Figure 7), and for the 100 MHz data, the peak beneath the main groundwave trough was chosen to reduce airwave interference (Figure 8).
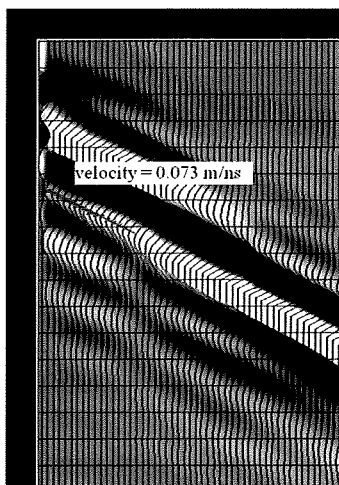
Figure 7a: 250-MHz data acquired over wet sand.
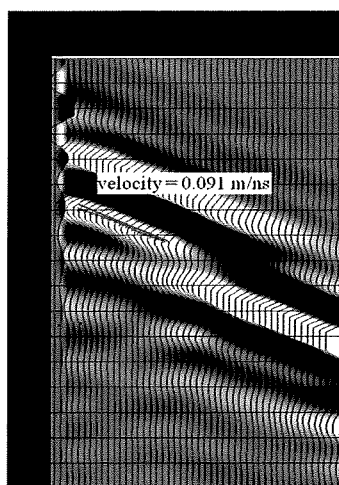
Figure 7b: 250-MHz data acquired over 3-cm of dry sand.
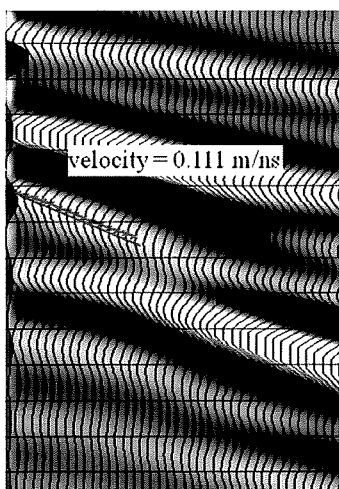
Figure 7c: 250-MHz data acquired over 6-cm of dry sand.
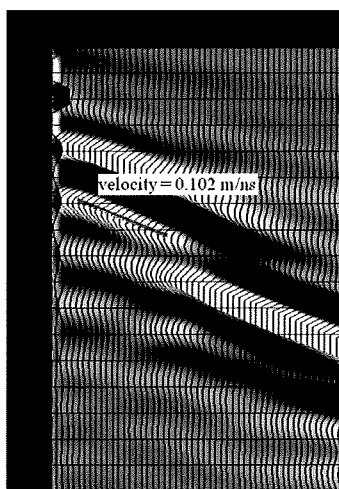
Figure 7d: 250-MHz data acquired over 9-cm of dry sand.

Figure 7: The highest amplitude trough was chosen as the groundwave pick for 250-MHz GPR data. The velocity of the groundwave increased as dry sand was added to the tank.
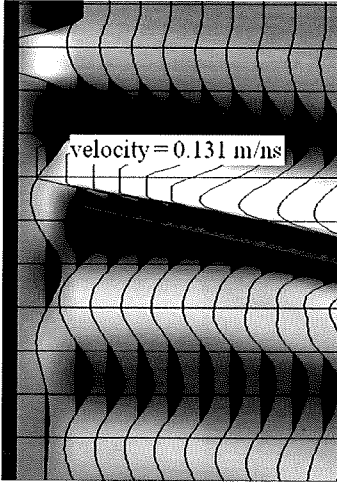
Figure 8a: 100-MHz data acquired over wet sand.
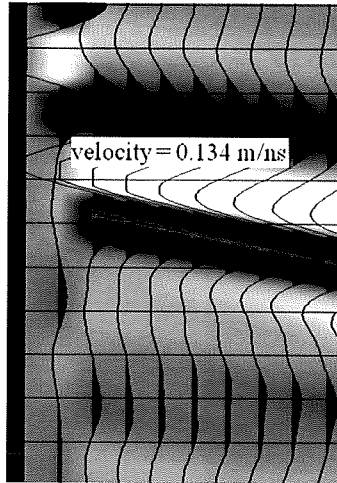
Figure 8b: 100-MHz data acquired over 3-cm of dry sand.
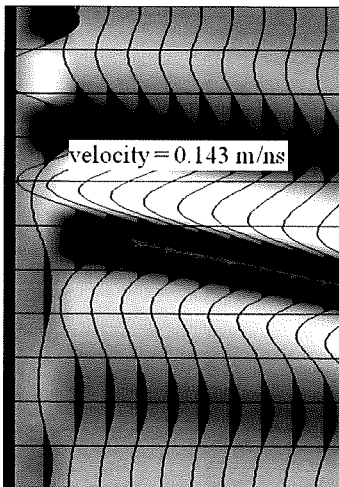
Figure 8c: 100-MHz data acquired over 6-cm of dry sand.
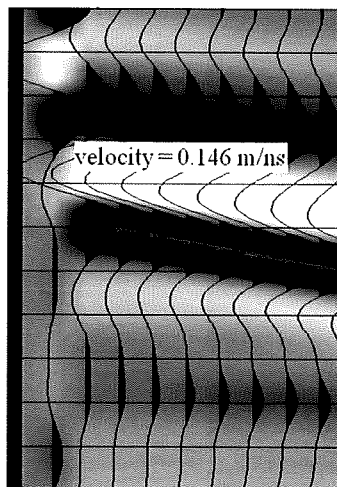
Figure 8d: 100-MHz data acquired over 9-cm of dry sand.

Figure 8: The peak beneath the highest amplitude trough was chosen as the groundwave pick for the 100-MHz GPR data to avoid interference with the airwave.

4. Experimental Groundwave Penetration Depth

The measured groundwave velocities were very low for the data acquired over saturated sand, but the velocities increased as layers of dry sand were added to the tank (Figures 7 and 8). The changes in velocity corresponding to the changing thickness of dry sand reflect the extent to which the groundwave passed through the saturated sand. As the depth of dry sand increased, the portion of the groundwave passing through the saturated sand decreased, and the velocity became more similar to that of dry sand. Figure 9 shows that the groundwave velocity increased in an approximately linear manner as layers of dry sand were added, although the slope of this linear relationship varied for each GPR frequency.
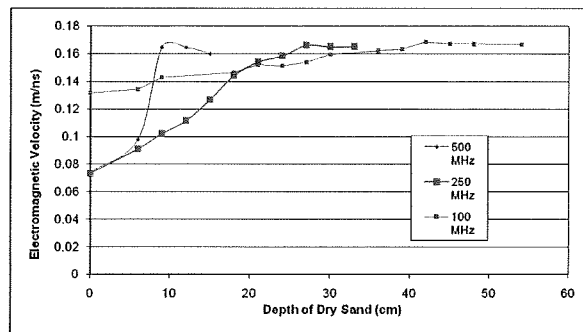
Figure 9: The groundwave penetration depth is determined by the thickness of dry sand where the velocity ceases to change as more dry sand layers are added. The penetration depth varies as a function of GPR frequency, where lower frequencies exhibit deeper penetration depths.

The groundwave penetration depth for each frequency can be estimated by noting the depth of dry sand where the velocity ceases to change as more dry sand layers are added to the tank. Figure 9 shows that the penetration depths of the 100-, 250, and 500-MHz antennas are approximately 42-, 27-, and 9-cm, respectively. Analysis of the 1000-MHz data is ongoing, but preliminary results suggest a very shallow penetration depth of ~6-cm. These results indicate that the groundwave penetration depth is frequency dependent, so multi-frequency groundwave data might be used to characterize a vertically heterogeneous water content profile. These results also show that none of the models of groundwave penetration depth characterize the experimentally-determined penetration depths very accurately; the experimental results for dry sand are bounded by the seismic approximation model and the half-wavelength model. Additional experiments using wetter soils and varying soil textures are necessary to more accurately characterize the groundwave penetration depth for field-scale applications.

5. References

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Sperl, C., Determination of spatial and temporal variations of the soil water content in an agro-ecosystem with ground penetrating radar (In German), Ph.D. thesis, Technische Universität München, Munich, Germany, 1999.

Van Overmeeren, R., S. Sariowan, and J. Gehrels, Ground penetrating radar for determining volumetric soil water content; results of comparative measurements at two test sites, *J. Hydrol.* 197, 316-338, 1997.

Analyzing the Surprising Weakness of X-Ray Emission from Wolf-Rayet Stars Using Computational Based Modeling

by
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Department of Physics and Astronomy

Abstract

We investigate the weak emissions of Wolf-Rayet stars in the X-ray band using time-independent non-LTE models of the wind structure. Shock formation in the wind, as well as its known contribution to the production of X-rays in the spectrum of massive stars, is incorporated into our models as the X-ray producing mechanism. Through comparison of Wolf-Rayet to non-evolved OB stars that are known to possess significant X-ray features, we conclude that Wolf-Rayet stars have a significantly larger optical thickness in the soft X-ray band. The comparison comes directly from the high mass loss rates that are a signature of Wolf-Rayet stars.

Introduction

Wolf-Rayet stars, believed to be the late evolutionary stage of the most massive main sequence stars, are identified by their extreme mass loss rates. These stars feature a line driven stellar wind characterized by a high particle density but lack the X-ray emission associated with the early type OB stars. X-ray production in massive main sequence stars has been explained through the production of shocks in an unstable wind (Feldmeier *et al.* 1997). Wolf-Rayet stars possessing the characteristic temperatures and mass outflow on the same order of X-ray emitting stars should undergo the same shock formation and resultant X-ray production.

Through continual observation, an attempt to explain the X-ray deficiency of Wolf-Rayet is directed towards an optically thick wind (Oskinova *et al.* 2007). The mass loss rate of an OB star is upwards of a hundred times less than that of a typical Wolf-Rayet star. As a result, a Wolf-Rayet wind containing a significantly large particle density would be optically thick in the X-ray band; this disallows the escape of X-ray emissions. However, theoretical treatment of this explanation has remained minimal.

Using established theoretical treatment of the line driven winds, it is possible to computationally approach deficient X-ray emissions from Wolf-Rayet stars. Our methodology uses this theory to produce time independent non-LTE models of Wolf-Rayet winds, and analyzes how shock production and a dense wind impact the resultant X-ray production. These models are compared to those of standard OB stars to determine whether shock production in a Wolf-Rayet wind is likely, and if the thickness of the wind contributes to the absence of observed X-rays.

Model Description

We can adapt the modeling software package Spect3D, developed by Prism Corporation, for analysis of inertial confinement fusion, to modeling stellar wind processes. The software package consists of three core components: Plasma Grid Generator, Atomic Model Builder, and Spect3D. Through the use of these three programs, we can develop a model of a stellar wind, manipulate properties throughout the wind, and adjust the composition and detail of the material in the wind.

With Plasma Grid Generator, we form a spherically symmetric model of the wind by the construction of radial shells in the wind. We can vary the thickness of the shells and adjust the density and temperature within each shell. Both temperature and density can be set as constants in the shell, or can be determined as a function of radius. Plasma Grid Generator provides the ability to specify the location of shock regions in the wind, as well as allows for construction of winds of different scales.

Atomic Model Builder allows one to create a file of a particular element with the option to include or exclude different ionization states of that element. Atomic Model Builder contains a feature through which one selects which transitions will be included for a particular ion, as well as how detailed the transitions will be (up to fine structure). Small adjustments to the detail level for a particular element can have significant ramifications on the run times of models; thus the amount of detail to be included constitutes an important consideration.

Spect3D is the program used to generate the results of the models. After reading in files from the Plasma Grid Generator and Atomic Model Builder, we are able to alter those variables that will impact the output graphs. Spect3D allows our models to simulate conditions in non-LTE, as well as allow the shells in Plasma Grid Generator to act dependently upon each other. We also incorporate a virtual detector that serves as the imaging system to detect the emissions from the star. The wavelength range of emissions can be specified for output spectra as well as for the appropriate magnitude of oscillator strengths. Spect3D also allows for adjustment in the amount of grid points in the spectra; up to 10,000 for the continuum, and 50 for an individual transition.

Our models assumed a radial velocity distribution in the wind following the standard Beta Law

$$v(r) = v_0 + [v_\infty - v_0]\left(1 - \frac{R_*}{r}\right)^\beta$$

(1)

where β is a fit parameter for the velocity distribution, v_0 is the velocity at the base of the wind, and v_∞ is the terminal velocity of the wind. Using EQ. (1) allows us to arrive at a radial density distribution in the wind when incorporating the equation of mass continuity EQ. (2),

$$M = 4\pi r^2 p(r) v(r)$$

(2)

$$p(r) = \frac{M}{4\pi r^2 v(r)}$$

(3)

and where EQ. (3) is used for density distribution in shells that do not include shocks. Temperatures in regions that lack shocks are taken to be at the effective temperature of the star: this is an appropriate approximation given that non-shocked wind temperature neither contributes significantly to X-ray production of the wind nor varies significantly from the effective temperature of the star. However, the ionization state of the un-shocked material can be affected by the X-rays through photoionization.

To analyze shocks, our models incorporate shock dynamics that reference temperature and density as functions dependent on distance in the shock, as well as on the shock's distance from the star. The shock dynamics used for the representative models are based on an extensive treatment for isothermal wind shocks. The density and temperature distribution of the material in the shock as well as the post shock density can be described by EQ. (8) and EQ. (9) respectively in Feldmeier *et al.* (Feldmeier, Puls, & Pauldrach 1997). Helium fraction by number is taken to be its proper solar abundance and, as all helium should be ionized, we assume two free electrons provided per helium nucleus. Figures 1 & 2 show the radial density and temperature distributions over the cooling region of the shock as they are used in our models. Both the shocks and the non-shocked regions of the wind have 10 grid points in which calculations are made.

Our models encompass the energy range of 600eV–1300eV and employ 10,000 grid points for the continuum as well as 50 grid points per transition. Transitions with associated oscillator strength values of greater than 0.001 are included in our spectra. We choose to include hydrogen and oxygen representations in our models: hydrogen to provide the necessary particle density in the wind, and oxygen for its prominent X-ray features over the X-ray band under analysis. For oxygen, high spectra detail is only included for OVI and higher ionization states, while detailed transitions are included for OV and higher ionization states.

Model Results

Standard OB Star Model

Our control is a standard model of the X-ray emitting OB star, ζ Puppis. ζ Pup has been thoroughly observed and the structure of its wind is well established; thus, it makes an ideal comparison star (Casinelli *et al.* 2001; Feldmeier, *et al.* 1997b; MacFarlane *et al.* 1993). The following parameters are used for the star: $17R_\odot$ radius, a mass loss rate of 2.4×10^{-6} $M_\odot yr^{-1}$, an effective temperature, T_{eff}, of 42,000 K, a terminal velocity of 2,200 km s^{-1}, and a value of 0.8 for β (Lamers & Cassinelli 1999).

Our model incorporates a wind of radius dependent density using EQ. (3), and a base wind temperature set at T_{eff}. A shock is placed at $2.7R_\odot$ and has temperature variation throughout the shock. The overall wind extends out a distance 50 stellar radii from the wind. The star itself is omitted from our model as the overall ionization in the wind due to radiation is minimally impacted by the star's contribution. We place our detector to analyze a 1cm x 1cm column through the diameter of the wind.

The intensity of the model wind, depicted in Figure 3, shows characteristic OVIII lines that originate in the shock regions and other strong lines corresponding to electron recapture of OV and OVI in the general wind. The corresponding optical continuum (Figure 4) is relatively transparent to X-rays, with an optical depth value of less than approximately 10, through the diameter of the wind, and shows the expected increases at the ionization edges for oxygen. A chart describing oxygen ionization fractions over the wind's radius (shown in Figure 6) shows not only the expected high ionization states in the shocks, but also the impact that the shocks contribute to the overall wind—driving up the ionization states of the base wind in regions closer to the shock.

Wolf-Rayet Models

The star used for defining the parameters for the Wolf-Rayet is WR1, in which the star's radius is $2.2R_\odot$, with a mass loss rate of 6×10^{-5} $M_\odot yr^{-1}$, an effective temperature of 40,000 K, a terminal velocity of 2,200 km s^{-1}, and a value of 0.8 for β (Lamers & Cassinelli 1999). It is important to note the similarity of WR1 and ζ Pup when comparing wind speed and T_{eff}, but the mass loss rate of the Wolf-Rayet star is a factor approximately 20 larger than that of ζ Pup. WR1 also has a much smaller radius, due to the outer layers of fused material being stripped off the Wolf-Rayet star.

We created 3 models for the Wolf-Rayet star by placing shocks at differing distances from the base of the wind. The first model incorporates a shock at 5 stellar radii from the photosphere, the second at 10 stellar radii from the photosphere, and the third at 35 stellar radii from the photosphere. Each wind extends out a distance 50 stellar radii from the wind, and the base wind has a temperature set at T_{eff} for WR1. It must be noted that shock formation as far out as 35 stellar radii into the wind is not believed to be intense enough to be able to contribute to the X-ray production of the wind, but it is included in our procedure as a method of comparison.

It can be observed in Figure 4 that for the two models with shocks close to the base of the wind, the intensity output is negligibly small. The intensity output for the shock at 35 stellar radii, howver, produces X-ray emissions on the order of the ζ Puppis model, but such results appear atypical for shock formation, and lie close to the outer constraints of our model. The lines observed in the 35 stellar radii model are electron recapture lines for OVI ions in the wind.

Optical Depth Parameter Analysis

A deeper understanding of the lack of X-ray production in the two WR1 models with shocks embedded deep in the wind can be obtained from analyzing the optical depth parameter for the entire wind. As shown in Figure 4, the optical depth over the continuum for all three WR1 models indicates that the wind is optically thick over the X-ray band under consideration. This is evident even in the shock occurring farthest out in the wind, and one can assume that the only reason for significant X-ray production in this 35 stellar radii model is that the photons had only a thin column from which to escape. If the wind were extended beyond 50 stellar radii from the base, it appears likely that the X-ray emission from the shock at 35 stellar radii would be extinguished as well. In comparison, the ζ Pup control model has an optical depth parameter across the 50 stellar radii continuum that indicates an optically thin wind.

Conclusions

Our results support the hypothesis of Oskinova *et al.*, that shock formation in the wind of Wolf-Rayet stars is still likely, but due to the optically thick nature of the wind, X-rays have a highly diminished ability to escape in comparison to a standard OB star (Oskinova, *et al.* 2007). The large amount of material in the WR winds restricts photons' passage through the wind without interactions with particles in the wind. It seems likely that shocks form in WR winds, as the same driving mechanisms as those in in ζ Pup would result in the same instabilities that result in shock formation. If it were possible for strong shock formation to occur in the outer layers of the wind, X-ray emissions could feasibly be observed.

Future models could further illuminate the issue. The three WR models we constructed assumed a wind composition based on proper solar abundances, which should be considerably different from a metal-rich Wolf-Rayet wind. The models presented throughout this paper only observe oxygen's effects in the wind, and ignore other significant X-ray producing elements such as Ne and Fe. Furthermore, our models were time-independent treatments of the situation, whereas shock formation in Wolf-Rayet winds could be further analyzed through time dependent models of wind perturbations.

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A Primary After-School Intervention for Preadolescent Females: The Efficacy of the Adventure Girls Program
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Introduction

Despite the United States' commitment to end poverty throughout the world, it still maintains a high rate of poverty at home. Overall, 20.3 percent of our nation's children live in poverty, which places the U.S. behind all European nations in the standard of living for children (Leonhardt, 2001). If we examine children in poverty statistics state-by-state, we find New York State ranks last in comparison to other wealthy nations, with more than 26 percent of its children living in poverty (Leonhardt, 2001). Furthermore, by including those U.S. youth living in substandard conditions, we find 39 percent (28.4 million) residing in low-income families (National Center for Children in Poverty, 2006).

How do we quantitatively measure who lives in poverty? The federal poverty line is calculated from a formula that assesses household income and household size, distinguishing between children and adults (Alverno College Research Center for Women and Girls, 2007). In 2005 the federal poverty line for a family of one adult and two children was an annual net taxable income of $15,270 (Alverno College Research Center for Women and Girls, 2007). Social programs use this poverty line to determine whether households and individuals qualify for assistance and benefits. The children in these households may receive benefits--such as free or reduced lunch--for those who live below the poverty line. Reduced lunch is offered to students whose families live just above the poverty line (Cox, 2008). Our primary intervention was designed primarily for girls in this demographic--i.e., those living close to or below, the poverty line.

The current research project focuses on poor adolescent girls in Western Wisconsin where, in 2005, approximately 54,000 girls between the ages of six and seventeen lived below the federal poverty line (Alverno College Research Center for Women and Girls, 2007, p. 4). This study assessed the efficacy of a primary intervention program, a short-term after-school program, for these girls in a public elementary school. We asked whether a relatively low-cost and short-term program could generate positive change in the participants.

Positive Effects of After-School Programming

After-school programs provide students a safe-alternative to many negative activities that occur from the time school lets out until about 6:00 pm, typically dinner time. These "prime hours" from 3:00 pm to 6:00 pm on weekdays are the most common period during which teens typically commit crimes (Fox 2003), become victims in a crime (Fox 2003), and experiment with smoking, drinking, and drugs (Richardson et al., 1989). This is also the most common time that 16 to 17 year-olds are involved in car crashes (Rice, 2000). Engaging children in an after-school activity at this time lessens the probability of their involvement with these negative activities, and also increases their opportunities to participate in positive socialization.

After-school programs not only discourage poor choices during "prime hours," but theyalso affect students' lives outside this three-hour window by helping them make positive choices about how to spend their time and by increasing their commitment towards academics. Lattimore and colleagues (1998) found that participants engaged in a four-year after-school program were six times less likely to be convicted of a crime than those not involved. This program helped its participants make safer choices regarding how to spend their time. The participants were half as likely to become teen mothers or fathers, committed fewer crimes, and engaged in fewer behaviors that put them at risk. Following program completion, participants were four times more likely to have a high school degree than their non-participating classmates, and more than twice as likely to go to college (Lattimore *et al.*, 1998).

Communities tend to rally behind after-school programs, given their relative efficacy. The success and importance of after-school programs are also reflected by community support. Results of a telephone survey of 800 registered voters age 18 and older conducted for the After School Alliance by Lake, Snell, Perry and Associates and the Tarrance Group (The Afterschool Advocate 2003) indicated that the majority of voters, across demographic and party lines, were willing to pay higher taxes if those monies would support after-school programs (The Afterschool Advocate, 2003). Seventy-one percent of these respondents believed that there were not enough after school programs for children and teens in the nation (The Afterschool Advocate, 2003, p. 1), and 94 percent agreed that there should be some type of organized activity or place for children and teens to go after school every day that provided opportunities for them to learn (The Afterschool Advocate, 2003, p. 4).

The Origins of Adventure Girls

The Eau Claire Area School District's support for after-school programs, similar to that reported in The Afterschool Advocate study (2003), enabled this research project to get off the ground. In the fall of 2005 the University of Wisconsin-Eau Claire's interdisciplinary Nutrition Education Research Team met with Longfellow Elementary School's Wellness Team. Three university faculty members joined with teachers from the school to create, implement, and gather data on the Adventure Girls After-School Program, which began in the spring of 2006.

School Wellness Teams originated as a mandate of a grant from the U.S. Department of Education. The 21st Century Community Learning Centers (21CCLC) program is Title IV-Part B of the Elementary and Secondary Education Act, more commonly known as the "No Child Left Behind Act" (Wisconsin Department of Public Instruction, 2007). Application of the No Child Left Behind Act has caused public schools to sacrifice such activities as art and physical education in order to give more time to English and math courses (Wisconsin Department of Public Instruction, 2007).

The 21CCLC grant, the means of support for the Adventure Girls Program, is a positive outcome of the No Child Left Behind Act, and is a competitive grant given to poor, rural schools in order to fund and operate high-quality academic support, recreation, and youth tutoring programs during after-school hours. Adventure Girls addressed under-resourced fifth grade girls in Longfellow Elementary School, and focused on the impact an after-school program could have on physical wellness, self-esteem, cooperation, leadership, and anticipatory socialization.

Physical Wellness

Physical wellness effects adolescents holistically, influencing not only their physical, but also their cognitive, emotional, spiritual, social, and environmental well-being. Issues related to physical wellness threatened 72.5 percent of Wisconsin girls in 2005, who did not meet the currently recommended levels of physical activity (Alverno College Research Center for Women and Girls, 207, p.21).

Obesity, for example, enhances the propensity to depression and depressive symptoms among 15 to 17 year-old students, and was significantly related to experiences of shame, parental separation, and social isolation (Pjoberg, Nilsson, & Leppert, 2005). Overweight girls are also less likely to be accepted into college, less likely to marry, and less likely to be economically well off in adulthood (Berkeley Cooperative Extension, 2000).

Other psychological risks facing overweight youth include low self-esteem and poor body image (Berkeley Cooperative Extension, 2000). Adolescents who struggle with their weight are more likely to report social stigmatization, such as derogatory remarks from others. A 1961 study used six pictures in order to determine children's perceptions of other children with varying disabilities. These depicted children with crutches, in wheelchairs, with an amputated hand, with facial disfigurement, and a child who was overweight (Richardson et al., 1961). The majority of school children examining the pictures chose the overweight child as the least desirable friend.

Theory and research suggest school-based strategies affect the overall health of young children, and hence warrant the development of such programs (Cullen & Baranowki, 1999; Wechsler et al., 2000). Adventure Girls offered health and wellness components focused on positive goals for development, such as becoming more physically active. An active lifestyle figured in many of the "adventures," including scuba diving, horseback riding, yoga, hip hop dancing, ropes course, and touring the YMCA. These "adventures" offered a diverse range of physical activities that participants could turn into lifetime activities.

Girls not only lack the recommended level of physical activity, but many have poor body image. In 1995, 34 percent of high school girls in the United States felt that they weighed too much, a number that rose in 2006 to over 90 percent (Martin, 2007). Along with physically active adventures, internal elements of self-esteem were presented to keep the participants from focusing overly much on their bodies. Physical activities and challenges with mentors emphasized the importance of continual physical challenge and active lifestyles.

As well as promoting active lifestyles, Adventure Girls emphasized sound nutritional choices. Adequate nutrition is essential for the growth and development of children (Bryan et al., 2004), whereas undernutrition can retard the development of the brain and nervous system, and hence cognitive functions. Nutritional deficiency in early life effects IQ scores and school performance. Some evidence implicates undernutrition in ADHD, dyslexia and dyspraxia (Bryan et al., 2004). Because of the importance of adequate nutrition, activities such as cooking with honey, making granola, and creating smoothies offered opportunities for the girls to experiment with healthy food choices that they created themselves.

Self-Esteem

Self-esteem develops differently among girls than among boys. For girls "self-esteem draws from two sources: 1) How a person views her performance in areas in which success is important to her, and 2) How a person believes she is perceived by significant others, such as parents, teachers, or peers" (Orenstein, 1995, p. xix). Orenstein argues that girls internalize "the limitations of gender," which then restrain and deny girls experiences and opportunities (1995, p. xix).

The definition of a girl's self-esteem, based on prior success and the perceptions of others, can prove dangerous to her future successes in both academics and more broadly in her lifetime. Bleeker's and Jacobs' (2004) longitudinal study explored this dynamic. They found that mothers' early perceptions of their children's mathematical abilities were related to those children's math-science self-efficacy even two years after high school. More importantly, mothers' perceptions of their children's abilities to succeed in math-based careers were significantly related to their children's later career choices (Bleeker & Jacobs, 2004).

Built on prior success and other people's perceptions, girls' self-esteem can diminishthrough interactions in the classroom. The unequal treatment from teachers that girls often face can further reinforce the limitations of gender. For instance, disruptive girls receive harsher treatment than disruptive boys, a situation that socializes students to judge girls' disruptive behavior (Martin, 1998).

While their bad behaviors receive disproportionate treatment, girls come up short in receiving positive input. Teachers remember boys' names more often than girls' names and call upon male students eight times more frequently than female students (Handel, 2001, p. 126). Female students also experience interruption more frequently and receive challenging questions less frequently than their male counterparts. These actions, though often unintentional, socialize students to believe that boys provide more important input than girls.

Research on socialization in the classroom, as well as construction of girls' self-esteem, suggests that girls stand at a high risk of something worse than failure--namely, satisfaction with mediocrity. Mary Pipher (1994) theorizes that by early adolescence girls lose their tomboyishness, their resilience, and their "voices." At this point "wholeness is shattered by the chaos of adolescence" (1994, p. 20) and "culture and societal pressures force girls to form true and false selves (1994, p. 22). These false selves want to please everyone. Courtney Martin states that this "compulsion to achieve constantly, to perform endlessly, to demand absolute perfection in every aspect of life is part of a larger, undeniable trend in the women of my generation all over the world" (2007). Thus, adolescents face many challenges when negotiating the pressures of academic performance and achievement in other realms.

The APA Task Force (2007) found that negative self-esteem may hinder girls' abilities to develop into assertive and healthy young women. The development of assertive and healthy attitudes in Adventure Girls constituted this program's central mission. Recent reports on the use of alcohol by girls show this practice on the rise, rising faster than the rate among male counterparts (McDonough, 2006, p.8). McDonough (2006) theorizes "girls feel more self-conscious, more separated from their peers than society as a whole, and are turning to depressants to self medicate" (McDonough, 2006 p.8). The Adventure Girls creates an inclusive atmosphere in which girls feel connected to their peers, the teachers, and the mentors within the group.

Cooperation and Leadership Abilities

Although many after-school programs exist, not all offer girls equal opportunities to develop leadership and build teams. Throughout Adventure Girls, cooperation and leadership were consistently emphasized. The majority of youth programs and drop-in centers for older children and adolescents are male-oriented and male-dominated (Women's Sports Foundation Body & Mind, 2004), a condition which limits girls' opportunities to develop as leaders. While created for all youth, the programs witness males taking leadership positions more often, limiting girls' opportunities to gain team building skills yet again. This situation lessens girls' opportunities to become assertive and confident leaders, and decreases their opportunities to learn to work in a collaborative environment.

These leadership and team building opportunities constitute important aspects of the healthy growth and development of females. Research indicates that when females receive practice in team building and develop as leaders, females gain both mental and physical benefits. For instance, female athletes in school or community sports teams did not smoke or smoked less than female non-athletes (Melnick *et al.*, 2001). Also, female high school athletes, especially those participating on three or more teams, showed lower odds of considering or planning a suicide attempt (Sabo *et al.*, 2004). This sense of team unity and community is important for Wisconsin, where 22 percent (2005) and 26 percent (2001 and 2003) of the female high school students answered positively to a question asking if they had seriously considered suicide in the past twelve months (Alverno College Research Center for Women and Girls, 2007, p. 53).

Although each Adventure Girls activity included aspects of cooperation and leadership, several activities focused on these as main objectives. For instance, each cohort made individual tie-dyed shirts with a screen printed Adventure Girls logo, an activity that allowed each girl a sense of ownership and individuality, while also promoting her feeling of inclusion in a team. Each cohort also participated in team building at the university's ropes course, in which both the high and low ropes stratagems required and reinforced team building and cooperation.

Anticipatory Socialization

Poverty has a large effect on future outcomes. In a recent study of girls from families receiving Temporary Assistance for Needy Families (TANF), the researchers found that despite good physical health, many differences existed between the girls in this group and girls from non-recipient families (Boothroyd, Gomez, Armstrong, Haynes, & Ort, 2005). For instance, three to five percent of TANF recipient girls had serious substance abuse problems (Boothroyd, Gomez, Armstrong, Haynes & Ort, 2005, p. 146), and 28 percent of the TANF recipient girls had stopped attending school despite the majority having maintained a B average or better (2005, p. 147). Also, two-thirds of the girls were sexually active, and 17 percent had children of their own--a rate six times higher than the national rate of 2.9 percent (Boothroyd *et al.*, 2005).

Besides the immediate behavioral and academic consequences of poverty, Danzinger and Haveman (2000) found that growing up in poverty puts children at risk for economic instability as adults. On average, adults who grew up in poverty earned lower hourly wages than their counterparts who did not grow up in poverty ($8.51 per hour vs. $12.14 per hour) and consequently had lower annual family incomes ($21,541 per year vs. $36,300 per year) (Danzinger & Haveman, 2000).

To decrease the risk of economic instability, the Adventure Girls After-School Program emphasized higher education. Each Adventure Girl was paired with a college student, known as a "University Buddy," who acted as a mentor. These mentors focused on individual girl's college preparation and promoted the opportunities of higher education. The girls also experienced a field trip to the University, during which they visited different parts of the campus, including the nursing building, the planetarium, the biology gardens, and the cafeteria.

In Wisconsin girls make up only 18 percent of students majoring in traditionally male fields (such as engineering and science technologies) (Alverno College Research Center for Women and Girls, 2007, p. 5). The vast majority, 88 percent, of female students remain in traditionally female course concentrations (Alverno College Research Center for Women and Girls, 2007, p. 5). In order to increase the Adventure Girls' awareness of career and hobby opportunities, many guest speakers with non-traditional jobs and hobbies gave presentations. These guest speakers included a competitor in the Iditarod, a female firefighter, and an underwater bridge inspector. Each of these guest speakers gave hands-on presentations, during which the girls tried on uniforms and interacted with the equipment and paraphernalia, both of which increased their anticipatory socialization.

Method
Participants

One reason Longfellow Elementary School qualified for this grant was its large percentage of low-income students--the highest percentage of low-income students among the fourteen elementary schools of the Eau Claire Area School District. This presence exeeds that of the other elementary schools by almost 30 percent. Seventy-five percent of Longfellow students were eligible for free or reduced school meals (Department of Public Instruction, 2008).

Longfellow Elementary School qualified for the 21CCLC grant on a second basis; it enrolls the highest percent of students from minority groups and English Language Learners (ELL)

in Eau Claire (Annual Report Card: 2006-2007, 2007). Thirty-six percent of the student body comes from an ethnic minority group, the Hmong (Annual Report Card: 2006-2007, 2007). Sixteen percent of these minority students receive English Language Learner (ELL) programming (Annual Report Card: 2006-2007, 2007) to address the language barrier that affects them both academically and socially.

Adventure Girls' emphasis on a personal mentoring relationship restricted participation to eight fifth-grade girls per cohort. Each participant needed to meet a financial need criterion, but since Longfellow has such a high percentage of low-income students, other criteria were also used to choose participants. These included teachers' nominations of girls on the basis of developmental needs that included emotional issues, attention problems, issues in physicality, and poor social skills. Two members of the Longfellow Wellness Team who taught at Longfellow and interacted with each of the students the year before made the final decisions. The students chosen were then invited to join the program.

Procedure

The Adventure Girls After-School Program began in April 2006. This pilot included eight fifth-grade girls who met on six consecutive Wednesday afternoons. Succeeding cohorts participated in an eight-week program on Wednesday afternoons, but maintained a sample size of eight participants. Each meeting lasted approximately two hours, from 3:00 pm to 5:00 pm, a time that coincided with "prime hours" (Lattimore *et al.*, 1998).

A combination of Longfellow staff, university faculty, and university students attended meetings. Guest leaders supervised the activities in each session. The Principal Investigator was Dr. Pamela Forman of the Department of Sociology from the University of Wisconsin-Eau Claire. The Longfellow organizers were Sarah Duerre, a teacher for children with special needs, and Carrie Gee, a fourth-grade teacher who had taught many of the girls before they entered the after-school program.

Initial meetings focused on building teams and setting goals. Although each cohort had its own unique "adventures," a few activities remained the same for all cohorts. Each of the cohorts toured the university, during which the girls experienced some "adventures," such as dinner at the university cafeteria, a planetarium show, a physics lesson, and other interactive activities. At the end of each meeting, the girls had time to reflect on their experiences and write both short-term and long-term goals in their journals.

During Spring 2007 Adventure Girls added a "buddy" component. Each Adventure Girl was paired with a female university student mentor, known as a "University Buddy." These mentors attended the Wednesday outings and met individually with their Buddies each week. This offered the Adventure Girls more time to receive one-on-one listening and support; any remaining time was used for journaling. The girls gained a chance to discuss their lives and learned the realities of life as a college student. With the inclusion of University Buddies, more personal focus was given to college preparation and promoting the benefits of higher education. This anticipatory socialization was especially important for the girls, as the majority came from working-class families without higher education.

The Adventure Girls participated in a range of experiential activities--some more "adventurous" than others. Experiential activities included scuba diving, horseback riding, doing yoga, visiting an art studio, hip hop dancing, completing a low and high ropes course, and touring the YMCA. When not outside engaged in physical challenges, the girls had fun making food or using their creativity. These later activities involved making granola and smoothies, creating their own journals, beading bracelets and necklaces, and making snacks with fresh honey. In summary, the curriculum of Adventure Girls focused on physical wellbeing, self-esteem, cooperation, leadership,

Measurement

To measure the efficacy of the program and its influence in the girls' lives, the researchers originally planned to use pre- and post-test Harter's Self-Perception Profile for Children (Harter, 1985) scales. These scales, created to gauge self-esteem on a number of different levels, did not prove a reliable measure for this population as it was too complicated for the girls' cognitive level. They were unable to successfully complete the test. Another issue with quantitative analysis was the small sample size, which could have skewed results and made it impossible to generalize from the sample to the larger population.

The researchers therefore focused principally on qualitative indicators, including participants' weekly journals and researchers' field notes, both from the weekly Wednesday meetings, as well as from the individual Buddy meetings of the last two cohorts. Responses to questions presented during focus groups at the conclusion of each program provided information on demographics, program evaluation, team building, social support, decision making, leadership, and self-esteem. Each focus group was videotaped and transcribed, then qualitatively analyzed using the Atlas.ti.5.0 software program.

To increase the validity of answers, several precautions were taken. For instance, the focus group met at the end of the program, when the girls had nothing to gain or lose by their answers. The girls were not required to answer any of the questions, nor were their responses reinforced or criticized. Also, a University Buddy facilitated each focus group to decrease the potential of the facilitator being perceived as an authority figure.

Results

The results were overwhelmingly positive. There were almost no negative comments other than not liking a particular activity. Many wanted the program extended. The retention rate for all five cohorts was 100 percent. One Adventure Girl even commuted to participate in the second half of the program after her family had moved to another county.

During the videotaped focus group, the girls answered open-ended questions to which they could respond freely. Among many good answers, the following excerpts represent the most common or the most insightful. These quotes, while often grammatically incorrect, are verbatim; they capture the true words and characteristics of the speaker.

Self-Esteem

When asked about self-esteem and empowerment, respondents' most common answer related to confidence. They stated that they felt "more confident and more brave," "more confident," "confident," and "adventurous, and confident." One girl reflected on her experience and her own personal growth throughout the program, "Before the Adventure Girls, I didn't feel like I could talk to any of the people because I thought they thought I was weird (laugh). But now I am able to talk to everyone, and not feel like a dork like I used to." Not only did she express her pre-program lack of self-esteem and self-confidence, but stated that she now felt like she could "talk to everyone." This change was also witnessed by the facilitators (teachers, researchers, University Buddies).

Cooperation

When asked about cooperation, the girls gave fairly similar answers. One girl stated, "I thought it was really cool because I got to I got to [sic] work as a team because normally I don't do that kind of thing, I haven't really got [sic] a chance to." This common answer illustrates the lack of opportunity that the girls experienced for taking part in team activities. Another common feeling was, "a lot of times they (other Adventure Girl participants) are on your team and when I when I [sic] ummm didn't want to do, sometimes when I wanted to to [sic] quit something, they cheered

me on so it made me so I could persevere." Another common and similar answer was "it made me feel like I was on a team because you had people cheering for you really hard, like they gave you the confidence 'I know I can do this, I know I can do this' and they helped us always." The support system and the cooperation that Adventure Girls participants gained from inclusion on a team proved to be a novel and rewarding experience.

Leadership

Serving as a leader also proved a very novel experience for many of the girls. Not only did they describe the impact that getting support had on them, but they also expressed the importance they saw in giving support. For instance, one girl stated "It made me feel good inside it made me kinda feel proud because a lot of cuz I'm not like always I'm not usually a leader all the time and ummm yeah this gave me the opportunity to be a leader sometimes." Another stated "It made me happy knowing that I could help my friend if they didn't get something, or if they wanted to quit, I gave them support." Notably, none of the girls stated that she liked to be the leader because it made her feel important or that people listened to her. Rather, respondents expressed excitement and pride over the fact that they were able to give support to their peers.

Anticipatory Socialization

When asked the open-ended question about college preparation, the girls became very eager to answer, a function of the strong impact the University Buddies had on them. These findings support the Adventure Girls' continued use of University Buddies, and demonstrate the excitement and inspiration participants felt when looking into a new option for their future. Respondents' answers took two distinct forms. The girls responded that their perceptions of college had changed, and that they felt it now possible to attain this opportunity.

For instance, one girl stated, "I learned that college people aren't really... mean, like I thought they were." Another said that "I'm thinking about college differently because when I was told in the tour about the campus. And he (a physics professor) told me that I'd get four years minimum at college and I'm thinking I might actually go until I'm a professor at whatever I want to do."

In addition to changes in perception that occurred though discussions of college and the campus tour, the majority of the girls realized that college was something they could attain despite academic and financial worries. One girl stated:

> I think it probably would change my mind because the way I looked at college
> before and the way I look at college now, they are two completely different
> things. I thought college would be challenging and hard but it turned out it
> isn't. It doesn't really sound quite that hard, but I understand that there will be
> some challenges. And then when the time comes, hopefully I will be ready to
> take on these challenges.

Besides participants' academic concerns about college, they also demonstrated financial concerns. The previous speaker explained, "I thought college would be a little spendy so I wouldn't go to college, but I found out that it was worth going to college. Before I started Adventure Girls I thought I couldn't go 'cause it was way too much money."

The girls also indicated that they believed they were confident about attending college. One stated "I know how hard my Buddy works now. Because she is trying to do nursing so I know what she... if I want to do something like that, I know what she is going through. And I know what she is going through so if I want to do nursing or something."

The Buddies helped the girls in other ways as well. One girl answered that, "I liked that the Buddies helped us get over our fears. They said like, I'll do that if you do that and they helpedus and we got to see them more often." This was similar to another girl's response that, "I liked my

Buddy because she always encouraged me to do stuff I didn't want to do, and I did it." Another stated qualities she liked in her Buddy, "I liked my Buddy.... Because she was honest and she didn't tell a lie." Not only did the Buddies explain the fun things about college and act as a support net, they also tried to demonstrate a broader picture. One girl said, "I think, I still wanted to go to college before, but now I want to go to college even more because our Buddies kind of said to us that we should go to college and help out people again like they were helping us out."

Discussion

The program is currently completing its fifth cohort and organizers have no plans to stop offering this after-school program. The longevity of this program speaks to the positive feedback received from both the participants and all of the people who contribute to each program. We continue to receive funding from federal, state, community, and private sources. The program has to turn down offers from community members to help facilitate sessions. For instance, one community member read about this program in a news bulletin, and offered to share her career with the girls. And recently, one of our kayaking instructors volunteered her skills as local musician to conduct a music workshop with the Adventure Girls.

Beyond strong community support, the participants themselves enjoy their involvement in the program. In videotaped focus groups at the end of each program participants are queried on what aspects of the program ought to change. Besides a few complaints about one activity or another, the only consistent complaint is the brevity of the program. Given limited resources and the desire to keep the program small by offering two different cycles in fall and spring, we have been unable to extend the duration.

The responses to the focus group questions also proved overwhelmingly positive. The girls not only demonstrated that they had learned something from the program, but they also claimed to have applied it to their personal lives as well. Each activity of the program received positive feedback.

The Adventure Girls data also demonstrated that the University Buddy facilitator was not perceived as an authority figure throughout the final focus group. The girls would, at some points, completely ignore the facilitator and have their own side discussions. They would also poke each other and banter. This not only validated the fact that the facilitator was not perceived as an authority figure, but it also reconfirmed the participants' group cohesiveness.

Concerns

The field notes and the journals posed one concern with the data gathering process. Due to the complexity of running an after-school program, the Primary Investigator was not always able to spend enough time training the students in qualitative data collection. At first, our mentor/researchers did not understand the importance of taking field notes, nor did they completely understand how to correctly take field notes. The current Adventure Girls sessions address this issue with more formal training for the undergraduate researchers on qualitative data collection. The Primary Investigator works with students with previous experience as mentors/researchers to help in training sessions and with offering constructive criticism on their weekly field notes.

Future Research

To augment this program for fifth-grade girls, one of the original researchers of Adventure Girls extended the program to the same group of girls at DeLong Middle School, the school that the majority of the Adventure Girls matriculated to after elementary school. In this program, named Ms. Adventure Girls, the girls met for two hours every Wednesday for a total of ten weeks. Extending the fifth-grade program to a middle school venue allowed for longer-term observation

of the program's impact on its initial participants, as well as provided an opportunity to further reinforce positive behaviors and attitudes at a critical juncture in the girls' socialization.

Not all of the initial Adventure Girls participants chose to continue in Ms. Adventure Girls, which due to funding guidelines focuses on empowering activities in the classroom as opposed to experiential activities. While maintaining two different programs for these girls is our current answer, we do agree that a more time-intensive program could further assist low-income girls of this age group.

While Adventure Girls' original holistic approach continues in Ms. Adventure Girls, additional age-appropriate foci distinguish the latter from the former. These include physical health, cliques, anti-bullying, peer pressure, and drug and alcohol awareness. As the first cohort of Ms. Adventure Girls was introduced this fall, the data and findings have not yet been examined.

Given the impact that the Adventure Girls had on the eight participants in each of the five cohorts, our research team is left with many questions about ways to positively influence adolescent development. The Adventure Girls met for roughly sixteen hours as a group--24 hours altogether when including individual time the girls spent with University Buddies--and participants expressed that they did not want the program to end. This abbreviated program is much shorter than other similar after-school programs that report positive results with approximately a year spent in those programs (LeCroy, 2007). Each girl does receive at program conclusion a one-year pass to the YMCA, which enables some of these girls to continue to play together, to challenge themselves physically, and to find positive things to do during "prime hours." Our concern remains the need to do more for these and other under-resourced adolescents to help ensure that they graduate from high school, consider attending college, and develop into healthy women and contributing members of society. The Adventure Girls program is one positive step towards helping these adolescent girls meet the challenges that they may face in their futures.

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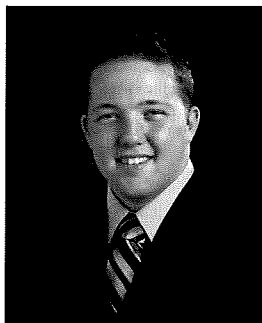
Testing Segregation Measurements in Milwaukee: Reality vs. Perception

by
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Abstract

This study evaluates residential segregation in the city of Milwaukee, Wisconsin, employing an index developed from each of Douglas Massey and Nancy Denton's five categories of hypersegregation (evenness, exposure, concentration, centralization and clustering) (Massey & Denton, 1989). Aimed at aiding public policy development, this study expands the Massey and Denton model by adding variables besides race--namely education, income, home ownership, and unemployment.

Area of Research

The Milwaukee metropolitan statistical area (MSA) serves as the focus of this study. This area includes the city and county of Milwaukee, along with the three surrounding counties of Ozaukee, Washington, and Waukesha. As of 2006, the population of the Milwaukee MSA approched 1,510,000 residents (United States Census Bureau, 2006).

Measurements

Massey and Denton's measurements of hyper-segregation include five dimensions of spatial variation that together encompass nineteen different indices. The five dimensions are evenness, exposure, concentration, centralization, and clustering. The current work utilizes these five dimensions, we chose one index from each dimension. The selected indices appeared to be the most influential and accurate in measuring segregation throughout the Milwaukee area.

(1) Evenness with the Dissimilarity Index
Evenness measures segregation by comparing the spatial distributions of different groups among units in a metropolitan area (Massey & Denton, 1989: 373). From the different indices within evenness, we chose the dissimilarity index. This index measures the percentage of a group's population that would have to change residence in order for each neighborhood to include the same percentage of that group as the metropolitan area overall (Massey & Denton, 1988: 284).

(2) Exposure with the Interaction and Isolation Indices
Exposure is a measure of the possibility of interaction between members of the majority and minority groups (Massey & Denton, 1989: 373). From the different indices within exposure, we chose interaction and isolation. These indices reflect the probabilities that a minority person shares a unit area with a majority person or with another minority member (Massey & Denton, 1988: 288).

(3) Concentration with the Delta Index
Concentration measures segregation by referring to the relative amount of physical space occupied by a minority group in the metropolitan area (Massey & Denton, 1989: 373). From the different indices

within concentration, we chose Delta. Delta computes the proportion of minority members residing in areal units with above average density of minority members (Massey & Denton, 1988: 289-290).

(4) Centralization with the Relative Centralization Index

Centralization measures segregation by determining the degree to which a group is spatially located near the urban center (Massey & Denton, 1989: 373). From the different indices within centralization, we chose relative centralization. This index is interpreted as the relative share of the minority population that would have to change their area of residence in order to match the centralization of the majority (Massey & Denton, 1988: 292).

(5) Clustering with the Relative Clustering Index

Clustering measures segregation by showing the extent to which areal units inhabited by minority members adjoin one another, or cluster, in space (Massey & Denton, 1989: 373). From the different indices within clustering, we chose relative clustering. This index compares the average distance between minority members with the average distance between majority members (Massey & Denton, 1988: 295).

Results

Evenness with the Dissimilarity Index

The dissimilarity index measures the percentage of a group's population that would have to change residence for each neighborhood to have the same percentage of that group as the metropolitan area overall.

$$D = \sum_{i=1}^{n} [t_i / |p_i - P| / 2TP(1-P)]$$

where:
t_i = total population of areal subunit i
p_i = "minority" population of areal subunit i
T = total population of whole county
P = "minority" population of whole county, which is subdivided into n areal units

Employing a scale of 0.0 to 1.0, with 0.0 being complete integration and 1.0 being complete segregation, we found that our data place Milwaukee at 0.67.

Exposure with Interaction and Isolation Indices

Interaction and isolation reflect the probabilities that a minority person shares a unit area with a majority person or with another minority person.

For *isolation:*

$$_xP^*_x = \sum_{i=1}^{n} [x_i/X][x_i/t_i]$$

For *interaction:*

$$_xP^*_y = \sum_{i=1}^{n} [x_i/X][y_i/t_i]$$

where:
x_i = number of X members in the areal subunit i
y_i = number of Y members in the areal subunit i
t_i = total population of number of the areal subunit i
X = number of X members county-wide

We only looked at the segregation of African-Americans and Caucasians; therefore, with only two groups being represented in this study, the isolation and interaction indices sum to 1.0, with lower values of interaction and higher values of isolation indicating higher segregation. We found that the interaction level was a 0.34 and the isolation level was a 0.66, both measures showing a relatively high rate of segregation.

Centralization with Relative Centralization Index

Relative centralization compares the areal profile of the majority and minority populations and may be interpreted as the relative share of members of the minority population who would have to change their area of residence in order to match the centralization of the majority.

$$RCE = (\sum_{i=1}^{n} X_i\text{-}1Y_i) - (\sum_{i=1}^{n} X_i Y_i\text{-}1)$$

This index varies between -1.0 and 1.0, with positive values indicating that minority members are located closer to the center than members of the majority, and negative values the reverse. With a value of 0.11, this index of segregation was not as strong an indicator of segregation in Milwaukee. . Milwaukee presents an interesting case in that no one distinct part of the city can be labeled "inner city," where the majority of minorities reside; rather minority persons reside in a few distinct neighborhoods throughout the city.

Clustering with Relative Clustering Index

Relative clustering compares the average distance between the residences of minority members with the average distance between the residences of majority members. $RCL= P_{xx}/P_{yy}\text{-}1$ where P_{xx} and P_{yy} are first calculated as the "Index of Spatial Proximity," as follows:

$$P_{xx} = \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j c_{ij} /X^2$$

where:
x_i = the number of members of X group (Black, Hispanic, White, Other) of tract i
t_j = the total population of tract j
X= the number of members of X group (Black, Hispanic, White, Other) county wide
c_{ij} = the negative exponential of the distance between the centroids of tract i and j
n = the number of census tracts (here, 1656)

This index equals 0.0 when minority members display the same amount of clustering as the majority. Our calculations have shown a result of 0.38. We hypothesize that this number will steadily grow closer to the 0.0 marker, and hence show a high result of relative clustering as compared to all of the surrounding Milwaukee suburbs.

Additional Evidence

The following table and graphics employ U.S. Census data (2009). The data illustrate different demographic representations within three respective zip code areas within the Milwaukee MSA. The zip code areas 53210 and 53213 border each other within the Milwaukee city limits. The village of Germantown, the 53022 area, is a Milwaukee suburb located in Washington County, approximately five miles from the Milwaukee city limits. The table and graphics present stark differences among the three areas, especially between the two zip code areas within the Milwaukee city limits.

Figure 1 illustrates the different demographics within the three zip code areas in terms of the percent of Caucasian residents, the percent of African-American residents, the percent of residents uninsured, and the percent of residents with an educational attainment level of a bachelors degree or higher. The bar graph makes it evident that all three zip code areas contain a disproportionate number of African-Americans to Caucasians. The 53210 zip code area has the highest number of African-Americans and the lowest percent of residents with a bachelors degree or higher level of education. Figure 2 presents the economic and real estate demographics among these three zip code areas. It is apparent that the Milwaukee suburb Germantown (53022) has the highest median income as well as the highest median house value. At the same time, the

highly dominant African-American zip code area (53210) has the lowest median income as well as the lowest median house value.

Table 1: Demographic Comparison of Three Zip Code Areas of Milwaukee SMA

Zip Code	53210	53123	53022
Municipality	Milwaukee	Milwaukee	Germantown
Total Population	30,509	26,141	17,507
% Caucasian	23.6	94.1	95.7
% African-American	70.4	1.8	1.4
Median House Income	32,340	51,951	60,099
Median House Value	66,700	130,300	170,300
% ≥ Bachelors Degree	18.5	48.9	30.7

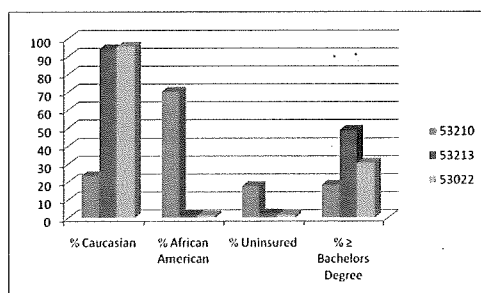Source: U.S. Bureau of the Census (2000)
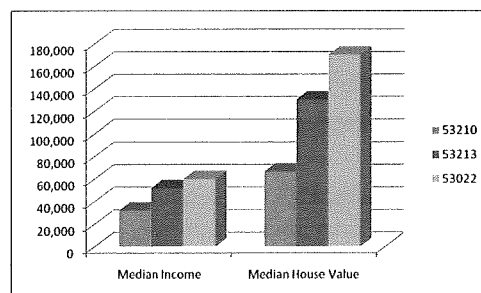

Figure 1: Race, Insurance, and Education

Figure 2: Income and Household Value

Mapping Illustrations of Segregation in the Milwaukee MSA

The following maps illustrate the racial and socioeconomic segregation occurring today in the Milwaukee MSA. We have utilized choropleth mapping techniques to represent these demographics; light and dark colors show the density of the particular mapped variable. Milwaukee County, the vertically shaped county to the right and center on all five maps, is surrounded by Ozaukee County to the north, Washington County to the northwest, Waukesha County to the west. Together these complete the Milwaukee MSA.

Figure 3 shows the apparent effects of "white flight" throughout the Milwaukee MSA. The much lighter shaded region of non-Caucasian people in the heart of Milwaukee county contrasts with the much darker surrounding areas, thus illustrating the dense suburban Caucasian population. As evident from Figure 4, the African-American population is highly centralized in the north and northwest portions of Milwaukee County, with a few anomalies scattered throughout the MSA. Figure 5 mirrors and reinforces the picture of segregation revealed in the previously shown Figure 3. In Milwaukee the racial divide has a high correlation with the median household income, a circumstance that underscores the intense partition of both the social and economic factors afflicting the area. Figure 6 also presents a high correspondence with Figures 3 and 5. Economic affluence typically provides one the ability to own housing rather than being forced to reside in rental properties. The phenomenon of "white flight" saw Caucasian residents flock to the more affordable suburban areas of Milwaukee. This migration helped the rise of the subdivision era.
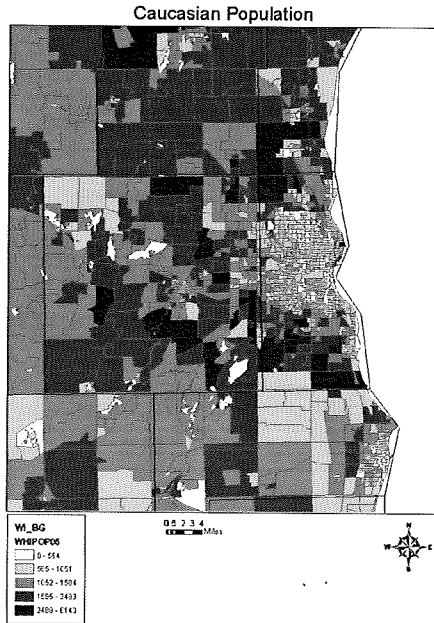
Caucasian Population

African American Population

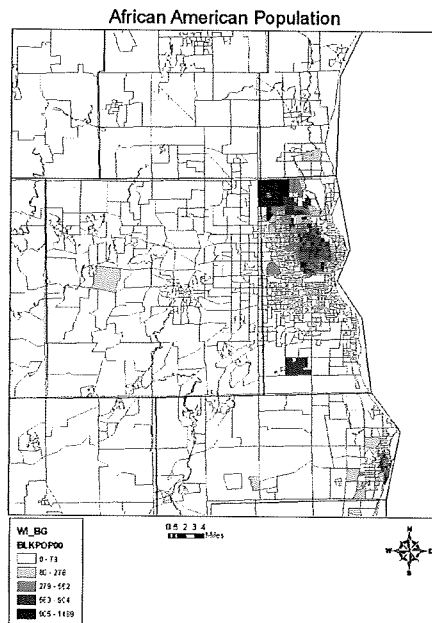

Figure 3. "White-flight" in Milwaukee MSA

Figure 4. African-American centralization in Milwaukee MSA

Finally, Figure 7 presents the rental properties occupied by households in the Milwaukee MSA. This map does not portray quite as clear a picture of the racial, social, and economic segregation taking place in the Milwaukee MSA as previous maps. A number of factors contribute to this less sharply segregated composition, most particularly the high number of college and university campuses located within the area where rental properties are extremely common.

Effects on the Milwaukee Public School System

The Milwaukee Public School System (MPS) employs a voucher system that allows parents and students to choose whichever school within the system they would like to attend. In addition, as discussed by Witte, the voucher system also provides funding to any student desiring to attend a parochial or private school within the district (Witte, 1999: 64). This well-intended policy has resulted in some problems; some of the private schools are simply old storefronts that have been turned into schools that lack many of the amenities that should be afforded to students receiving primary education (Borsuk & Carr, 2005). In this author's opinion, Milwaukee's voucher system enables segregation, and does not offer the students within MPS the chance to receive the best education that they deserve. Allowing students and parents to choose their school subtly encourages those people to choose the location where they feel most comfortable, typically the most homogeneous environment. This does not bode well when trying to integrate a community.

MSP has also attempted to incorporate a bussing system, entitled the "Chapter 220 System," in which African-American students from the city of Milwaukee ride city busses each day to the suburbs where schools demonstrate a higher level of education. The 34th largest school district in the nation, MPS's dropout rate ties, at 8.5 percent, for the 6th highest place among the 50 largest districts. The state of Wisconsin, at forty percent, leads the nation for lowest graduation rate of African-American students (Greene). With "white flight" MPS has lost a significant amount of tax dollars; the affluent suburbs now collect that money from their new residents. MPS's loss of income has been detrimental; their reduced annual budget has resulted in cuts to academic and extracurricular programs, as well as in employment of teachers (Borsuk, 2004).
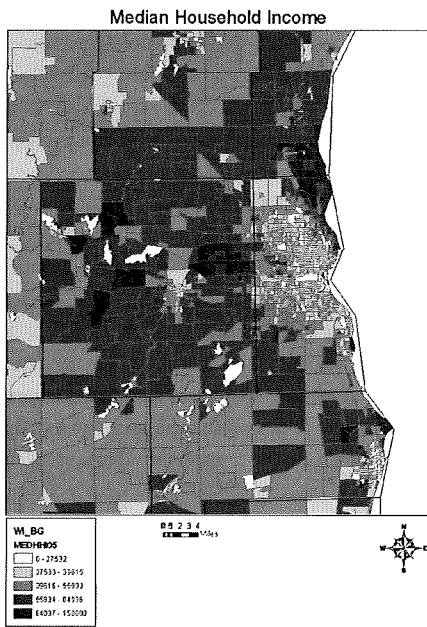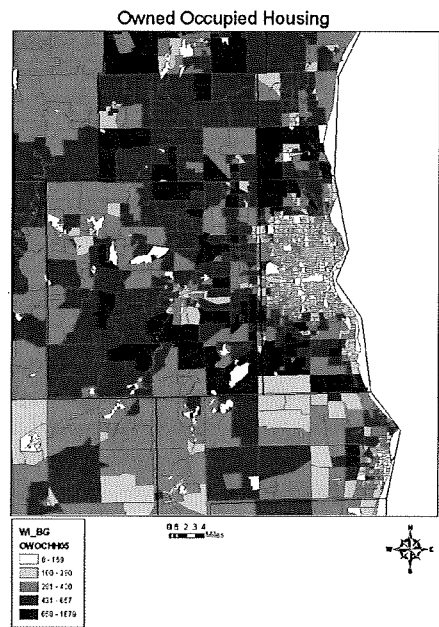
Median Household Income

Owned Occupied Housing

Figure 5. Median household income in Milwaukee MSA

Figure 6. Home ownership in Milwaukee MSA
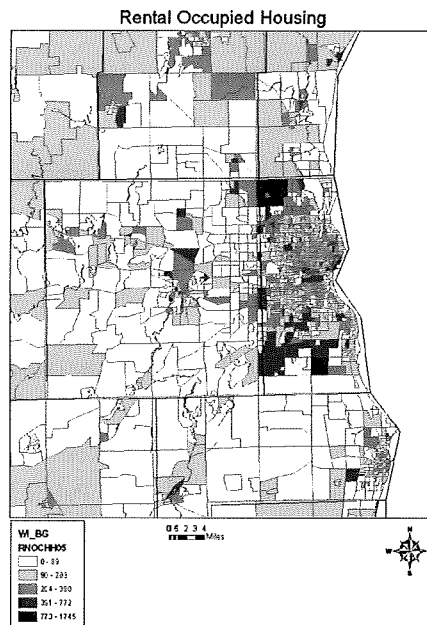
Rental Occupied Housing

Figure 7. Rental property in Milwaukee MSA

Conclusion

Through our research, based on Massey and Denton's measurements of hyper-segregation, we have found that Isolation and Interaction present the best indices of segregation within the Milwaukee MSA. These two indices reflect the probabilities that a minority person shares a unit area with a majority or with another minority person. The Milwaukee MSA possessed a high finding of isolation (0.66/1.0), and a relatively low finding of interaction (0.34/1.0).

The table, graphs, and maps presented here provide evidence of how, through social and economic factors, segregation remains a defining reality of the Milwaukee MSA. That zip code areas 53210 and 53213, both within the Milwaukee city limits and bordering each other, could encompass such drastic demographic differences testifies to the current situation afflicting the largest city in the state of Wisconsin.

Because education is key to future success, it is vital that every youth in the Milwaukee MSA have the same opportunity for education. MPS's current voucher system, however, enables segregation to persist. In summary, the *de facto* segregation problem that haunts Milwaukee is in desperate need of change. In order to reverse what has happened in the Milwaukee MSA, it is imperative that social programs, public policy, and the contiguous education systems attempt to better integrate themselves into a cohesive heterogeneous unit.

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The Effects of Motivating Operations on the Transfer from Tacts to Mands for Children Diagnosed with Autism

by

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Abstract

In this study motivating variables were manipulated to examine the effects on teaching children with autism to mand for preferred items after teaching them how to tact the items. A 24-hour or more deprivation of the preferred item condition and a pre-session exposure to the preferred item condition were compared using an alternating-treatments single-subject experimental design. Two children diagnosed with autism were first taught to label a highly preferred edible, as determined by a preference assessment. Then the children were tested to see whether they would mand for the item under both deprivation and pre-session exposure. The children requested the highly preferred item under both conditions but there was variability between the conditions.

Children with autism have an impairment in developing language skills (Sundberg & Michael, 2001). Since verbal behavior is an important skill for learning to appropriately communicate with others, one way children with autism can learn language skills is through behavioral therapy. Therapists who work with children with autism need to optimize the learning environment effectively in order to acquire appropriate verbal behavior skills. Children with autism, who lack the ability to appropriately communicate, typically engage in problem behavior as a replacement behavior (Carr & Durand, 1985). Thus, understanding functional communication skills--specifically tacts and mands--is very important.

The primary function of a mand (a request) is to obtain a desired item. Skinner (1957) explained that the mand is a type of language unit in which the form of the child's verbal response is controlled by what the child wants. For example, if a child were to say "juice," the child would expect to receive juice because saying "juice" or requesting something is usually reinforced by receiving that item or activity. Thus, mand training is one of the best ways to establish this essential element of verbal behavior. It is also important to understand what controls a mand (motivating operations) when teaching a child verbal behavior. A motivating operation (MO) refers to environmental variables, such as deprivation and satiation, that make a reinforcer more or less valuable. If a child just ate two bags of chips, the child may not mand for the chips because they have lost their reinforcing value.

A tact, or label, as Skinner (1957) defined it, is a verbal operant in which a response of given form is evoked by a particular object or event or property of an object or event. A tact is reinforced with general or social reinforcers, unlike when a person emits a mand. If a mother points to a cracker and asks, "What is it?" the child should say "cracker." The mother then could either give social praise (e.g., "Yes, a cracker."), or a generalized reinforcer. Therefore, in this case when the child said "cracker," the word functioned as a tact because the child did not receive the cracker; instead he/she received social praise, or a generalized reinforcer.

Skinner (1957) described the mand and the tact as independent response functions; he implied that if a child were to learn to tact an item, the child may not automatically establish the ability

to mand for the item. For example, if a child was taught to tact a cracker, the acquired tact may not automatically transfer to establishing a mand for the cracker (Hall & Sundberg, 1987; Lamarre & Holland, 1985; Sigafoos, Doss, & Reichle, 1989; Twyman, 1995). Moreover, if a child was taught to mand for a cracker, the child might not be able to tact the cracker (Lamarre & Holland, 1985).

Sundberg et. al. (1990) stated that teaching tacting has demonstrated great potential for transfering to an untrained verbal operant, such as the mand. Conversely, mand training appeared to have very little potential for transfering to an untrained verbal operant, such as the tact. From these findings, Sundberg et. al. (1990) implied that tact training could possibly be one of the most effective ways to establish mands.

Past research on the acquisition of a mand after learning to tact an item has indicated mixed results. Some past research, however, identified variables under which the transfer from a tact to a mand would occur (Sundberg, San Juan, Dawdy, & Arguelles, 1990; Sigafoos, Reichle, & Doss, 1990; Wallace, Iwata, & Hanley, 2006.) To test the tact to mand transfer, Wallace, Iwata, and Hanley (2006) manipulated preference and found that the highly preferred (HP) item functioned ·as a reinforcer, yet the motivating operations were held constant.

Research on the transfer from tacts to mands has only examined one variable, reinforcing value, and this on learning to acquire mands following tact training, as in the Wallace, Iwata, and Hanley (2006) study. Thus, research has not provided strong evidence for the motivational control over responding, after learning to tact an item. The current study was conducted to account for the MOs that were held constant in the Wallace, Iwata, and Hanley (2006) study; it investigated the effects of manipulating the motivating operations of an HP item when learning to mand an item after teaching to tact it. Therefore, the current study taught children diagnosed with autism to tact a highly preferred edible and investigated the effects deprivation and pre-session exposure would have on manding, as well as the transfer from tacts to mands.

Participants and Setting

The participants in this study included two children diagnosed with autism. Weston was a four-year-old male. He received in-home applied behavior analysis (ABA) services 27 hours a week. He was tested on the Preschool Language Scale: 4th Ed. (PLS-4), which assessed both his receptive and expressive skills. Weston was given a raw score of 67, whereas a standard score for children his age would be 100. An expressive language score for Weston was not calculated. Ariel was a five-year-old female, who received in-home applied behavior analysis (ABA) services 27 hours a week. Ariel was also given the PLS-4.Her PLS score was 67, and her expressive language score was 56. All of the children had some manding and tacting abilities (e.g. "I want___" or " Can I have a___" or "It's a___."

For all of the children, the sessions were conducted in their homes, in a workroom, which contained a table, two chairs, and the items necessary for each condition. For Weston, sessions were conducted in two workrooms, one at home and one at the daycare center he attended. At the daycare center the sessions were conducted in an empty workroom that contained only a table and two chairs.

Treatment Integrity and Interobserver Agreement

Treatment integrity was measured by calculating the total number of correctly conducted procedural steps, dividing the result by the total number of steps, and multiplying this by 100 percent. A procedural step was considered correct if the researcher carried out the step as written on the treatment integrity sheet. For Weston, treatment integrity was calculated on 70 percent of the sessions, and rated at 100 percent. For Ariel, treatment integrity was calculated on 35 percent of the sessions and, was rated at 100 percent.

Interobserver agreement (IOA) was collected by a second observer on 70 percent of the sessions for Weston, and 35 percent of sessions for Ariel. The data collected were then compared for agree-

ment between the two observers. An agreement for tact training phases was defined as when the two observers recorded the same response as an error, a prompt, or correct, and was calculated by dividing the number of agreements by the number of agreements plus disagreements. This number was then multiplied by 100 percent to obtain a percentage agreement score. Agreement for each of the mand test phases was calculated by dividing the frequency of mands each observer recorded for the item by the total number recorded. For Weston, the percentage of IOA ranged from 95 percent to 100 percent, and the mean agreement score was 100 percent. For Arial, the percentage of IOA ranged from 95 percent to 100 percent, and the mean agreement score was 100 percent.

Preference Assessment

The children's parents and direct care therapists identified five highly preferred (HP) edibles for each child to use in conducting the preference assessment. The edibles were not part of the child's daily diet. A multiple stimulus without replacement preference assessment was conducted to determine relative preference for each edible (DeLeon & Iwata, 1996). A minimum of three sessions were conducted to establish an HP edible for use in the remainder of the study. Preference assessments were conducted until a clear HP edible could be determined.

The preference assessment was conducted by placing the five edibles two inches apart on the table in front of the child. During each trial, the instruction "pick one" was given, and the first edible the child removed and consumed from the array was recorded as the selected edible. Following the selection of an edible, the remaining edibles were randomly rotated and the instruction "pick one" was given again. This was done for each edible; however, if the child did not pick any of the remaining edibles within 30 seconds or said "no" or "all done," the preference assessment ended for the day and the remaining edibles were recorded as not chosen.

Experimental Design

A multi-element (alternating treatments) single-subject experimental design (Barlow & Hayes, 1979) was used to evaluate the effects of deprivation and satiation during mand testing conditions. Conditions of deprivation and satiation were alternated in random order for each session by drawing a slip of paper from an envelope showing one of two conditions for the HP edible. If a condition was chosen three days in a row, however, the other test condition was automatically assigned.

General Procedures

First, a baseline condition for tact training was conducted to determine whether the child could tact the HP edible item. Second, a baseline condition for manding was conducted to determine whether the child could mand for the HP edible. If the child was unable to tact or mand for the item, then the HP edible was selected to be included in the study. Following tact and mand baseline conditions, the child was taught to tact the HP item selected for the study. When a child acquired the tact for the HP edible, the final condition consisted of testing for a mand response while alternating between pre-session exposure and deprivation of the HP edible.

Baseline Tact Training Condition

In the tact training baseline condition, the HP edible was held in front of the child and the instruction "what is it?" was given. If the child responded with a correct verbal response the experimenter provided praise (the edible was not provided to prevent teaching a mand response). If the child did not respond or gave an incorrect response within five seconds, the trial ended. Inter-trial interval time was approximately 30 seconds; then the next trial was conducted. A minimum of three trials were conducted for the HP edible.

Mand Test Baseline Condition

Mand probes in the baseline condition were conducted by placing a bowl of the HP edible in front of the child. If the child emitted a non-target mand (reaching, pointing, "I want food") and/or 30 seconds passed, the child did not receive the edible and the baseline mand test ended. A minimum of three baseline mand test conditions were conducted for each child. The HP edible was used in the study if the child was unable to emit the target mand for the edible item. If the child emitted the target mand, the child was given the edible and the edible was not used in the study. No other edibles were available to the child during the mand test baseline condition.

Tact Training Condition

In the tact training condition the edible was placed in front of the child and the instruction "what is it?" was given. A constant prompt delay procedure (Snell & Gast, 1981) was used to transfer stimulus control from the experimenter's prompt to the instruction. On the first trial of the initial tact training session, an immediate prompt was given to the child. On the second trial, a five second prompt delay was used. If the child emitted a correct response, the child received a generalized reinforcer such as praise and/or a tangible item. If the child emitted an incorrect response or did not respond in five seconds, the trial ended and the researcher used an immediate prompt for the next trial. This procedure was used for all five trials. An inter-trial interval of approximately 30 seconds was used during the tact training condition and a total of five trials were implemented in each session. The criterion for accurately tacting the HP edible was 100 percent of the trials over two consecutive sessions. When the tact training criterion was met for the edible item, mand tests were run the following session.

Mand Test Condition During MO Manipulation

In this condition the child was tested to determine whether the ability to tact the HP item resulted in a mand response. At the beginning of each mand test session a multiple stimulus without replacement preference assessment was conducted to determine the preference for the HP edible for that day (DeLeon & Iwata, 1996). If the child chose the HP item (identified in the initial preference assessment), the mand test was conducted. If the child did not choose the HP item first, the preference assessment continued until the HP item was chosen. This was done to determine the current rank of the original HP item.

The mand test was conducted with the HP edible under either a pre-session exposure or a deprivation condition. Each session was conducted one-half hour to an hour after eating a meal. A multi-element single-subject experimental design (Barlow & Hayes, 1979) was used to alternate between the two conditions. Conditions were pre-determined by randomly picking a slip of paper out of an envelope which showed one of the two conditions. A deprivation condition consisted of at least 24 hours of no access to the HP edible. A pre-session exposure condition consisted of providing a pre-determined amount of the item immediately prior to the mand test. A small amount of the HP item was placed in front of the child and he/she was told he/she could eat the item. This procedure was continued until either the pre-determined amount of items was all gone, or the child communicated he/she was all done. If the child manded during the pre-session exposure condition the food was removed for 30 seconds (to eliminate directly reinforcing a mand).

During mand testing a bowl of the HP edible was placed in front of the child. If the child emitted a mand (e.g., said "Can I have _____ ?"), a small amount of edible was given to the child. A progressive ratio schedule of reinforcement (PR-1) was used to deliver the HP edible. The PR schedule included a step size of one response for each trial. That is, the child was required to mand once for the food on the first trial, twice on the second trial, and continuing until a break point was reached. A break point was defined as the last schedule completed before the child either stopped responding for 30 seconds, engaged in problem behavior, manded for something else or communicated that she/he was done.

To address concerns from his parents, Weston was allowed to consume two packs (twelve pieces) of the HP edible during the mand test. The mand test ended if the child no longer manded for the HP edible, or when the pack (twelve pieces) of the HP edible was all gone. If the child did not emit the target mand for the edible, the child did not receive the edible. No other edibles were available to the child during the mand test.

Results

The preference assessment results for each of the two participants are depicted in Figures 1 and 2. Weston's HP item was a Gusher®, as determined by the preference assessment, and was chosen on 100 percent of the trials. Ariel's HP item was an Oreo®, chosen on 100 percent of the trials. Each of these items was used during tact training and the mand test.
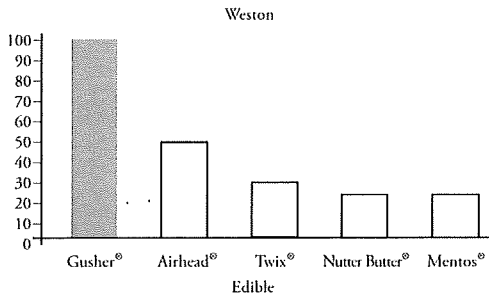

Figure 1. Preference assessment for Weston as determined by the percentage of time each edible was selected. Shaded bar represents the edible used in tact training.
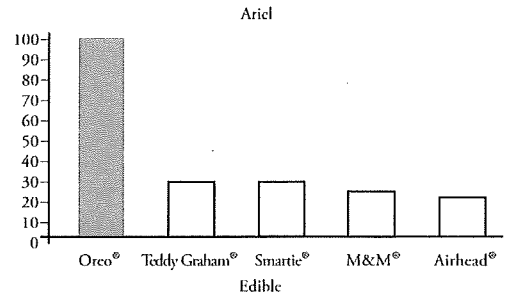
Figure 2. Preference assessment for Ariel as determined by the percentage of times each edible was selected. Shaded bar represents the edible used in tact training.

The results of the tact training and mand test conditions for each participant are shown in Figures 3 and 4. During the baseline mand test and baseline tact training, neither of the participants emitted the correct verbal responses for any of the items. For the baseline mand tests, participants generally either emitted the generic response "I want cookie/candy," pointed, or reached for the item. These responses were not considered proper mands during the baseline mand test; therefore, consumption of the item was not granted.

Weston learned to tact his HP item in four sessions as the shown in Figure 3. When criterion was met for the item, mand tests were run. In the initial mand test, which was a pre-session exposure condition, Weston did not mand for the HP item; however, he chose the Gusher® first in the preference assessment (indicated by the small number above the data point). The second mand test was run under the deprivation condition and Weston manded 36 times for the Gusher®. In Phase 1 Weston manded on average one time for a Gusher® in a total of seven pre-session exposure sessions, totaling seven mands, as seen in Table 1; on average he manded 11.5 times for a Gusher® in a total of ten deprivation sessions, totaling 115, as seen in Table 1. Because the rates of manding decreased in both conditions, Phase 2 was conducted to examine the effects of a long break from Gushers®. Following an eight-week deprivation from Gushers®, mand tests were resumed. In Phase 2, Weston manded on average 32 times for a Gusher® in a total of three sessions during deprivation sessions and 21 times in a total of three pre-session exposure sessions, as seen in Table 2.

Ariel learned to tact her HP item in four sessions (as shown in Figure 4), after which mand tests were run. In the initial two mand tests, which were deprivation conditions, Ariel manded ten times for an Oreo®. In the third mand test, under the pre-session exposure condition,

Ariel did not mand for the Oreo®. Ariel manded on average .33 time(s) for an Oreo® in a total of three pre-session exposure conditions, which is one mand total, as seen in Table 3. She manded on average 5.5 times for an Oreo® in a total of four deprivation conditions, which is 22 mands total (as seen in Table 3).
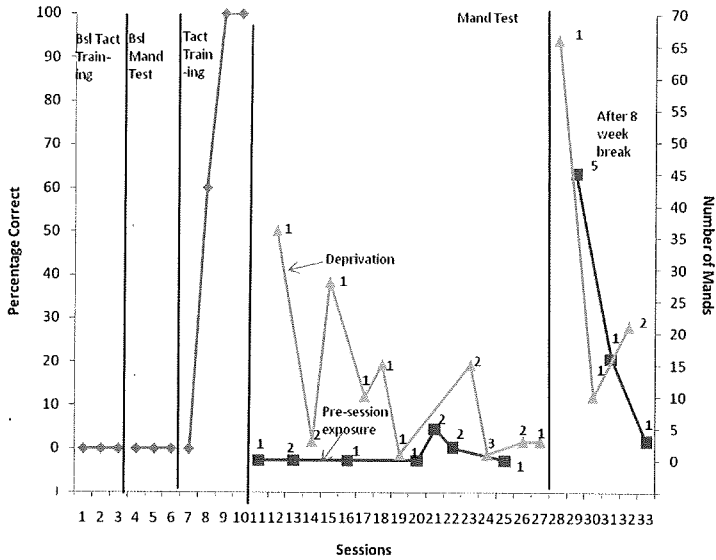

Figure 3. Tact training conditions for Weston for the HP edible as calculated by percentage correct (left scale) and mand test conditions for the HP edible as calculated by the number of mands (right scale).
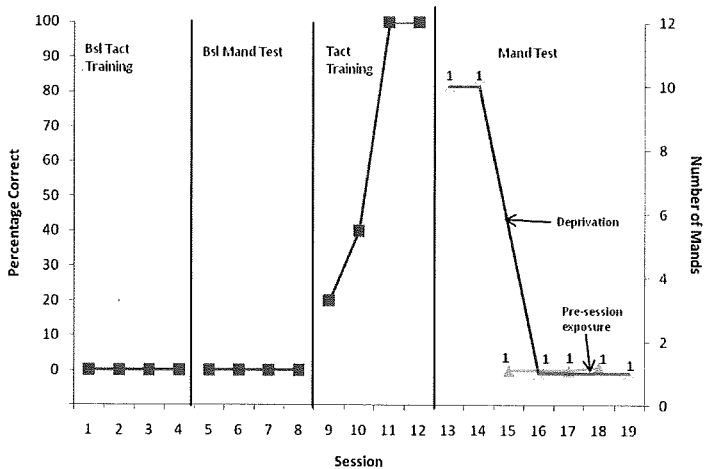

Figure 4. Tact training conditions for Ariel for the HP edible as calculated by percentage correct (left scale) and mand test conditions for the HP edible as calculated by the number of mands (right scale).

Table 1: Weston Phase One Manding

Weston-Phase1	Pre-session exposure	Deprivation
Sessions conducted	7	10
Average number of requests	1	11.5
Total	7	115

Table 2: Weston Phase Two Manding

Weston-Phase 2	Pre-session exposure	Deprivation
Sessions conducted	3	3
Average number of requests	21	32
Total	64	97

Table 3: Ariel Manding

Ariel	Pre-session exposure	Deprivation
Sessions conducted	3	4
Average number of requests	0.33	5.5
Total	1	22

Tables 1, 2, and 3 provide numerical data for sessions conducted and responses during the requests test conditions under both pre-session exposure and deprivation.

Discussion

The purpose of this study was to investigate the effect deprivation and pre-session exposure had on learning to mand after learning to tact an item. During the baseline tact training and baseline mand test, neither participant was able to tact or mand for their HP item. During tact training both participants learned to tact their HP item. Both participants emitted a mand response for the HP item following tact training, which suggests that the transfer from a tact to a mand did occur. This finding is consistent with past research that has found the transfer to occur from a tact to a mand (Sundberg, San Juan, Dawdy, & Arguelles, 1990; Sigafoos, Doss & Reichle, 1990; Wallace, Iwata, & Hanley, 2006).

Initial mand responses occurred in deprivation conditions for both participants. In the initial mand test, Weston did not mand for the item until a deprivation session occurred. In the initial mand test for Ariel, which was a deprivation condition, she manded immediately after tact training. Results suggest that if a child were to learn to mand for an item, he/she will be more likely to acquire the mand if deprived of the item.

Overall, this study provides some general implications for teaching verbal communication skills to children diagnosed with autism. The results of this research indicate one condition under which manipulating the MOs could result in the tact to mand transfer. Tables 1, 2 and 3 provide numerical data to assist the clarity of the overall response patterns in the mand tests. For both participants, the average number of mands was higher in deprivation than in pre-session exposure; this indicates that on average a child will mand more for an HP item from which he/she has been deprived rather than satiated or previously exposed to. Researchers can suggest that when a child with autism is deprived of a HP item that he/she is able to tact, he/she will more likely mand for the item than if he/she just had recent access to the item. In other words, therapists who work with children with autism should set up an environment with items to which the child has not had recent access, to allow for an effective teaching environment.

Although the transfer from a tact to a mand occurred, there is a drawback. The responses emitted by the participants decreased across sessions. Both participants showed a decrease in the number of responses across sessions during the deprivation condition in the mand tests. A decrease in responses in the pre-session exposure condition was only indicated in Phase 2 of the mand test for Weston. There was no clear indication of a decrease in responses in the pre-session exposure

conditions across mand tests for both Weston (in Phase 1) and for Ariel. The decrease in responses across sessions is contrary to previous research, which has only found a decrease in responses within a session. Future research should investigate conditions under which responding may decrease across sessions, such as mand responding on PR schedules, as seen in the present study.

One potential limitation to the present study is that in the mand test condition the participants received the item that was manded for, which could have facilitated mand training. Future research should evaluate the effects of using a generalized reinforcer, such as social praise, or a mand extinction phase on the transfer from a tact to a mand. This may provide further support for the generalization from discriminative to motivational control of a tact to a mand during testing conditions.

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Language Over Mind or Mind Over Language: The Problem with Fuzzy Agreement

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1. Introduction

One's use of language can lead to either a clear understanding or miscommunication. This paper argues that some miscommunication may lie in "fuzzy" subject-verb agreements, specifically agreements that may be grammatically correct in either the singular or the plural, but that sometimes result in somewhat illogical semantic content. Considering the fact that subject-verb agreement is a rather broad area, this researcher focused on the occurrence of this linguistic phenomenon in "one of" clauses introducing a relative clause. "One of" clauses are those that contain "one of the" followed by a plural noun + a relative pronoun. A relative clause further defines a preceding noun. A relative pronoun (who, that, which) introduces a relative clause. In this research, the relative pronoun refers to the subject phrase of the main clause-- the "one of" clause. Fuzzy agreement depends on how a speaker views this relative pronoun in relation to the respective subject phrase. The phrasal construction that includes a singular "one" as well as a plural noun forces the speaker to decide whether the relative pronoun refers to a singular or plural noun phrase, therefore determining the later verb choice in the relative clause. The main foci of this research are an analysis of verb choices made by native English, French, and German speakers in the fuzzy agreement context, a determination of the impact fuzzy agreements have on communication, and a review of some theories regarding their cause.

2. Methods

Survey

This study employed a ten sentence survey translated into each of three languages (English, French, and German). The researcher took Anglo-Saxon, Francophone and Germanic cultures into consideration during the preliminary writing stages of the survey items. The main goal for each sentence was that a participant could understand it and relate to it regardless of age, gender, or culture. Each sentence contained a "one of" clause as a subject phrase, a relative pronoun, and a relative clause containing the verb relating to the noun phrase. The English version of the survey on the following page (Table 1) illustrates the structure and content of all the surveys. (The French survey appears as Appendix A, and the German survey appears as Appendix B of this article.)

The survey instructions included the word "think" to encourage participants to base their decisions on instinct or personal opinion rather than on grammatical rules. This wording, rather than a phrase instructing participants to "choose the right verb," better catered to the descriptive (rather than perceptive) focus of this study; it emphasizes the logic of a response rather than its grammatical correctness. English, French and German grammarians alike have declared both singular and plural as acceptable options in the sentence structure consisting of a "one of" clause preceding a relative clause (Durrell; Grévisse; Quirk *et al.*). The choice of a

singular or plural verb has often been left up to the reader or speaker and is rarely challenged, since the choice depends solely on that individual's interpretation of a sentence's meaning. The correctness of verb choice in such a construction cannot be questioned, but the logic behind a participant's verb choice remains open for discussion.

Table 1: ENGLISH SURVEY

Age: _____   Sex: F M
Occupation:_____   Native Language:_____
Nationality:_____   Other language abilities:_____

Please circle the verb that you think fits best:

1. For her birthday, I gave my sister one of her favorite red wines, which is/are produced in Italy.

2. Look, there's one of the trees that was/were uprooted by the storm.

3. One of the firemen, who was/were overcome by smoke inhalation, was my uncle.

4. I know one of the waiters, who was/were working at the restaurant last night.

5. He finds it to be one of the most important themes that run/runs through the novel.

6. My brother is one of the few players on the soccer team who is/are going to play the entire game.

7. One of the neighbors' three cats that always walks/walk through the backyard is really mean.

8. She often forgets to pay at least one of her many bills that is/are due in December.

9. This morning, I broke one of the few precious cups that has/have belonged to our family for generations.

10. Julia is one of my friends who wakes/wake up at 6am every morning to do Yoga.

Administration And Participants

In order to grasp the scope and impact of this linguistic phenomenon, the researcher sought to obtain responses from a wide variety of native speakers differing in age, sex, occupation and nationality. The researcher tried to personally administer as many surveys as possible, however other administrators were eventually employed to help the process. Personal administration of the majority of German surveys took place in Austria in the regions of Styria and Lower Austria near Graz and Vienna respectively. The French surveys were hand-administered in the PACA (Provence-Alpes-Côte d'Azur) region in the cities of Mont-Dauphin, Guillestre, L'Argentière-la Bessée and Briançon. Only a few of the English surveys could be personally administered due to the researcher's location in Graz at the time. The English hand-administration took place in Eau Claire, Wisconsin.

Administrators always spoke with participants in the language of the survey they administered, whether this was French, German, or English. They presented participants with the survey and entered into little or no conversation besides discussion of the aim of the research. If any conversation took place during participants' filling-out of the survey, this generally involeded administrators' clarification of instructions, their reminders to participants to respond according to instinct rather than grammatical correctness, and their asking participants to avoid thinking too much about any one sentence. Participants who thought over a question for too long and who consequently wished to change an answer, no longer answered according to instinct. Administrators sought to avoid such circumstances as much as possible.

Targeted participants included 50 native speakers, age eighteen and over, for each language. To obtain results from a wider variety of participants outside of the previously mentioned areas, the researcher made the survey available online and distributed it via email with a link to the survey's website. This allowed aditional participants to take the survey conveniently and then easily forward it on to other prospective participants. This method, however, forced the researcher to forfeit control over certain aspects of the administration. These included loss of the ability to enforce time constraints or to target speakers of a specific language or certain age groups. In the end, approximately 200 participants of ten different nationalities including American, Austrian, Belgian, British, French, German, Irish, Italian, Moldovan, Moroccan and Senegalese participated in the survey. Only the responses of native English, French, and German speakers figure in the data presented here. The ages of the 200 participants ranged from twelve to 84; the current study, however, excludes participants under the age of eighteen. The following results, therefore, indicate responses from 54 native French speakers (ages 18-84), 54 native German speakers (ages 18-78), and 68 native English speakers (ages 18-76).

3. Results

The analysis of responses began with identifying trends in English, French and German across four different age groups (AG): 18-30 (AG1), 31-45 (AG2), 46-60 (AG3), and 61+ (AG4). The age groups of different languages are distinguished by the letters .en (English), .fr (Français/French), and .dt (Deutsch/German) respectively. The analysis continued with attention to trends in each separate age group in each respective language. Trends became apparent in certain sentences across all languages and age groups, as well as within each age group of a language and within each language as a whole. The following sections of this paper first address trends seen within the four age groups for each language and then present comparisons and contrasts the languages and age groups.

Age Groups Among English-Speaking Participants

Respondents from the youngest age group of English speakers largely referred to the relative pronoun as representing the singular "one," except in the case of "bills" in sentence 8 and "cups" in sentence 9; here the majority of participants (80 percent) and (66 percent), respectively, chose the plural. In Diagram 2 one already notices a difference in response pattern between participants of this youngest age group
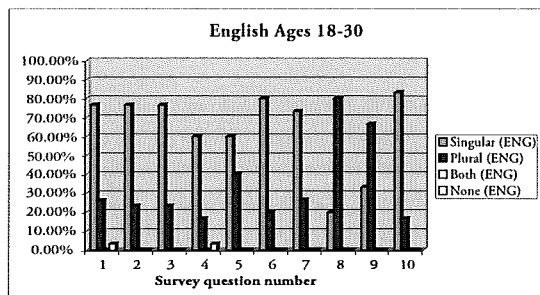

Diagram 1. Graph of responces to English survey: AG1.en.

and those of AG2.en. AG2.en participants demonstrated a slight tendency toward the singular, though they also chose the plural in sentences 8 and 9, but with slightly lower frequency
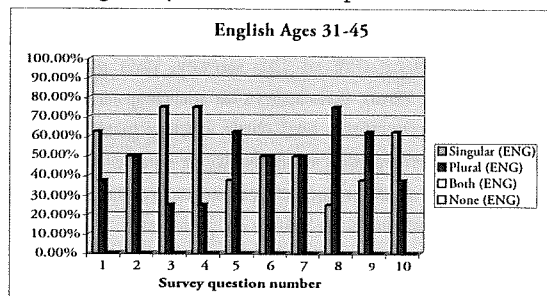

Diagram 2. Graph of responces to English survey: AG2.en.

at 75 percent and 62 percent respectively. Responses of participants in AG2.en also show a few 50/50 splits, as in sentences 2, 6, and 7. Also unlike AG1.en, 62.5 percent of participants in AG2.en chose the plural as the best fit for sentence 5.

Diagram 3 also illustrates differences between participants of AG3. en and the previous two age groups, with responses similar to those in AG1. en. As in AG1.en, AG3.en respondents demonstrate a higher tendency toward the singular. However, the gaps between singular and plural choices are rather low (less than five percent) in sentences 5 and 9, with responses showing a slight preference for the singular in sentence 5 and the exact opposite in sentence 9.

Diagram 4 shows AG4.en participants demonstrating a high tendency towards singular, staying consistent with the responses from AG1.en and AG3.en but differing from those of AG2.en. However, AG4.en shows

Diagram 3. Graph of responces to English survey: AG3.en.

lower gaps as well: sentences 5 and 7 responses have a nine percent gap, tipping them over to the singular preference, whereas sentences 8 and 9 responses have the same percent gap, tipping them to the plural.
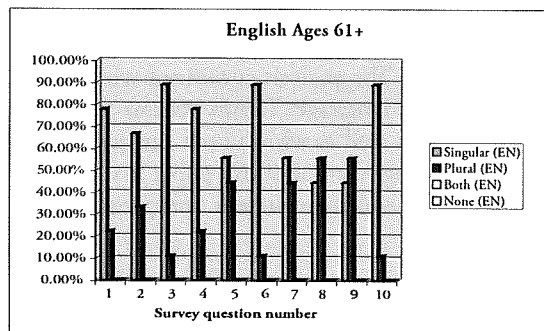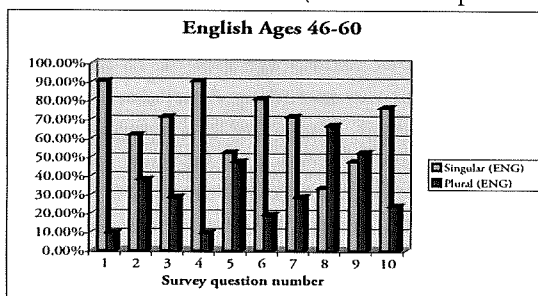

Diagram 4. Graph of responces to English survey: AG4.en.

These four diagrams suggest that the average English native speaker has a preference for identifying a singular verb with "one of" clauses. However, it is also evident that sentences 8 and 9 pose something different for the average English speaker. There, in all four speaking age groups, respondents favored the plural verb choice. This paper will discuss possible explanations for these trends in section 4.

Age Groups Among French-Speaking participants

The French survey consisted of the same sentences as those in the English survey. They maintained, when possible, the exact content and syntax changing only when necessary in order to observe grammatical rules. The French survey also differs slightly from the English in its showing the singular and plural form of a verb's past participle, since this must show agreement with the subject. In order to accomplish this, an "s" in parentheses follows the past participle form of the verb relating to the subject. (See Appendix I.)

As Diagram 5 illustrates, the responses of AG1.fr participants are rather similar to those of AG1.en participants in their high preference for the singular. In fact the AG1.
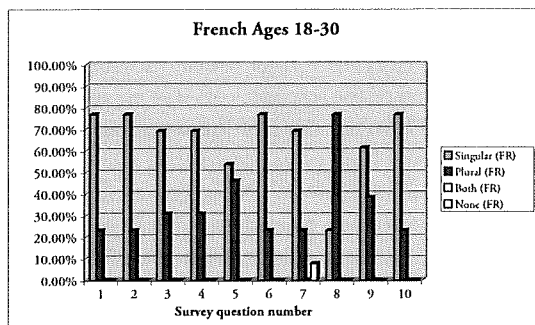

Diagram 5. Graph of responses to French survey: AG1.fr.

fr group has a higher overall tendency towards the singular than the plural, showing preference for the plural only in sentence 8. As in some of the English responses, the gaps between singular and plural choice are closest in sentences 5 and 9. However, these gaps, of eight percent and 23 percent respectively are not as close as those seen in the English responses.

Diagram 7 shows that while AG3.fr participants still prefer the singular in general, this group tends towards the plural in more cases than in the previous two age groups, adding in addition to sentences 5, 8, and 9, a plural preference to sentence 6.

This is different from AG3.en, where responses closely matched those of AG1.en participants, with a high tendency toward singular and barely any preference for plural.

Diagram 8 shows an interesting shift in singular/plural preference. Unlike the previous seven diagrams (including those of English respondents), AG4. fr participants show a very high preference for the plural, except in the cases of 50/50 splits (sentences 2, 4, 5, 10) and

Diagram 6. Graph of responses to French survey: AG2.fr.

sentence 3, where 100 percent of participants chose the singular. The graphs of the French age groups could be evidence of a change within the language, though no parallel shift appeared in the English graphs. This possibility will be discussed later in section 4 of this paper.
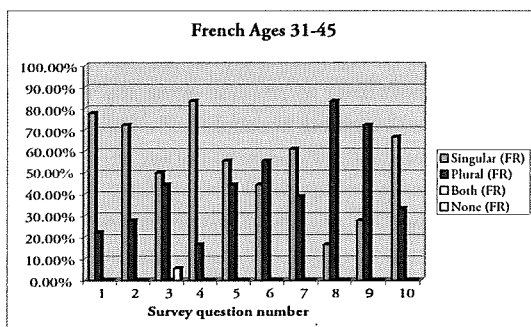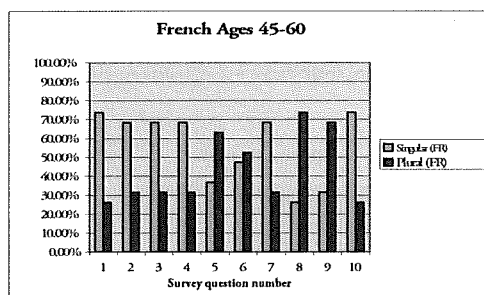

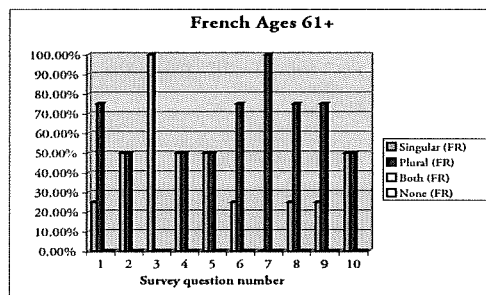**Diagram 7.** Graph of responses to French survey: AG3.fr. **Diagram 8.** Graph of responses to French survey: AG4.fr.

Age Groups Among German-Speaking Participants

Like the French survey, the German survey consisted of the same sentences as in the English survey, with the same content and syntax. However, in some sentences German speakers had to make a second choice to pick the best fitting relative pronoun. This is due to the fact that, in German, a relative pronoun reflects the gender of the antecedent (the noun it refers to or replaces) while assuming the case triggered by its grammatical role in the sub-clause.

Therefore, participants had to decide before arriving at the verb in a few cases, whether the subject phrase represented the single "one" or the plural noun (See Appendix B).
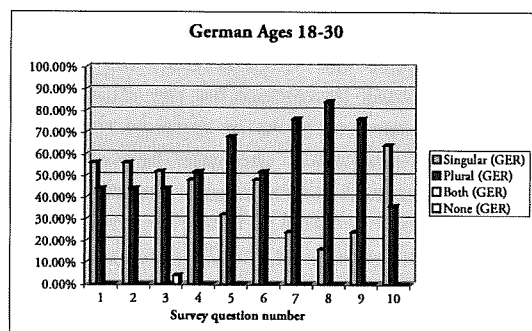

Diagram 9. Graph of responses to German survey: AG1.dt.

Diagram 9 illustrates a preference for the plural among participants in the AG1.dt--a large difference when compared to the responses of AG1.en and AG1. fr. However, three of the sentences that reflected high plural preference include sentences 5, 8, and 9. All sentences illustrated a preference toward the plural in certain previous age groups, with the addition of a high preference in sentence 7 and slight plural preferences in sentences 4 and 6.

The preference for plural soars in sentences 4 and 6 in AG2.dt as well as in sentences 7, 8, and 9, with only 12.5 percent of participants choosing the singular (though 12.5 percent of participants also left no response for sentence 8). A significant difference, however, between the responses for AG2.dt and AG1.dt, as well as some of the English and French AGs, can be seen in this graph. This difference is that the majority of respondents in AG2.dt chose the singular over the plural in sentence 5. The preference for plural in German survey responses increases dramatically when looking at the graph for AG3.dt. Every question has a large preference for the plural, except for sentence 10, where the opposite is true. The closest gap between plural and singular (27 percent) exists in sentences 1 and 6.

Diagram 12 continues to show participants' high preference for the plural in

Diagram 10. Graph of responses to German survey: AG2.dt.

AG4.dt as well. The highest gaps lie in sentences 4, 7, 8, and 9. However, as shown in the graph in this age group, some participants failed to complete questions 1 and 5. Sentences 2 and 3 also produced a 50/50 split, demonstrating neither a preference towards plural nor towards singular. However, as in nearly all the previous graphs (including those of other languages), responses for sentence 10 tended toward the singular.
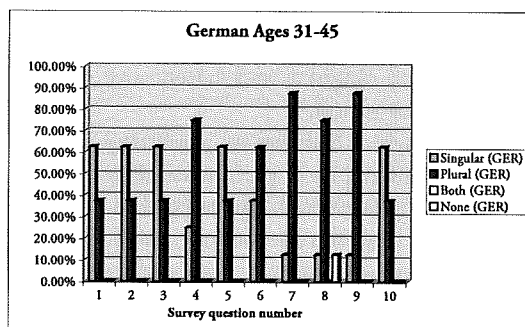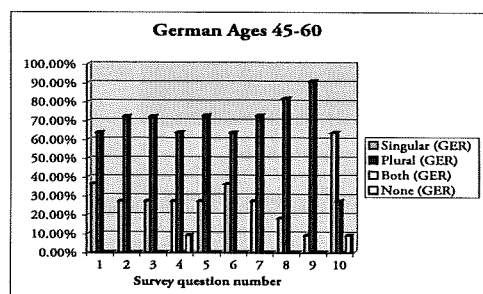

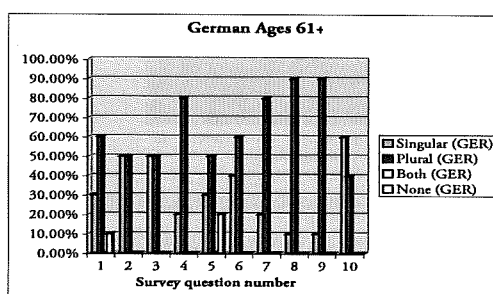**Diagram 11.** Graph of responses to German survey: AG3.dt.

Diagram 12. Graph of responses to German survey: AG3.dt.

Summary Of Trends

The graphs illustrate that a participant's preference for a singular or plural verb when relating it to a "one of" clause can depend on his or her age, as well as his or her native language. English and French responses are somewhat similar, both showing a general preference for the singular, whereas German responses show a marked preference for the plural in all age groups. In French and German, a preference for the plural appears to also depend on age: the older the age group, the higher the general preference for the plural. However, some trends are also evident across nearly all age groups and accross all three languages. These include (1) the preference for the plural in sentences 8 and 9, and (2) a preference for the singular in sentence 10, even among German speakers who demonstrated a large preference for the plural. Why do German speakers tend to view a "one of" clause as triggering plural, while English and French tend to do the opposite? What role does age play in this choice? Why do some sentences tend to manipulate a plural or singular response, whereas others do not?

4. Possible Representations

Syntax and Semantics

Some answers to these questions may lie in the respective syntax and semantics of the individual sentences. Take sentences 8 and 9, for example:

> 8. She often forgets to pay at least one of her many bills that is/are due in December.
> 9. This morning, I broke one of the few precious cups that has/have belonged to our family for generations.

Why would English and French speakers feel that the plural verb fit better in these two instances, whereas they tended towards the singular in other sentences, such as 2 and 3?

> 2. Look, there's one of the trees that was/were uprooted by the storm.
> 3. One of the firemen, who was/were overcome by smoke inhalation, was my uncle.

The researcher posed these questions to linguists at the University of Wisconsin-Eau Claire: Drs. Marcela Depiante, Maria Cirizia Lope, and Lynsey Wolter. The linguists suggested possible reasons for such occurrences, one being semantics, in regards to detail or language specificity. Sentences 8 and 9 are similar to sentences 2 and 3 in that they both include a "one of" clause followed by a relative pronoun; however, they are semantically different. Sentences 8 and 9 include modifiers in their subject phrase, whereas sentences 2 and 3 do not. Sentences 2 and 3 are simple "one of" clauses, consisting of nothing but the words "one of" and a plural noun.

Sentence 8 further modifies its subject "one of her bills" with the word "many," and it also specifies the meaning of the sentence even outside of the subject phrase with the words "at least." This detail could lead readers to interpret a certain meaning more so than in the simple sentence "She often forgets to pay one of her bills that is/are due in December." Since she forgets to pay "at least" one of her "many" bills, readers may envision a plural idea of the subject phrase. The same could be true for sentence 9.

Sentence 9 modifies the subject phrase "one of the cups" with the adjectives "few precious." With these words, readers can better visualize those cups that are still intact, as well as the broken cup: all are precious, and there are few of them. These words could dispose readers to see a group of these "few precious" cups more clearly than the one broken cup. This would induce readers to view the relative pronoun as plural, therefore letting them gravitate towards the plural auxiliary "have" over the singular "has." One must wonder whether or not the same

results would come about if the sentence read: "This morning I broke one of the cups that has/have belonged to our family for generations."

Marcel den Dikken also discusses this possible impact of modifiers on agreement in his paper " 'Pluringulars', Pronouns and Quirky Agreement." His examples, however, fail to include "one of" clauses, but rather explore the role of each/every phrases in sentences with the structure of "all of" statements. A person's mind most likely views the "all of" structure as similar to the "one of" structure, just as it does the structure "each of" and "every one of" (Cirizia Lope, Depiante, Wolter). One of Dikken's examples of "quirky agreement" includes the clause: "Unless every one of you want to be sent down to the principal's office." He references both Reid (1991) and Chung (1998), stating that "due to an each/every phrase's semantic plural, a speaker or reader can lean toward plural verb agreement, regardless of the content of the noun phrase" (p. 25-26). extending den Dikken's argument, one can argue that certain modifiers in "one of" clauses act as each/every type quantifiers, and as such they also seem to trigger plural agreement.

Proximity and Content

Semantics in regards to specificity, however may not supply the only reason behind a reader's choice. Proximity may also play a role, as could content.

The proximity hypothesis arrises from the fact that multiple content sentences employ modifiers such as "few," but not all trigger a plural response. Compare sentences 6, 9, and 10:

6. My brother is one of the few players on the soccer team who is/are going to play the entire game.
9. This morning, I broke one of the few precious cups that has/have belonged to our family for generations.
10. Julia is one of my few friends who wakes/wake up at 6am every morning to do Yoga.

Sentence 9 triggered mostly plural responses, whereas participants of every age group and language consistently responded to sentence 10 with the singular. Responses for the verb choice in sentence 6, however, showed a preference for the singular; within certain age groups or within certain languages, the plural tended to be preferred. Though these sentences all use the quantifier "few" to modify the subject clauses, not all elicited the same results. For sentence 9 this could again have to do with the additional modifier "precious." It could, however, also have to do with proximity. The "one of" structure of the subject clause is located farther away from the verb in sentence 6 than in sentences 9 and 10. In the latter two sentences, the "one of" clause immediately precedes the relative pronoun followed by the verb choice. Perhaps the fact that the singular "one" is physically distanced from the verb has an impact on a speaker's choice. The participants may have evaluateed the sentence differently from sentences 9 and 10. Even more than proximity, the semantics of the sentence in regard to content probably play a large role in triggering certain responses.

The fact that sentence 10 begins with the words "Julia is" could be the driving factor that explains why so many participants chose the singular to best fit this case. They could have seen Julia as the subject, rather than the "one of" clause. However, the singular vs. plural verb choice makes a difference in meaning in this case. The singular choice rationale could run thus: the author of the sentence has few friends, as in, not many. Julia is one of this small circle of friends and she alone wakes up every morning to do Yoga. The plural choice rationale could run thus: the author of the sentence may have a lot of friends, not just a few. Julia is part of a group of friends who all wake up in the morning to do Yoga. Why does the modifier "few" seem to

negate a plural impact on this sentence? Does the content outweigh the role of "few"? Unfortunately, answers to all of these questions and those posed previously cannot be derived from this survey alone. Further research needs to be conducted before hard conclusions can be drawn.

5. Consequences

The data from this study suggest that a sentence's specific constillation of syntax, semantics, proximity, and content cause a participant to choose either singular or plural. However, in order to substantiate this conclusion, more studies must take place. These studies would determine if age or native language/culture determine one's verb choice. Next steps include isolating each possible cause, creating surveys pertaining to each aspect, and determining a way to understand participants' interpretation of a sentence. Since "quirky" verb agreement can occur outside of sentences containing "one of" clauses, relative pronouns and such, the surveys should also include verb choices in other instances to determine if an individual participant is prone to making "fuzzy" or "quirky" agreements or if this only occurs in sentences containing "one of" clauses.

Sentence pairs could test multiple causes for "fuzzy" agreement including--

(1) "One of" agreement with a relative clause compared to simple "one of" subject-verb agreement:

      1.   a. It's one of the themes that run/runs through the novel.
              b. One of the themes run/runs through the novel.

      2.   a. There's one of the cats that always walks/walk through the backyard.
              b. One of the cats walks/walk through the backyard.

(2) The role of modifiers:

      1.   a. It's one of the themes that run/runs through the novel.
              b. It's one of the many themes that run/runs through the novel.

      2.   a. There's one of the cats that walks/walk through the backyard.
              b. There's one of the few cats that walks/walk through the backyard.

(3) The impact of proximity:

      3.   a. It's one of the themes that run/runs through the novel.
              b. It's one of the themes in Shauna Singh Baldwin's The Tiger Claw that run/runs through the entire book.

      4.   a. There's one of the cats that walks/walk through the yard.
              b. There's one of the cats from the back alleyway that walks/walk through the yard.

Other trends, including the role that age plays on one's choice of singular or plural could not be determined through sentence pairs, but rather by participant selection and assignment within study groups. The subsequent studies' survey distribution would proceed in the same manner. Personal administration of the surveys would accomplish the control of time,

the ages of participants, and the reliability of participants making decisions based on their feelings rather than on grammatical correctness. Such multiple follow-up studies could also better highlight differences among the languages: do German speakers prefer the plural after all, or does this apparent preference result from the syntax or semantics of the sentence? What causes English speakers' and their obvious preference for singular? Since age appeared a determining factor for French speakers' verb choice, subsequent studies could also verify the significance of this factor, or reveal whether verb choice had more to do with the structure of the sentences.

6. Conclusion

This project resists hard conclusions, though it did nonetheless demonstrate that "fuzzy" agreement occurs in all ages and in multiple languages. Some possibilities suggested here include English speakers' preference for singular and German speakers' preference for plural. The French survey results suggest the possibility that a language change is occurring. Project data do not allow one to draw conclusions about how language influences thinking, but data do suggest that language does impact thinking, though the inverse is often thought to be true.

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Appendix A. *FRANÇAIS SURVEY*

Age: _____   Sexe: F M
Profession:_____ Langue natale: _____
Nationalité:_____ D'autre connaissance des langues: _____

S'il vous plait, encerclez le verb souligné qui, à votre avis, convient le mieux:

1. Pour son anniversaire, j'ai offert à ma soeur un de vins rouges préférés qui est/sont produit(s) en Italie.

2. Regarde, voici un des arbres qui a/ont été déracinée(s) par la tempête.

3. Un des pompiers qui a/ont été asphyxié(s) était mon oncle.

4. Je connais un des serveurs qui a/ont travaillé dans ce restaurant hier soir.

5. Il trouve que c'est un des thèmes les plus importants qui est/sont abordé(s) dans le roman.

6. Mon frère est un des quelques joueurs dans l'équipe de football qui va/vont jouer pendant tout le match.

7. Un des trois chats appartenant à mes voisins qui traverse/traversent souvent le jardin, est très méchant.

8. Elle oublie souvent de payer un de ses multiples factures qui est/sont due(s) en décembre.

9. Ce matin, j'ai cassé une des tasses précieuses qui appartient/appartiennent à notre famille depuis des générations.

10. Julia est une de mes quelques amies qui se lève/lèvent tous les jours vers six heures pour faire du yoga.

Appendix B. DEUTSCH SURVEY

Alter: _____   Geschlecht: M W
Beruf: _____ Muttersprache: _____
Nationalität: _____ Andere Sprachkenntnisse: _____

Kreisen Sie bitte das unterstrichene Verb und/oder Relativepronomen ein, das
    Ihrer Meinung nach am besten passt:

1. Zum Geburtstag habe ich meiner Schwester einen ihrer Lieblingsrotweine,
    der/die aus Italien kommt/kommen.

2. Guck mal, hier ist einer der Bäume, der/die vom Sturm entwurzelt
    wurde/wurden.

3. Einer der Feuerwehrmänner, der/die einer Rauchvergiftung erlag/erlagen
    war meinen Onkel.

4. Ich kenne einen der Kellner, der/die gestern Abend in diesem Restaurant
    gearbeitet hat/haben.

5. Er hält dies für eines der wichtigsten Themen, das/die den Roman
    durchzieht/durchziehen.

6. Mein Bruder ist einer der wenigen Spieler, der/die das ganze Fußballspiel
    spielt/spielen.

7. Eine der drei Katzen der Nachbarn, die immer durch den Garten
    schleicht/schleichen ist sehr böse.

8. Oft vergisst sie zumindest eine ihrer Rechnungen zu bezahlen, die im
    Dezember fällig ist/sind.

9. Heute Morgen habe ich eine der kostbaren Tassen zerbrochen, die seit
    Generationen unsrer Familie gehört/gehören.

10. Julia ist eine meiner wenigen Freundinnen, die jeden Morgen um 6 Uhr
    aufsteht/aufstehen um Yoga zu machen.

Herbaceous Vegetation Response to Holocene Climate Dynamics in South-Central Minnesota

by
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Faculty Mentor: Kristina R. Beuning[1], Ph.D.

Abstract

This study examined the carbon isotopic composition of charred grass (Poaceae) cuticle preserved in Holocene deposits within Kimble Pond and Sharkey Lake in south-central Minnesota. Kimble Pond and Sharkey Lake exist in a critical location along the current prairie-forest ecotone. As such, pollen macrofossils and charred vegetation epidermis preserved in the sediments of these lakes provide outstanding records of the hypothesis regarding changes in grass community composition associated with climatically driven longitudinal shifts in this boundary throughout the Holocene. Preliminary results indicate a mixed C_3/C_4 grass community from 10000 y BP to present with bulk $\delta^{13}C$ values ranging from −17 ‰ to −24 ‰. These carbon isotopic shifts closely mirror changes in total charcoal influx to the community composition or reflect differential flammability of grass species biomass, with C_3 species only burning extensively during periods of increased fire intensity. Data integrity analysis demonstrating that data represents grasses proves to have very low R^2 values, presenting little bias. Ongoing work seeks to clarify the cause of our observed Holocene shifts in charred grass carbon isotopic composition in these lakes.

Introduction

Vegetation changes in the north-central United States can be linked to several factors including climate, environmental change, and fire. Vegetation in this area has been fluctuating between woody types and more herbaceous types throughout the Holocene, as demonstrated by Webb III *et al.*, (1993). These fluctuations are the result of moisture availability, specifically the precipitation to evaporation ratio (P:E). When there is more evaporation than precipitation there is not enough moisture to support woody vegetation and, therefore, prairie grasses and forbs dominate. When there is more precipitation than evaporation, woody vegetation quickly takes over and the area becomes tree dominated. However, if there are equal parts precipitation and evaporation, then a prairie-forest ecotone forms. Such ecotones exist in several states of the north-central United States where there are equal ratios of precipitation and evaporation (Fritz *et al.*, 1991).

An example, and well studied site, is south-central Minnesota where the tall-grass prairie dominating the western half of the state turns into woody vegetation (Figure 1). Studies of this site have yielded vegetation community composition information referencing the past ~12,000 years. Throughout the Holocene, the main driver of vegetation composition change in this area has been the transformation of woody vegetation to more herbaceous vegetation during the mid-Holocene

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(MH; ~8000-4000 cal yr BP) (Clark *et al.*, 2001). Such a change is thought to be the result of drier and more arid conditions due to cooler and drier Pacific air (Denniston *et al.*, 1999). Then, during the late-Holocene, ~600-700 cal yr BP, as moisture slowly returned to the area, the vegetation transformed into the 'bigwoods' forest that exists there today (Umbanhowar *et al.*, 2006).
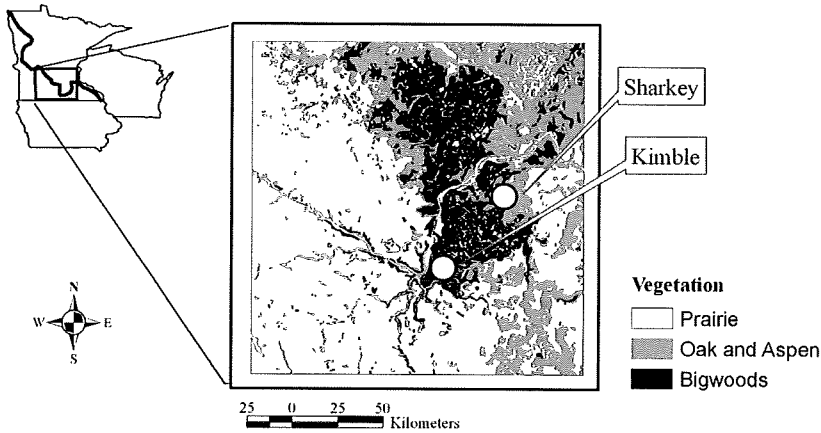

Figure 1. Map of vegetation cover of south-central Minnesota with Sharkey Lake and Kimble Pond.

These vegetation community composition changes have been one of the main themes in studies regarding the Holocene in the prairie-forest ecotone of Minnesota (Clark *et al.*, 2001; Camill *et al.*, 2003; Nelson *et al.*, 2004; Umbanhowar, 2004 and others). Temperature and environment can influence what type of plants survive where this is due to the respiration mechanism the plants possess. The most common photosynthetic pathways are called C_3 and C_4 and therefore those plants that use these pathways are called C_3 or C_4 plants. C_3 plants are mostly trees, forbs and some grasses. These plants prefer cooler and moister climates (Clark *et al.*, 2001). On the other hand, C_4 plants, primarily grasses and some sedges, have a competitive advantage in drier and warmer climates due to their more efficient way of trapping water and their ability to store CO_2 in their bundle sheath cells (Sage, 2004). Because of their different mechanisms of CO_2 utilization, C_3 and C_4 plants differ in their carbon isotopic signatures. C_3 plants have $\delta^{13}C$ values between -31‰ and -23‰, whereas C_4 plants have $\delta^{13}C$ values between -16‰ and -10‰ (Clark *et al.*, 2001). As a result, by looking at the carbon isotopic signatures of fossil charred epidermis, one can predict what kind of climate shifts may have occurred through time, in this case the Holocene.

Charred epidermis is the result of fires, and because fire is such an important part of prairie and savanna maintenance, several studies have explored the influence of fire on vegetation community composition (Clark *et al.*, 2001; Camill *et al.*, 2003; Nelson *et al.*, 2006). For the most part, researchers believe that fire is not the cause of vegetation shifts, but rather that the vegetation changes themselves influence fire frequency and intensity (Camill et al., 2003).

Our study analyzes charred epidermal microfossils and grass pollen (Poaceae) from cores taken at two lakes, Kimble Pond and Sharkey Lake, located in Minnesota's prairie-forest ecotone. To determine an approximate lake level, we examined the pollen abundance of two *Typha* species from Sharkey Lake, *Typha angustifolia* and *Typha latifolia*. We expected lake levels to decrease during arid climates and increase during moisture climate. After determining climate changes, we can examined vegetation changes.

These vegetation shifts have been explained as reactions to moisture availability (Nelson*et al.*, 2004), supported by our data. Nelson *et al.* (2004) gives several statements about how drought

and aridity can modify the herbaceous vegetation composition from either C_3 to C_4, if it gets too dry, or from C_4 to C_3, if moisture increases. What Nelson's sources did not explain was what kind of herbaceous vegetation--C_3 grasses, C_4 grasses, C_3 forbs, or mixtures of any kind--would be expected to occur. Our study aims to establish what kind of C_3 vegetation occurred at which Holocene interval, and explain why.

Site and Core Description

Both Kimble Pond and Sharkey Lake are located in south-central Minnesota, USA (Figure 1). Kimble Pond (44°13'15" N, 93°50'24" W), with an area of 4.9 ha and a depth of 16 meters, lies west of the prairie-forest ecotone and is surrounded by mostly oak woodlands and big woods taxa such as elm (*Ulmus*), basswood (*Tilia*), and sugar maples (*Acer*) (Camill *et al.*, 2003). Sharkey Lake (44°35'39" N, 93°24'49" W), with an area of 28 ha and a depth of 15 meters in its southern east pool, is located in the prairie-forest ecotone and is made up of two pools. Surrounded by mostly oak woodlands and hills, Sharkey Lake is more heterogeneous than Kimble Pond because it encompasses a larger area containing shallow water—the northern pool—that eventually slopes down into a deeper pool (Figure 2).

Retrieval of sediment cores as well as the pollen data is explained in Camill *et al.* (2003). Calibrated dates were done using CALIB v. 4.3 (Stuiver *et al.*, 1998).

Methods

1cc of sediment taken at ~ 300 yr resolutions for Kimble Pond and ~200 yr resolutions for Sharkey Lake were used. Samples from Kimble Pond were submerged in a hot KOH bath to disaggregate the contents and make extraction of the charred epidermis easier. They were then filtered with a 150-µm filter. Sharkey Lake samples were sieved with a 180-µm filter. Charred grass epidermal pieces were identified and removed by tweezer. Identification of charred grass epidermis was done using a light microscope based on morphology of the charred pieces. Typical charred grass epidermis possesses long cells, stomata and guard cells, as well as other characteristics as described in Beuning *et al.*, (2003). The samples were pipeted into 5x9 mm tin cups (Cosech #041061) and dried for a minimum of four hours at 60 °Celsius. Carbon isotope analyses were completed at the Center for Stable Isotope Biogeochemistry at the University of California, Berkeley, CA, USA with an average analytical error of ±0.2‰.

Pollen data was collected and analyzed as explained in Umbanhowar *et al.* (2006).

Results
Data Integrity

Prior work has demonstrated that the process of burning does not shift the $\delta^{13}C$ of epidermal fragment as compared to the parent plant (Beuning & Scott, 2002). Conversely, a subsequent study demonstrated that, in fact, differences did exist between parent plant $\delta^{13}C$ and charred $\delta^{13}C$ (Krull *et al.*, 2003). Those results, however, were achieved in the lab and do not necessarily demonstrate real world situations. Since then, another follow-up study by Nelson, Hu, & Michener (2006), has maintained that burned C_3 and C_4 plants do indeed have similar $\delta^{13}C$ values as their parent plants. As a result, previous studies have utilized the carbon isotopic value of charcoal to reconstruct past vegetation (Clark *et al.*, 2001; Beuning & Scott, 2002; Nelson *et al.*, 2004). In this study, several analyses were used to further test the integrity of the carbon isotopicvalue of charred epidermis as a record of surrounding vegetation.

Based on our analyses, we conclude there was no relationship between percentage of Poaceae pollen and C_3 or C_4 values, which is demonstrated by a low R^2 value (~ 0.025) of both lakes (Figure 3). This lack of correlation proves that during the Holocene, there were equal amounts of

C_3 and C_4 vegetation. There was also no correlation between charcoal influx and C_3 or C_4 ($R^2 = \sim 0.12$) (Figure 3), proving that C_3 plants demonstrated no greater flammability than C_4 plants. No bias existed towards either vegetation type. Lastly, to show that a respectively greater biomass of either C_3 or C_4 plants did not bias the data, there was a low R^2 value; this demonstrates that the bulk $\delta^{13}C$ carbon of charred epidermis is not correlated with the total amount of that charcoal in the core sediment (Figure 4).

These tests support the view that the changes in $\delta^{13}C$ values reflect actual changes in the relative abundance of C_3 and of C_4 grasses on the landscape. We also feel confident that fragments identified do not include arboreal charcoal. Therefore, any future mention of C_3 and C_4 plants assumes that these are grasses and not forbs.
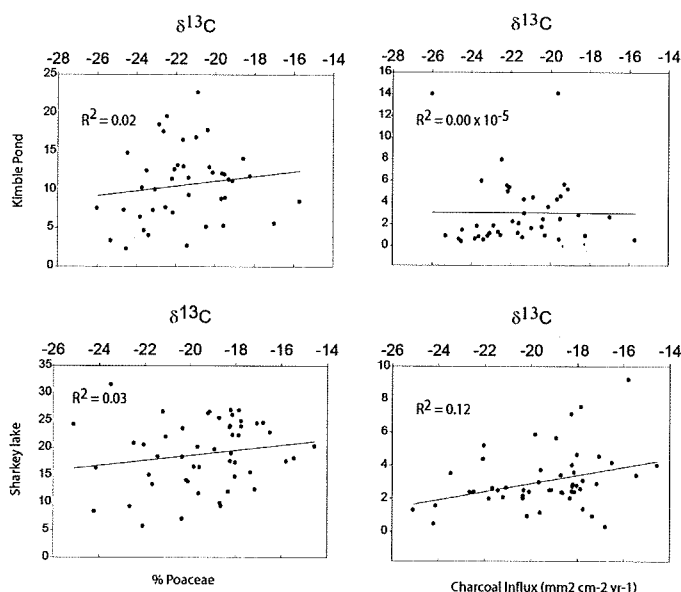
Figure 3. Data integrity cross-plots with comparisons of % Poaceae pollen and charcoal influx to $\delta^{13}C$ values for Sharkey Lake and Kimble Pond show very low R^2 values. Plots with % Poaceae demonstrate that the abundance of biomass on the landscape is not the result of either more C_3 or C_4 vegetation. Plots with charcoal influx show that flammability of C_3 vegetation is no greater than that of C_4.

The $\delta^{13}C$ Record

Charred epidermis is well preserved in the Sharkey Lake and Kimble Pond sediments. In Kimble Pond, this record extends back to 12 ka. In Sharkey Lake, however, sediment samples older than 8 ka contained insufficient charcoal for isotopic analysis. These $\delta^{13}C$ records indicate that, during the last 8000 years, a mix of C_3 and C_4 grasses grew around Kimble Pond and Sharkey Lake, MN (Figure 5). In Kimble Pond $\delta^{13}C$ values of charred epidermis ranged from -26‰ to -15.7‰, with a mean of -21.5‰, whereas the charred epidermis in Sharkey Lake ranged from -25.1‰ to -14.5‰, with a mean of -19.4‰. An explanation for Sharkey's lower mean could be related toits higher numbers of extreme fluctuations, whereas Kimble Pond did not have as many extreme fluctuations (Figure 5). Another possible explanation for this could be that Sharkey Lake has a larger watershed, 59 ha, than Kimble Pond, 17.8 ha (Umbanhowar *et al.*, 2006). The larger watershed might encourage an increased amount of shallow-water vegetation species, especially in

Sharkey Lake's shallow pool, or an increased probability for microhabitat favorable to C_4 vegetation. The overall $\delta^{13}C$ records preserved in these two lakes are quite similar. However, Sharkey Lake demonstrates higher sensitivity to fluctuations in surrounding vegetation composition than Kimble Pond, possibly because of its larger size and source area for small airborne particulates.
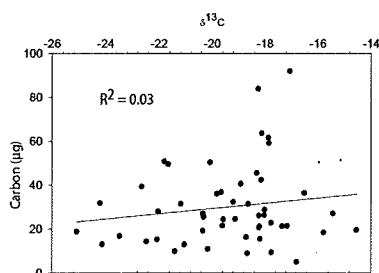

Figure 4. Low R^2 value between amount of carbon in samples and $\delta^{13}C$ show that selected charred epidermis does not influence the bulk $\delta^{13}C$ value of the sample.
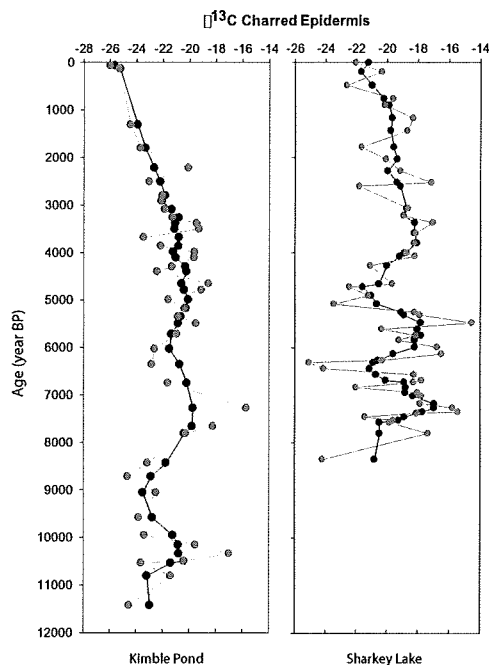
Figure 5. Data obtained from charred epidermis found in soil samples of Kimble Pond and Sharkey Lake. Five-point running mean also in place to show the general trend of the original data.

During the early-Holocene, ~8000 to 12000 cal yr BP, Kimble Pond tended toward having an increased surrounding C_3 vegetation composition, which was inferred from carbon isotopic analysis. One exception occurred around 10300 yr BP, at which time the data switched over to predominantly C_4 vegetation. This switch lasted for only about 400 years, but is important to note since Kimble Pond, for the most part, showed much less extreme fluctuations than Sharkey Lake.

The wide swings in $\delta^{13}C$ of charred epidermis during the mid-Holocene indicate a period of instability in regional vegetation cover, probably in response to short-term climatic fluctuations. During this interval, $\delta^{13}C$ values in Sharkey Lake fluctuate between -25‰ and -14.5‰, whereas in Kimble, more muted changes, between –22.8‰ and -15.7‰, occur. Intervals with relatively increased C_3, vegetation occur from 6800 to 6200 cal yr BP in both lakes. A pronounced peak towards more C_4 from 6200-5200 cal yr BP, is evident in Sharkey, but not Kimble.

During the late-Holocene (~4000 yr BP to present), both records indicate a gradual, but consistent, trend towards increasing C_3 dominance in the biomass of herbaceous vegetation. The modern sample in Kimble Pond contains a $\delta^{13}C$ value of -26‰ indicating minimal C_4 vegetation near the lake today, as is consistent with modern vegetation; this includes grasses dominated by Bromus, Phleum, and Phalaris.

A noticeable difference between Sharkey Lake and Kimble Pond during the late-Holocene is that Sharkey Lake continues to express periodical fluctuations, whereas Kimble Pond makes a consistent and steady shift towards a C_3 dominated landscape, a trend especially demonstrated by the five point running mean. Kimble Pond's modern vegetation $\delta^{13}C$ value of -26‰ is also lower than Sharkey Lake at -22‰.

Discussion
Mid Holocene Warm Period

A particularly arid and warm episode of the Holocene, known as the mid-Holocene warm period, ~8000-4000 cal yr BP, should have produced $\delta^{13}C$ shifts toward C_4 grasses. The MH mean $\delta^{13}C$ values are −20.3 ‰ and −19.9 ‰ for Kimble Pond and Sharkey Lake, respectively. During the early-Holocene, mean $\delta^{13}C$ values were -24‰ and −24.2‰ for Kimble Pond and Sharkey Lake, respectively. During the MH, the peak C_4 vegetation type does not occur until ~7500 yr BP.

In Sharkey Lake, during the MH, rapid fluctuations between C_3 and C_4 grasses took place (Figure 1). While Kimble Pond shows a few shallow fluctuations with a total change of ~7‰, Sharkey Lake has several abrupt fluctuations with a total change of ~11‰. The forces driving these fluctuations are unknown, but are likely related to broader environmental changes such as seasonality of rainfall or local factors such as hydrology of the lake basin. Local controls on vegetation composition--such as farming, anthropogenic burning, and grazing by large animals--may have also played a role.

MH fluctuations in $\delta^{13}C$ values of charred epidermis also closely match the relative abundance of *Typha angustifolia* surrounding Sharkey Lake (Figure 6). *Typha latifolia* prefers shallow water, less than 50 cm deep, while *T. angustifolia* has a competitive edge in waters deeper than 50 cm (Grace & Wetzel, 1981). *T. latifolia* tends to have larger leaf surface area while *T. angustifolia* tends to express thin and tall leaves. These characteristics provide *T. angustifolia* an advantage for living in deeper waters. When *T. angustifolia* increases, surrounding herbaceous vegetation has a greater C_4 component. At first glance, this correlation would suggest that *T. angustifolia* increases in abundance with increasing aridity, as C_4 plants dominate in drier environments. However, *T. angustifolia* is a superior competitor in deep water environments (> 50 cm). We attribute these results to a change in seasonality of precipitation within this interval. Clearly, periods of high *T. angustifolia* requires a positive P:E ratio that keeps water within the lake basin. If that moisture falls during the summer, and not spring, C_4 grasses would expect to benefit. Drought in spring causes the cool-season C_3 grasses to suffer and hence decline in relative abundance. However, more wetland habitats may trigger increased C_4 sedges and could supply the cause for these increased $C_4 \delta^{13}C$ values. Since we are looking at charred epidermis, these waterside sedges would have had to have burned to produce such $\delta^{13}C$ values. Assuming they did burn, we would then also have to assume that *Typha* species, which also grow on water edges, burned as well; this would decrease the amount of C_4. Since that is not the case, we rule out any C_4 sedges or other waterside vegetation contributing to the data (Figure 7).

Late Holocene

Annual moisture availability increased around 5000 yrs BP to signal the transition from the MH to the late-Holocene period. General climatic conditions of late-Holocene are thoughtto be cooler and moisture than the middle or early-Holocene (Lynch *et al.*, 2006). Nelson *et al.* (2004) propose that the late-Holocene is more favorable to a tall grass prairie, a conclusion supported by our data. One point of discussion regards whether changes to $\delta^{13}C$ values happen gradually or shift abruptly. We see, in both lakes, a gradual and consistent shift from mostly C_4, starting at the end of the MH, into a more C_3 dominated vegetation composition, one which continues to the present. During the MH, the average $\delta^{13}C$ value was −20.3 ‰ for Kimble Pond and −19.9‰ for Sharkey Lake. In the late-Holocene, the average value was −24.2‰ and −19.6‰, respectively.

Currently, Kimble Pond is predominantly C_3 while Sharkey Lake remains a mix of C_3 and C_4 vegetation. This is expected given the heterogeneity of Sharkey Lake's surrounding vegetation community types pertaining to topography.
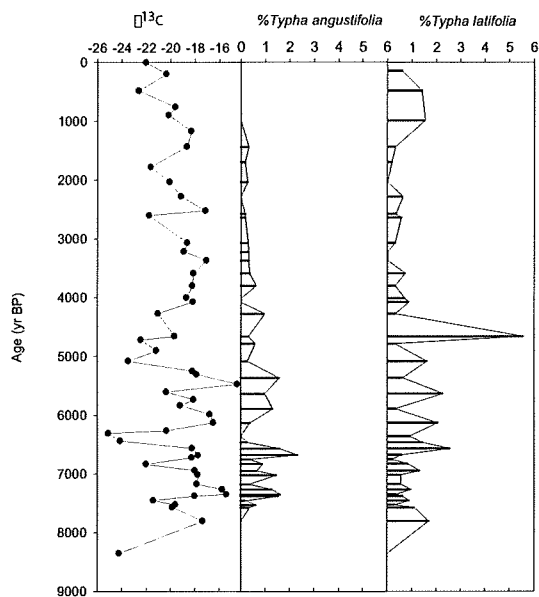

Figure 6. $\delta^{13}C$ values from Sharkey Lake compared to two Typha species shows evidence that the relationship is due to periodic changes in seasonality of precipitation within this particular time interval. Decreased moisture during summer, but not spring, would bring about an increase in C_4 plants. Source of pollen data was from Umbanhowar *et al.*, 2006.

Figure 7. Picture of Sharkey Lake showing modern surrounding vegetation types, courtesy of Charles Umbanhowar, Jr.

Conclusion

In summary, moisture availability has the capability to influence movements of vegetation community and has done so during the Holocene. The prairie-forest ecotone of south-central Minnesota experienced this vegetation migration at the prairie-forest ecotone. Data gathered at Kimble Pond and Sharkey Lake supported earlier assertions of grass-dominated vegetation

composition.   Carbon isotopic signatures of charred epidermis revealed a fairly mixed C_3 and C_4 vegetation, with Sharkey Lake showing more rapid fluctuations than Kimble Pond.   Such fluctuations were thought to be the result of increased heterogeneity of the lake's environment in regards to landscape. During the early-Holocene, $\delta^{13}C$ values ranged closer to C_3 and during the MH, they shifted to more C_4; with the start of the late-Holocene, however, $\delta^{13}C$ values steadily shifted back to C_3. Seasonality of rain and P:E are thought to cause these shifts and would have played an important role in maintaining certain vegetation, including grass types, in this region. Further work and examination would likely clarify what kind of C_3 or C_4 vegetation was able to dominate in the varying moisture levels.

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Photometry of Four Asteroids

by
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In 2007 and 2008 we observed four asteroids, 2167 Erin, 1084 Tamariwa, 2660 Wasserman, and 17010 1999 CQ72. Data were taken with R and V filters. We used images of Landolt standard fields to find first order extinction coefficients, transform values, and nightly zero points. These values were used to put several stars in the asteroid field onto the standard photometric scale. These comparison stars were then used as secondary standards to establish the V and R magnitudes of the asteroid. When combined with data from Montigiani *et al.* (2008) our data showed the period of 2167 Erin to be 5.72 hours. Data for 1084 Tamariwa has been used to confirm an uncertain period of 6.22 hours published earlier by K. Iverson *et al.* (2004).

1. Introduction

There are over ten thousand asteroids with well catalogued orbits, whereas only a few hundred have well known rotational characteristics. Properties such as rotational periods, spin axes, and shapes can be determined from photometric measurements--that is, measurements of the apparent brightness of asteroids.

2. Basic Photometry

A light curve is a plot of brightness versus time. This brightness is an intensity measurement, I, made with instrumentation that will be described later. The equation

$$(1) \qquad M = -2.5 \log_{10} \frac{I}{I_0}$$

is used to put the intensity measurement onto the astronomical magnitude scale. Magnitude is an inverted logarithmic scale: brighter objects have a lower numerical value than dimmer objects. For example, the star Sirius has a magnitude of -1.4, while our asteroids, which are significantly dimmer, have a magnitude of about 14.

Asteroids are usually oblong in shape. When the narrow side faces the observer, the amount of light reflected will be relatively small, and we observe a minimum in brightness; when the broad side faces the observer, we see a maximum. Because asteroids are typically oblong there will be two bright maxima and two dim minima in each rotation. We can see this very well in Figure 1. The period of an asteroid is found by "folding" the light curve, or finding the times where the standard double-humped pattern repeats.

Raw intensity measurements contain many layers of unwanted signals. These signals include amplifier noise and thermal noise from our instrumentation, atmospheric effects, which dim the object, and sky background. These layers have to be removed from the raw data before true brightnesses can be determined.

H.L. Johnson and W.W. Morgan created a standardized system of magnitudes in specific wavelength bands. Their system was later modified in the lower wavelength bands by A.W.J. Cousins (Warner, 2006). This standardized system allows observers to meaningfully compare data taken with different instruments and at different times and places.
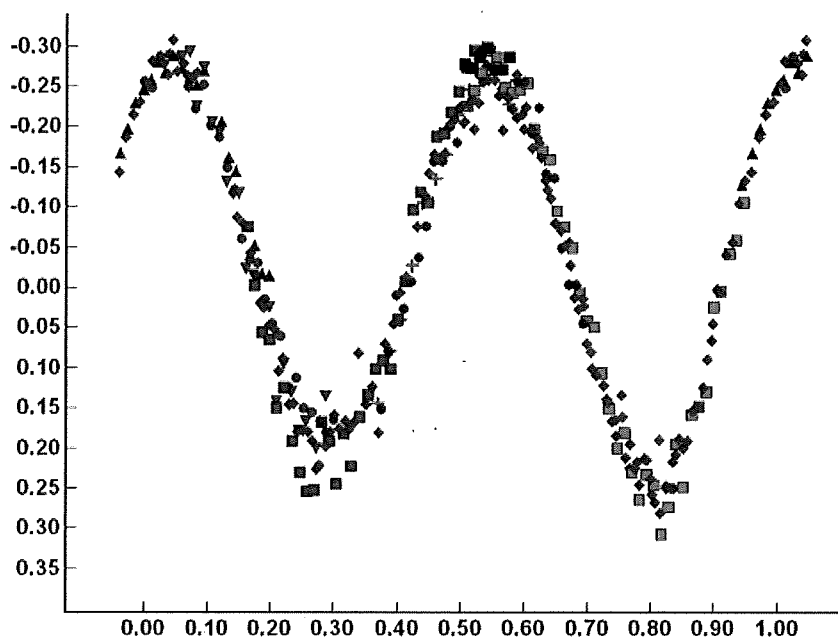

Figure 1—an example of a folded light curve of asteroid 2167 Erin. The vertical axis is non-standardized magnitude and the horizontal axis is the phase. One period is denoted by 0 through 1 and its actual time is 5.7186 hours (Montigiani *et al.* 2008).

3. Method

Our data were taken at Hobbs Observatory near Fall Creek, Wisconsin, with a 24" Newtonian reflector. The images were obtained using an Apogee Alta U-55 CCD camera. A CCD is a charge coupled semiconductor device which collects light striking its surface in a way similar to that of a standard digital camera. The CCD's surface is subdivided into photosites, or pixels. Photons, discreet amounts of light, strike the pixels, exciting electrons to jump into higher energy states. These electrons are later counted by circuitry located within the camera. This data is then sent to a computer and reconstructed into an image. The more electrons that are detected in a pixel means that the pixel was hit by more light. To put these images onto the Johnson-Cousins standard system, we used a specific set of filters placed in the optical path.

The Johnson-Cousins system, an older technology used for light detection, was originally defined by a set of filters matched to specific photomultiplier tubes. Because the CCD cameras in use today are more sensitive in the V and R bands, we used Bessel filters, which, when combined with a CCD camera, give similar sensitivity profiles to the Johnson-Cousins passbands. However the match is not perfect. To counter the mismatch and other variables that alter the raw intensity, supporting images--called darks and flats--and images of Landolt standard stars are taken along with the raw data.

Dark images are supporting images used to remove both the thermal noise that accumulates while the CCD is active and also the amplifier noise. These are exposures of the same length as all data images; however, they are taken with the shutter of the camera closed.

Flat images are another set of supporting images used to account for varying pixel sensitivity. The images are taken using an artificially lit screen placed in front of the telescope which creates a uniform illumination. These images are used to map the pixel sensitivity over the entire CCD chip.

Landolt stars have been carefully measured using the Johnsons-Cousins standard magnitude system. It should be noted that Landolt stars are not variable. These stars are used to find atmospheric extinction coefficient values, k', and transform values, T, in order to match stars in the asteroid's field—and ultimately the asteroid itself—onto the standard scale. We took several images of some of these stars at two different air masses; that is, two different thicknesses of atmosphere.

To fully remove the excess noise from the data, the supporting images must be used to calibrate the raw images. First, the darks are combined using a median function to make a master dark. This master dark, which is a measure of the typical thermal and amplifier noise, is then subtracted from all remaining images, removing that noise. The dark-subtracted flats are then similarly combined to make a master flat. The dark-subtracted images are then divided, pixel by pixel, by the master flat image. This division removes the differences in pixel sensitivity. The process of calibration can be illustrated by the simple mathematical model shown in Equation 2.

$$(2) \qquad Calibrated\ Image = \frac{Raw - MasterDark}{MasterFlat}$$

Calibration removes noise from the instrumentation. One must still, however, remove the sky background. MPO Canopus, the software package we used for data analysis, uses a series of rings surrounding an object to measure the value of the sky background and subtract it from the target. An example can be seen in Figure 2.
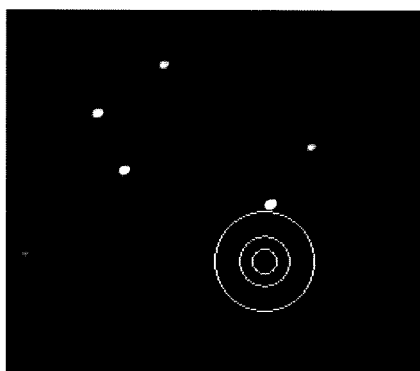
Figure 2: 2167 Erin within a measuring aperture.

The region between the two outermost rings is called the sky annulus. All the pixel values from the sky annulus are medianed, resulting in a typical sky background value for that immediate region. This value is then subtracted from the region inside the center ring, which is called the measuring aperture.

The sum of all the pixel values within the measuring aperture is proportional to the amount of light from the object itself or the object's intensity. This intensity, I, is plugged into Equation 1, yielding a new value called the instrumental magnitude, which can be symbol-

ized by a lower case letter, such as r or v, depending on the passband used. We used the basic photometric equations:

$$(3) \qquad V = v - k'_v X + T_v CI + ZP_v$$

and

$$(4) \qquad R = r - k'_r X + T_r CI + ZP_r$$

to turn our instrumental magnitudes, v and r, into standardized values, V and R. To use these equations we first found the values of k', T, and ZP for both the V and R filtered measurements. The transform values, T, maps our raw system onto the Johnson-Cousins system. The value k', the coefficient of extinction, removed atmospheric dimming from our measurements. ZP is a zero point which represents an offset present in our system.

In order to use these equations, we found several new parameters. Air mass, X, represents the amount of atmosphere through which the light travels. An air mass of (1) corresponds to the amount of atmosphere at the zenith. For objects closer to the horizon, the air mass is greater than one. X can be found using simple geometry. The color index, CI, is a calculation of V-R, the standard magnitudes of the star in the visual and red base bands subtracted from each other.

We now altered Equation 3 to give:

$$(5) \qquad V - v + k'_v = T_v CI + ZP_v$$

which is in the form of a line,

$$(6) \qquad y = mx + b$$

where V-v+k'vX is equivalent to y, Tv is the slope, ZP is the y-intercept. We used the data gathered from the images of Landolt fields to know all the values of V, CI, X, and v. The value of k'v could be ignored because we only used images taken at the same air mass to find the transform values. Figure 3 shows the graph from which these values were found, as well as the empirical line fit that found the transform value.
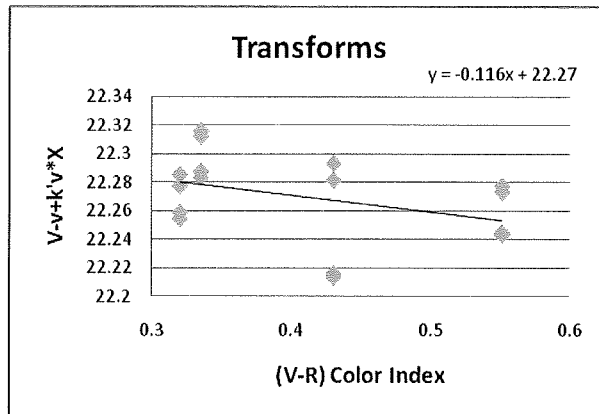
Figure 3: Transform values for 2660 Wasserman

A similar procedure is used to find Tr. Three different transform values are found using these two equations. The first two are Tv and Tr, and the third is what is known as "the hidden transform" or Tv-r. This value is necessary for matching the asteroid field's color index to that of the standard system. This will be discussed later.

Now that the transforms were known, we rearranged Equation 3 to yield

$$(7) \qquad V - v - T_v CI = -k'_v X + ZP_v$$

One can see that $-k'v$ is the slope of a line and ZPv is the y-intercept. We now used two Landolt star fields at two different air masses. Figure 4 shows the empirically fit line.
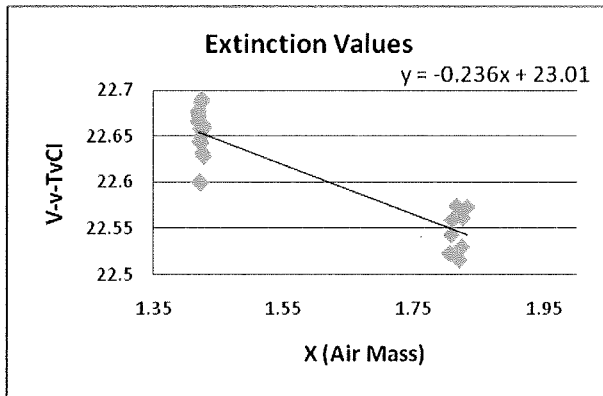
Figure 4: Extinction data for 2660 Wasserman

We now passed all of the values necessary to convert our instrumental magnitudes into standard magnitudes, except that Equations 3 and 4 depended on the standard color index, CI, which was V-R, and not the instrumental color index, ci, which is v-r. To convert ci into CI we used the hidden transform mentioned earlier. It was found by subtracting Equation 3 from Equation 4, which, after a small amount of rearrangement, gave:

$$(8) \qquad V - R = T_{v-r} ((v-r) - k'_{v-r} X) + ZP_{v-r}$$

or

$$(9) \qquad CI = T_{ci} (ci - k'_{ci} X) + ZP_{ci}$$

Tci is the slope of another empirically fit line. Note that:

$$(10) \qquad k'_{ci} = k'_v - k'_r$$

We now used Equations 3 and 4 to find the standardized Johnson-Cousins R and V values of objects in any of our images.

Because of small fluctuations in the atmosphere, it was preferable to place stars in the asteroid's field, called comparison stars, onto the Johnson-Cousins scale, and then use those stars' R and V magnitudes as secondary standards. Because there are several secondary stan-

dards in this field, to which one can compare the asteroid, the small fluctuations of the atmosphere are accounted for in an averaged sum. This method, known as differential photometry, gives more precise measurements of the asteroid's brightness variation than does putting the asteroid directly onto the Johnson-Cousins scale.

4. Data and Results

An uncertain value of about seven hours for 2167 Erin's period was first published in 1978 (Lagerkvist 1978). Montigiani *et al.* later found a period of 6.43 hours (Montigiani 2007). Montigiani *et al.*'s analysis indicated two possible periods, 6.43 hours and 5.72 hours, although they only published the more likely period of 6.43 hours. The two periods differ by approximately one-half rotation per day. Because of the oblong shape of many asteroids, as well as their usually uniform surface color, one maximum is often difficult to distinguish from its counterpart. Our data, shown in Figure 5, indicated that the shorter period was correct and that the longer period was the result of aliasing. Data gathered by the Montigiani group was taken in short sessions over a period of nine nights, whereas our data were taken in one long night of observation. As a result, Montigiani *et al.* could not distinguish between the two maxima and folded their light curve such that different maxima were matched on alternate nights. We contacted Montigiani *et al.*, pooled our data and together published the correct period (Montigiani 2008).
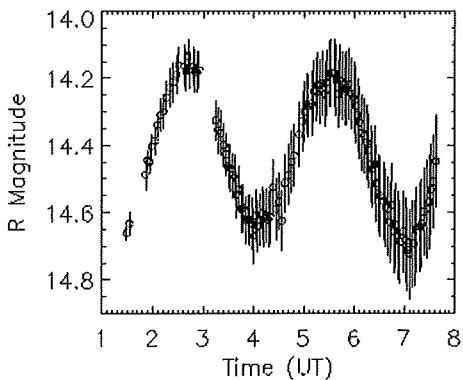
Figure 5: The Folded Light Curve of 2186 Erin   **Figure 6:** Folded Light Curve of 1084 Tamariwa
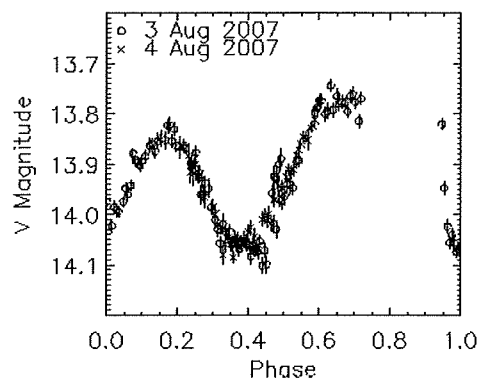
In 2004, K. Iverson published an uncertain period of 6.22 hours for 1084 Tamariwa. Our data confirmed Iverson's period. We also found the standard R and V magnitude of the asteroid. This light curve appears in Figure 6. We obtained partial light curves of our third and fourth asteroids, 2660 Wasserman and 17010 1999 CQ72, but were unable to find or verify their periods. We were, however, able to use the data gathered to put the brightnesses of both asteroids onto the standard scale that could be useful for future observers.

6. References

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Moral Decisions in the Trolley Problem: People Save Five Over One – Except When the One Is Young, Genetically Related or a Romantic Partner

by

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Abstract

This research concerns moral decision-making in an ethical thought experiment known as the Trolley Problem. In the original Trolley Problem, readers had to decide whether by pulling a lever to save the lives of five persons tied to a track, they would sacrifice the life of one person tied to an alternate track. According to W. D. Hamilton's (1964) formulation of inclusive fitness, people's moral decisions should favor the well-being of those who are reproductively viable, share genes, and provide reproductive opportunity. Across two studies (Ns = 659 and 960), we manipulated the sex, age (2, 20, 45, and 70 years old), genetic relatedness (0, .125, .25, and .50), and potential reproductive opportunity of the one person tied to the alternate track. As expected, men and women were less likely to sacrifice one life for five lives if the one hypothetical life was young, a genetic relative, or a current mate.

In the long-standing study of moral reasoning, philosophers have used an ethical thought experiment known as the Trolley Problem to understand implicit rules that govern humans' moral decisions. A classic formulation of the Trolley Problem reads as follows:

> A trolley is running out of control down a track. In its path are five people who have been tied to the track by a madman. Fortunately, you can flip a switch that will lead the trolley down a different track to safety. Unfortunately, there is a single person tied to that track. Would you flip the switch?

The reader must decide whether he or she would save the lives of five people tied to the main track by flipping a switch to sacrifice the life of one person tied to the alternate track. One key decision in the Trolley Problem involves a utilitarian judgment of whether the benefit of saving five exceeds the cost of killing one. In response to the wording offered above, the majority of people do opt to flip the switch (sacrifice the life of one). However, like other artificial dilemmas such as the burning building dilemma (Burnstein, Crandall, & Kitayama, 1994), the Trolley Problem is useful because researchers can manipulate its parameters, one by one, to shed light on systematic patterns of human judgment (Hauser, 2006). In so doing, researchers have documented several parameters of the dilemma that influence people's decisions. For example, if the wording is slightly modified so that one must push a lone person onto the track to save the five people, thus harming the one person as a means to save five (rather than an unintended consequence of saving five), individuals are less likely to sacrifice the lone person (Hauser, 2006). Individuals also respond to framing effects. For example, they agree more with the option of "saving" the five than with the option of "killing" the one, even though the two options are consequentially equivalent (Petrinovich & O'Neill, 1996). Individuals also respond to variations in the species involved, with a tendency to spare human lives over non-human lives (O'Neill & Petrinovich, 1998).

A selfish gene perspective (Dawkins, 1989) and the logic of Inclusive Fitness Theory (Hamilton, 1964) implicate genetic relatedness, age, and reproductive opportunity (of the person on the alternate track) as additional parameters that should undermine a utilitarian response to the Trolley Problem. Over evolutionary history, individuals who saved the lives of those who (a) were likely to share genes with them, (b) had their reproductive lives ahead of them, and (c) were likely to provide reproductive opportunity, would have been more likely, on average, to pass their genes on to subsequent generations than would individuals who did not save those lives. Research using the Trolley Problem has offered support for people's bias toward saving kin (O'Neill & Petrinovich, 1998; Petrinovich, O'Neill, & Jorgensen, 1993). Other research using hypothetical helping dilemmas other than the Trolley Problem (Burnstein et al., 1994) has illustrated people's concern for the welfare, particularly under life-and-death conditions, of targets depicted as genetically related or as very young children. However, past studies suffer from two primary limitations: first, they have utilized a within-subjects design, whereas between-subjects designs would provide stricter tests of the hypotheses, and second, they have not investigated systematically the effects of age, varying degrees of genetic relatedness, and reproductive opportunity on people's decisions.

In the current studies, we used a between-subjects design to investigate the effects of multiple independent variables. We refer to the one life on the alternate track as the lone target. In the first study, we investigated the effects of the lone target's sex, the lone target's age, and the lone target's genetic relatedness on participants' decision to sacrifice the lone target in order to save five lives. In the second study, we held genetic relatedness constant (at zero) and age constant (at the same age as the participant) to investigate the effect of the lone target's reproductive opportunity on participants' decisions.

STUDY 1

In Study 1 we tested two hypotheses about implicit rules that guide people's decisions in the Trolley Problem. First, we hypothesized that participants would be less likely to flip the switch on genetically related targets. Second, because youth is an indicator of reproductive viability, we also hypothesized that participants would be less likely to flip the switch on younger targets. Because past research has documented a greater tendency toward inaction among women than among men in helping situations (Lay, Allen, & Kassirer, 1974) and in response to life-or-death dilemmas (Petrinovich et al., 1993), we also expected that female participants would be less likely than male participants, overall, to flip the switch on the lone target.

Method
Participants
A total of 239 men and 413 women from a suburban Midwestern community participated. Participants ranged in age from 15 to 86 years (M = 31.23, SD = 15.41).

Measures
We created 32 versions of the original Trolley Problem (above) by manipulating the sex (male vs. female), age (2, 20, 45, and 70 years old), and genetic relatedness (0, .125, .25, and .50) of the person tied to the alternate track (the lone target). Examples of the final sentence of the dilemma were: "Unfortunately, your 20 year-old male cousin is tied to that track," "Unfortunately, a 2 year-old male stranger is tied to that track," and "Unfortunately, your 45 year-old mother is tied to that track." Table 1 displays the 32 distinct versions. We provided no information about the "five people" tied to the main track. With participant sex as a relevant predictor variable, the experiment included one subject variable (participant sex) and three true independent variables (lone target's sex, lone target's age, and lone target's relatedness), for a 2x2x4x4 between-subjects design.

Table 1. Study 1: Independent Variables Combined to Form 32 Versions of the Lone Target Depicted in the Trolley Problem, and Number of Participants (N) Exposed to Each Version

IV1. Relatedness	IV2. Age	IV3. Sex	Target Depicted	N
.00	2	Male	Male Stranger	20
		Female	Female Stranger	21
	20	Male	Male Stranger	22
		Female	Female Stranger	21
	45	Male	Male Stranger	21
		Female	Female Stranger	20
	70	Male	Male Stranger	21
		Female	Female Stranger	22
.125	2	Male	Male Cousin	20
		Female	Female Cousin	17
	20	Male	Male Cousin	25
		Female	Female Cousin	22
	45	Male	Male Cousin	20
		Female	Female Cousin	21
	70	Male	Great Uncle	17
		Female	Great Aunt	22
.25	2	Male	Nephew	18
		Female	Niece	20
	20	Male	Half Brother	18
		Female	Half Sister	18
	45	Male	Uncle	19
		Female	Aunt	21
	70	Male	Grandfather	21
		Female	Grandmother	21
.50	2	Male	Son	20
		Female	Daughter	20
	20	Male	Brother	22
		Female	Sister	21
	45	Male	Father	21
		Female	Mother	21
	70	Male	Father	21
		Female	Mother	20

Procedure

We approached individuals, as they passed through either the local farmer's market or college campus, and asked them to complete a brief questionnaire involving a moral dilemma. Upon consent, each participant read and responded to one of the 32 versions of the Trolley Problem (see Table 1 for the number of participants exposed to each version). After a description of the hypothetical situation, researchers asked the question "Would you flip the switch in this situation?" Participants checked Yes or No. In an effort to have participants emulate a real-life, high pressure situation in which they would be forced to act rapidly, we asked them to answer as quickly as possible after reading the dilemma. Upon providing their response to the dilemma, participants reported their age and sex. They responded anonymously; after completion, they folded their response sheet and placed it in a secure box to ensure confidentiality. We debriefed them verbally or in writing, as per their request.

Results

Overall, 53 percent of participants opted to flip the switch on the lone target. We conducted multinomial logistic regression analyses to test the main and interactive effects of participant sex, lone target sex, lone target age, and lone target genetic relatedness on likelihood of flipping the switch on the lone target. Although multinomial (rather than binary) logistic regression is typically used for dependent variables with more than two outcomes, we used multinomial logistic regression for three reasons. First, multinomial logistic regression is also appropriate for dependent vari-

Table 2. Study 1: Logistic Regression Analysis of Participants' Decision to Flip the Switch on a Lone Target

Predictor	β	SE β	Wald's x^2	df	p	e β (odds ratio)
Constant	.164	.252	.423	1	.515	NA
Target relatedness = 0	2.039	.260	61.551	1	.000	7.684
Target relatedness = .125	.769	.235	10.674	1	.001	2.157
Target relatedness = .25	.567	.239	5.613	1	.018	1.762
Target relatedness = .50	----	----	----	0	----	----
Target age = 2 years old	-1.353	.254	28.414	1	.000	.259
Target age = 20 years old	-.299	.239	1.565	1	.211	.714
Target age = 45 years old	-.198	.241	.673	1	.412	.821
Target age = 70 years old	----	----	----	0	----	----
Participant sex = female	-.661	.180	13.415	1	.000	.516
Participant sex = male	----	----	----	0	----	----

Final Reduced Model			x^2	df	p	
Overall model evaluation (against intercept-only model)						
Likelihood ratio test			116.85 7		.000	
Model fitting criteria						
AIC			147.051	NA	NA	
BIC			182.891	NA	NA	
-2 log likelihood			131.051	NA	NA	
Goodness-of-fit test						
Pearson chi-square			29.592	24	.199	

Note. The last category of each predictor variable served as the reference category. For the dependent variable "flip the switch," the reference category is "No." Cox and Snell R2 = .164. Nagelkerke R2 = .219. For model with intercept only, AIC = 249.916, BIC = 254.396, -2 log likelihood = 247.916. NA = not applicable.

ables with two outcomes; second, it provides three methods for assessing which model is the "best" model [last step model, lowest Akaike Information Criterion (AIC), and lowest Bayesian Information Criterion (BIC)], whereas binary logistic regression provides only one; and third, the procedure internally aggregates cases to form subpopulations with identical covariate patterns, and so is preferred in a design like ours in which all predictors are categorical. By aggregating, the procedure creates several cases at each distinct covariate pattern to produce valid goodness-of-fit tests.

We treated all variables as categorical, including our dependent variable, "flip the switch." Using a forward entry procedure with hierarchical constraints in place, the best-fitting model included three main effects and no higher order interactions. Table 2 provides the parameter estimates and fit statistics (Peng, Lee, & Ingersoll, 2002) for the final reduced model. This model correctly predicted 69.9 percent of "Yes" responses and 64.2 percent of "No" responses for an overall correct prediction rate of 67.2 percent.

The three significant main effects in the final reduced model, displayed in the three panels of Figure 1, supported our hypotheses. First (upper left panel), there was a significant effect of genetic relatedness: participants were increasingly unwilling to flip the switch on targets of increasing levels of genetic relatedness. Second (upper right panel), there was a significant effect of target age: participants were less likely to flip the switch on a very young (2 year-old) lone target than on the other lone targets. Third (lower panel), there was a main effect for participant sex: female participants were less likely than male participants to flip the switch on the lone target. Figure 2 displays the effects of lone target age and lone target genetic relatedness, across participant sex, on participants' decision to sacrifice the lone target in order to save the five passengers.
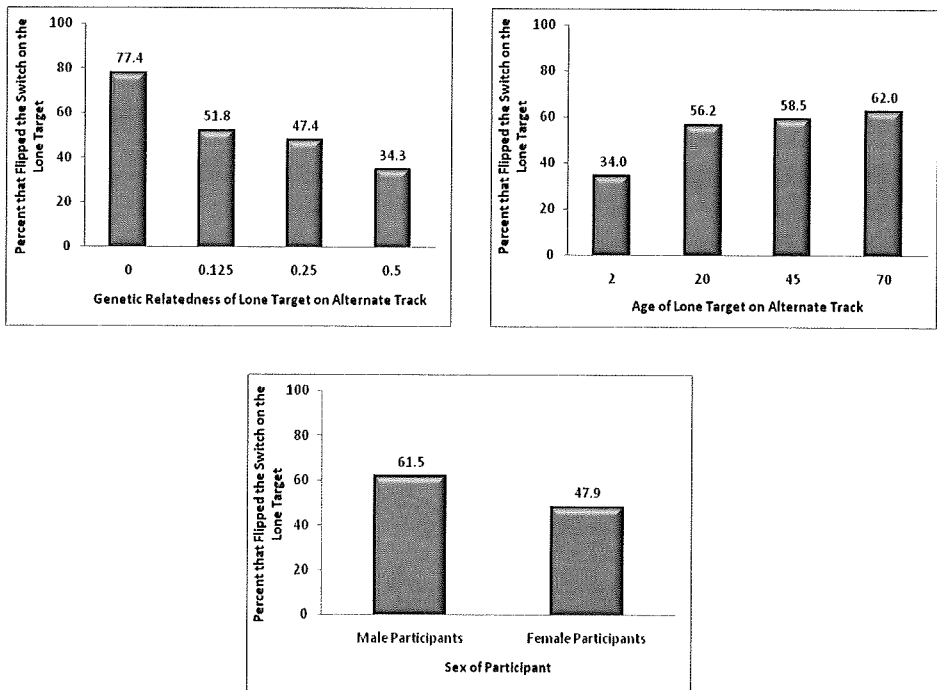
Figure 1. Study 1: Effects of Target Genetic Relatedness (upper left panel), Target Age (upper right panel), and Participant Sex (lower panel) on Likelihood of Flipping the Switch to Sacrifice the Lone Target.
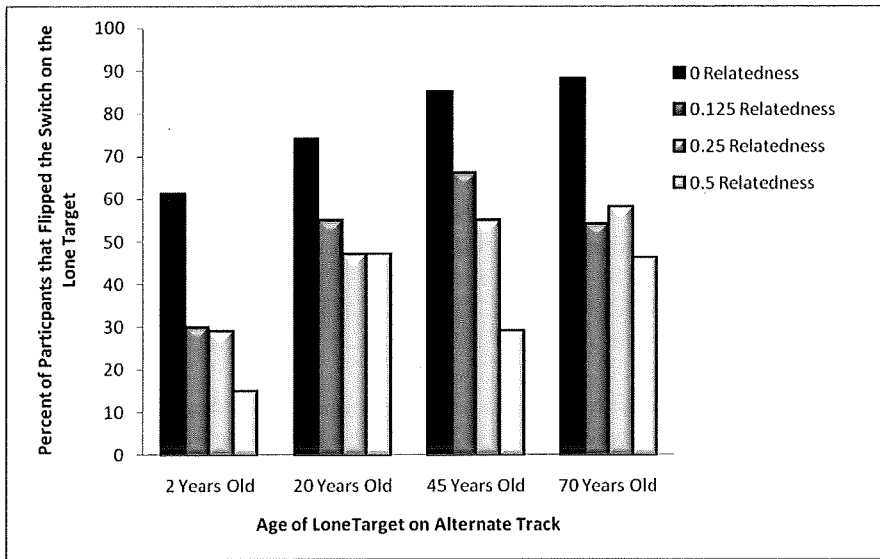
Figure 2. Study 1: Effects of Target Genetic Relatedness and Target Age, Across Participant Sex, on Likelihood of Flipping the Switch to Sacrifice the Lone Target.

STUDY 2

In Study 2 we focused on the effect of reproductive opportunity on willingness to sacrifice one life for five lives. We acquired a sample of young adults, and, in every scenario, we described passengers and lone targets as being of the same age as the participant. We hypothesized that participants would be less likely to sacrifice a lone target who was likely to provide reproductive opportunity–specifically, a lone target depicted as their "current romantic partner." We speculated that participants would be especially unwilling to sacrifice a hypothetical romantic partner if they were actually currently involved in a romantic relationship, because they would be more likely to visualize a specific person. We also speculated that participants would be especially unlikely to sacrifice a hypothetical romantic partner when the passengers to be saved, by doing so, were depicted as being of the same sex, because those same-sex passengers might be perceived as potential intrasexual competitors.

Method
Participants

Participants were 956 students (352 men and 604 women) from a regional public university in the Midwest. Participants ranged in age from 16 to 27 years, with 97 percent between 18 and 22 (M = 18.92, SD = 1.36).

Measures

We created twelve versions of the original Trolley Problem by manipulating the sex of the five people originally in danger (unstated, same-sex, and opposite-sex) and the sex of the single person (the lone target) who could be sacrificed to save them (unstated, same-sex, opposite-sex, and romantic partner). We refined the general dilemma to include more detail, as well as clarification of the consequences of each decision. An example of the refined scenario is as follows (key manipulated areas in italics):

It's a lovely day out, and you decide to go for a walk along the trolley tracks that crisscross your town. As you walk, you hear a trolley behind you, and you step away from the tracks. But as the

trolley gets closer, you hear sounds of panic—the five *men* on board, who are about your age, are shouting for help. The trolley's brakes have gone out, and it's gathering speed. It is going to crash and kill the passengers.

You find that you just happen to be standing next to a side track that veers into a sand pit, which would provide safety for the trolley's five passengers. All you have to do is pull a hand lever to switch the tracks, and you'll save the five *men*. But there's a problem. Along this off-shoot of track leading to the sandpit stands a *woman* about your age who is totally unaware of the trolley's problem and the action you're considering. There's no time to warn her. *So by pulling the lever and guiding the trolley to safety, you'll save the five men. But, you'll kill the woman.*

Table 3 displays the twelve distinct combinations of target sex and passenger sex included in the study and the number of participants exposed to each combination. With participant sex and relationship involvement as relevant predictor variables, the experiment included two subject variables (participant sex and participant involvement) and two independent variables (passenger sex and lone target sex) for a 2x2x3x4 between-subjects design.

Table 3. Study 2: Independent Variables Combined to Form Twelve Versions of the Trolley Problem, and Number of Participants (N) Exposed to Each Version

IV1. Sex of Lone Target	IV2. Sex of Passengers	N
Unstated	Unstated	79
	Same-sex	88
	Opposite-sex	71
Same-sex	Unstated	81
	Same-sex	75
	Opposite-sex	86
Opposite-sex	Unstated	82
	Same-sex	72
	Opposite-sex	81
Romantic Partner	Unstated	81
	Same-sex	82
	Opposite-sex	76

Procedure

Data collection occurred on the campus mall at a Freshman Orientation event and during normal school hours. We approached students and asked them to complete a brief questionnaire involving a moral dilemma. Upon consent, each participant read and responded to one of the twelve versions of the Trolley Problem. After the scenario, participants read the question "What will you do? Choose one." Participants checked "Pull the hand lever" or "Don't pull the hand lever." Again, we asked participants to answer as quickly as possible, after reading the dilemma. Upon providing their response to the dilemma, participants reported their age, sex, and whether or not they were currently involved in a romantic relationship. They responded anonymously; after completion, each participant folded the response sheet and placed it in a secure box to ensure confidentiality. We debriefed each participant verbally or in writing, as per their request.

Results

Overall, 66 percent of participants opted to pull the lever to sacrifice the lone target and save the five passengers. We conducted multinomial logistic regression analyses to test the main and interactive effects of participant sex, participant involvement, lone target sex, and passenger sex on the likelihood of pulling the lever to sacrifice the lone target. Using a forward entry procedure with hierarchical constraints in place, the best-fitting model included two main effects and one higher order interaction (this pattern of findings replicated with a general loglinear analysis). Table 2 provides the parameter estimates and fit statistics for the final reduced model, which correctly predicted 95.3 percent of "Yes" responses and 28.3 percent of "No" responses for an overall correct prediction rate of 72.7 percent.

Contrary to our findings in Study 1, male and female participants in Study 2 did not differ in the frequency with which they opted to pull the lever, p =.61. Also contrary to our speculation that same-sex passengers might be viewed as intrasexual competitors, particularly when pitted against a hypothetical romantic partner, passenger sex did not influence decisions, p =.55, nor did it interact with any other variable to predict likelihood of pulling the lever.

As displayed in Figure 3, however, our hypothesis that participants would be unwilling to sacrifice their romantic partner in order to save five others was supported. As implicated in the interaction between target sex and participant involvement, the negative effect of romantic involvement on willingness to pull the lever was apparent only when the lone target was depicted as the participant's romantic partner.
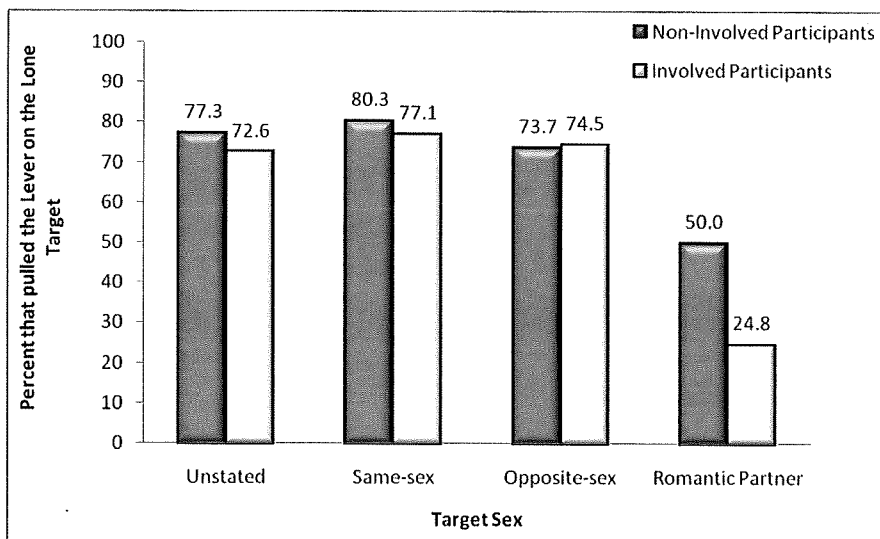
Figure 3. Study 2: Interactive effects of target sex and participant relationship involvement on likelihood of pulling the lever to sacrifice the lone target.

DISCUSSION

In two studies, we have documented that humans' moral decisions follow the laws of Inclusive Fitness Theory. Participants were unwilling to sacrifice the life of a family member or reproductive partner, even when the alternative was to let five people die. Our findings are particularly notable in light of our conservative between-subjects design and use of two distinct samples. It is clear from the current set of studies that seemingly small alterations to a situation, such as the age or relatedness of a lone target who could be sacrificed to save five others, can have large influences on our moral intuitions.

Although some might suggest that the use of hypothetical scenarios is a limitation of the present research, we argue that it is not. As other researchers have noted (e.g., Hauser, 2006), hypothetical moral dilemmas allow researchers to manipulate the very parameters they propose have an impact on moral decisions. Burning buildings and impending death of innocent victims are events that do occur, but not predictably enough or close enough in time and space for researchers to chart their contexts and outcomes. Further, human ancestral environments involved warfare and raids, harsh environmental conditions, and tragic accidents with behavioral choices whose outcomes most certainly mirrored the Trolley Problem in its abstract form. We also have anecdotal evidence that participants very easily imagined themselves in the scenarios they read. Participants made their decisions quickly, and also frequently wanted to tell us about the exact person (aunt, brother, etc.) they had been asked to imagine (such as how close they were to that person). In future research we aim to test the hypothesis that the effects of the lone target's genetic relatedness, age, and reproductive opportunity are heightened when participants are placed under cognitive load (e.g., forced to decide in a brief, set amount of time), and minimized when emotional closeness to the target is included as a covariate.

Another direction for future research lies in our unsupported speculation that participants would respond negatively to same-sex passengers, particularly when the lone target was a romantic partner. We had speculated that favoring the same-sex passengers might be read as jeopardizing one's own reproductive opportunity while simultaneously facilitating the survival (and thus reproductive opportunity) of one's competitors. It is possible that the scenario did not provide enough detail to spur this mental image. Perhaps typical male participants might respond as predicted in a scenario that involved five young male passengers from a rival university (or employer) pitted against a beautiful young woman (such as their romantic partner) on the alternate track.

We conclude that the complex rules governing humans' moral intuitions surely lie in the interplay of our human evolutionary heritage, our individual dispositions, and the specific contextual factors of a given situation. Hypothetical dilemmas like the Trolley Problem provide an opportunity for psychologists and moral philosophers to collaborate in delineating how these factors interact to guide our moral attitudes and behaviors.

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Portraits: The Struggle for Individualism in Victorian Society

by

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Introduction

Late nineteenth century Britain witnessed the birth and development of several social and artistic movements. Each movement involved distinct beliefs and ideals that made it unique; however, many of them—Aestheticism, Naturalism, Decadence, and Feminism, to name a few—did have at least one common aspect: they all challenged or rejected the dominant bourgeois standards and ideals that shaped Victorian society. This work explores how authors from two different "schools"--Oscar Wilde, associated with the Aesthete and Decadent movements and Kathleen Mannington-Caffyn (Iota), associated with the New Woman writers used portraits in their respective novels, *The Picture of Dorian Gray* (1891) and Mannington-Caffyn's *A Yellow Aster* (1896), to explore society's influence on the individual. By analyzing the symbolic significance of a portrait in each novel, I illustrate how a male Aesthete and a female New Woman writer, though seeming to each push for different societal changes, were both working towards the same goal.

Wilde: Aesthete, Decadent, or Dandy?

At the height of his notoriety in the late-nineteenth century, Oscar Wilde was seen as the embodiment of Decadence. However, as Wilde's work has been more completely explored in recent years, scholars have seen that Decadence does not align with Wilde's written philosophies, and have reinterpreted him as an Aesthete. Although these two identities--the selfish, immoral Decadent and the philosophizing art theoretician--may seem to us quite distinct from each other, nineteenth century bourgeois culture clearly imputed both identities to the same man. Built on societal regulation and strict ideals, Victorian society denounced individual development and non-conformist ideas. For Wilde, as for many others who pushed against social guidelines, this resulted in a divided identity: a private and a public self. Wilde himself characterized this situation quite clearly when, speaking of his personal relation to the characters in *Dorian Gray*, he said, "Basil Hallward is what I think I am: Lord Henry what the world thinks me: Dorian is what I would like to be--in other ages, perhaps" (qtd. in Ellmann 319). The difference between who Wilde was (an Aesthete and a dandy) and who people perceived him to be (a Decadent) was not an isolated case of misconception; many people mistakenly used all three terms interchangeably.

In the 1890s the terms Aesthete, Decadent, and dandy were used loosely and often incorrectly by many people, including those who considered themselves part of these movements and those who discussed them with contempt. Karl Beckson, in the *Introduction* to his anthology *Aesthetes and Decadents of the 1890's: An Anthology of British Poetry and Prose*, gives an excellent example of the poor understanding and ill-usage of these terms in his discussion of Walter Pater. (Beckson xxxii-xxxiii). Pater was misread to hold the exact opposite of what he truly believed; Wilde, a disciple of Pater's, was misconstrued in the same way. The confusion came from the closeness of each movement's origins, beliefs, and use of dandyism as a form of expression. Both terms,

Aesthete and Decadent, developed from, and were influenced by, the same group of philosophers and artists, including Gautier, Baudelaire, Kant, Huysmans, Swinburne, and Pater. However, each distinct movement developed its own tenets and goals, and each utilized dandyism as a form of expression.

Aestheticism, in its most general form, refers to an entire branch of philosophy. I focus here on Aesthetic art philosophy centered in Britain. In the Romantic period, the Aesthetes, like the Romantics, believed art served the artist and should be used to reach beyond society. However, unlike the Romantics who reveled in color and fantasy, the Romantic Aesthetes focused on the use of form and symbolism and attempted to move away from Romanticism's sensuality and moralization (Beckson xxiv-xxvi). However, the political, economic, and social changes of the late-eighteenth and nineteenth centuries increased educated persons' social concerns and created a larger social consciousness that in turn raised the question of art's relation to a new, interconnected, and increasingly international society. Several responses transpired including Realism, Naturalism, the doctrine of social responsibility, and a new Aestheticism, often referred to as "art for art's sake." In this new version of Aestheticism there "was a desire to redefine the relation of art to life, to impart to life itself the form of a work of art and thereby raise it to a higher level of existence" (Chai IX). By making life a form of art, these Aesthetes connected art back to life. Aesthetes placed art above society and focused on its formal values, but they also valued human experience and believed that art, if held beyond societal control, could be used to reach individual perfection. By the 1890s, several Aesthetes, including Walter Pater and Oscar Wilde, brought society into their aesthetic concerns and created one intertwined doctrine that promoted a direct and dynamic relationship between art, society, and the individual.

The Decadent movement embraced several of the Aesthetes' beliefs, but differed in key ways. Developed mainly by Baudelaire and Gautier, Decadence was "a cult of artifice" aimed at indulging in the abnormal and in exercising personal will against nature and society in order to assert mankind's superiority to natural law (Beckson xxix-xxx). In its effort to assert human superiority, Decadence adopted an Aesthetic view of art that privileged form over content and placed art above society to "purify it of irrelevant intrusions of morality and socio-political ideas" (Beckson xxiv). Unlike Aestheticism, however, Decadence was concerned not with art's ability to improve individuals or society, but rather with its ability to be used as a complete escape from society and nature. Though Decadence used several Aesthetic precepts, its motivation and goals were entirely different. Still, because adherents of both movements believed the human body, and experience, was a form of art, they both found expression and social prestige in the figure of the dandy.

"Dandy," the third term that is often associated with Wilde, is related to both the Aesthetic and Decadent movements. In the 1890s, a dandy was someone associated with the aristocracy, concerned mostly with elegance and fashion, and important merely for that reason (Moers 288). Based on this definition, there exists no doubt that Wilde was a dandy; however, the "dandyish" public persona he created supported Aesthetic, not Decadent, precepts. Alan Sinfield and Rodney Shewan both convincingly suggested that Wilde adopted dandyism for the practical reason of social and career advancement. In *The Wilde Century*, Sinfield explains that Wilde's adoption of dandyism was a move from bohemian aestheticism to a higher class of Aesthete, the leisured decadent, who did not have to scrape by on meager earnings from his art, but could pursue art out of passion, and on his own terms (98). Regina Gagnier expounded on this point, saying that "the dandy was the human equivalent of art under aestheticism" (3). The dandy existed in society, but never was involved in it, taking part in society's materialism just to mock it and point out its absurdity. Through these associations, dandyism aligned high society with Aesthetic ideals, which allowed Wilde to live out several aspects of his philosophy in a socially acceptable way. Nonetheless, it should be noted that dandyism's overlap with Decadence ended up proving troublesome for Wilde in his final years. However, regardless of how one construes Wilde's public persona, his writings make it clear that Wilde was not a Decadent, but an Aesthete.

Though only slowly understood among critics, Wilde's Aestheticism is a focus of contemporary scholarship and recently has been thoroughly discussed by Richard Ellmann, Richard Dollimore, Regina Gagnier, Leon Chai, Julia Brown, and Yukiko Kinoshita, among others. Like most other versions of Aestheticism, Wilde's version rests on the autonomy of art and placing art above societal regulation. However, Wilde does not elevate art merely because he believes it superior to all other aspects of life; rather he does so rather to allow individuals the freedom to truly explore all possibilities, to develop in a variety of directions without actually indulging every impulse and experiencing potentially violent or immoral actions, as the Decadents advocated doing.

In contrast to Victorian ideology, Wilde's philosophy acknowledged that humans are not simple, single-identity creatures, but are, instead, complex beings with varied interests and developmental directions. As he wrote in *The Picture of Dorian Gray*, "…man was a being with myriad lives and myriad sensations, a complex multi-form creature that bore within itself strange legacies of thought and passion…" (Wilde qtd. in Adams 220). As a result, according to Wilde, human identities, while developing, are likely to be multiple and/or divided, particularly when they are confronting a dominant, hegemonic society. In Wilde's perfect world, individuals would develop freely; however, in a world dominated by one ideal, in Wilde's case the gentleman, a flowering individual can easily turn into a divided individual, as he depicts in *Dorian Gray*. Wilde's solution to this reality was to allow individuals to use art to develop outside of societal restraint and judgment and without external influence. That way, they could develop naturally and reach full development. Wilde believed that, if individuals were allowed to pursue this course of free exploration to reach full development, it would lead to societal growth and improvement.

Richard Ellmann and Rodney Shewan both explored Wilde's Aesthetic art-based philosophy in their respective discussions of Wilde's *The Soul of Man Under Socialism*. They suggest that Wilde believed "…the primary aim of [all] life is self-development" (Ellmann 285). In order for individuals to develop, Wilde believed they had to move between art and life, following their sincere desires, no matter how inconsistent these might be, and then analyzing themselves through external expressions to find understanding and reach full self-realization (Shewan 4). In this construction, individuals become distant critics of themselves by expressing their actions and impulses in their artwork. After expressing their desires in their artwork, they can then analyze themselves externally and potentially grow from this analysis. Wilde illustrated this artistic art philosophy and suggested that society should foster free individual development in *Dorian Gray*. The novel centers on Dorian Gray's portrait, a simple picture of "a young man of extraordinary personal beauty" (Wilde 140). In the novel the portrait symbolizes art. Wilde used this external connection to comment on the relation of art to the artist, the subject, the Decadent movement, Victorian society, and also to explain his own Aesthetic beliefs rejecting hegemonic conformism and promoting individual development.

Wilde used the relationship of the artist Basil Hallward to the portrait to illustrate the limitations society places on artistic expression. The first section of the novel establishes that the portrait constitutes Basil's greatest work. Lord Henry Wotton even states that it "is one of the greatest things in modern art" (Wilde 168). However, even though the portrait could give Basil prestige, wealth, and a place in art history, he does not want to display it. To Basil the picture is more than just beautiful art; it is the expression of his own soul (Wilde 145). He does not want to exhibit it because he has put too much of himself into it. Basil fears showing his picture not because he thinks it a poor piece of art; in fact he is quite conscious of its beauty. Rather, Basil does not want to show his artwork because it expresses himself so very well, and he does not want to expose himself to society's criticism. He knows that society will hold his artwork, and therefore his person, up to its expectations and judge him comparatively, in the end accepting or rejecting him. Basil's fear of public judgment suggests that he knows he will not live up to society's ideal and will incur rejection. By exposing the artist's fear of judgment, Wilde showed the negative effects that a conformist and

idealist society could impose on individual expression and development. He continued this discussion by having the picture embody an ideal. While Basil believes the picture expresses his soul, Lord Henry believes that the portrait, and Dorian Gray, portrays the ideal dandy. In Lord Henry's eyes, Dorian is "wonderfully handsome... [and holds] all the candour of youth, as well as all youth's passionate purity" (Wilde 156). Beyond his beauty, wealthy Dorian "doesn't do anything," a circumstance that makes him a prime dandy figure (Wilde 147). Established as a textbook dandy, Dorian and his portrait become ideals that Wilde used to suggest the negative effects of Idealism and external influence on an individual's development.

As both Sinfield and Cohen established, Dorian has no concept of his own beauty or the power of his position as a perfect dandy until he converses with Lord Henry and sees the portrait (Wilde 167). When Lord Henry gives Dorian a flippant lecture on the dangers of influence, the Decadent goal of complete expression, and the power of youth, Dorian begins to realize the power he possesses and he starts to change. Dorian does not explicitly realize what is happening to him, but he "is dimly conscious that entirely fresh influences are working in him" (Wilde 160). As Dorian processes these new ideas, Basil finishes the portrait, and for the first time Dorian gains a "sense of his own beauty" (Wilde 167). At this point, Dorian realizes that, as long as he has youth and beauty, he will hold a high position in society because he embodies an ideal, at least for the circle in which he moves. Not wanting to lose his status as an ideal, Dorian makes a fateful declaration to give his soul to make the picture age, so that he can keep his youthful appearance and high status forever (Wilde 168). By making this wish, Dorian succumbs to external influences, those of Lord Henry Wotton, and Idealism, and sacrifices thereby his own soul and true identity. He also becomes a divided individual, suppressing his true self and expressing what he believes he is and should continue to be. Wilde made this division easy to see by having the portrait represent Dorian's true identity, while Dorian, the person, represents society's ideal. Throughout the rest of the novel, Wilde used Dorian's development as a divided person to suggest the dangers of hegemonic idealism on individual development.

Lord Henry Wotton promotes and embodies Aestheticism; he philosophizes at great length, appreciates pure beauty, and suggests several ways to experience life, but never actually acts throughout the entire novel. When he meets Dorian, he is "amazed at the sudden impression that his words produce on him" (Wilde 160-61). However, even though Lord Henry intends to influence Dorian, he does not mean for Dorian to harm himself or others. Lord Henry's goal is for Dorian to realize the value of his youth so that he can use it to its full potential, to embody "a new Hedonism," a Hedonism that is carried out through thought and art, not action--Wilde's Aesthetic art philosophy. Dorian, an innocent and impressionable young man, misinterprets this, and instead adopts a Decadent philosophy, which he pursues throughout the rest of the novel.

The disconnect between these--Lord Henry's philosophy, and Dorian's implementation of it, can be seen when Dorian tries to redeem his sin through confession to Lord Henry. As Dorian talks, Lord Henry listens to his tales of evil deeds and corrupt acts, but never actually believes them. Even to the very end of the novel he believes Dorian is "quite perfect" and, as a true Aesthete, does not take Dorian's confessions of crime seriously. Dorian relates that he has "done too many dreadful things in his life," (Wilde 375). Henry does not ask what they are, but instead skips over the comment entirely and asks where he was the day before. Lord Henry sees Dorian's pure beauty, believes that it faithfully represents the course of Dorian's life, and therefore dismisses Dorian's tales as fiction. However, Dorian's tales are true, and even though it appears he has escaped Hedonism unscathed, the picture testifies to his true suffering.

Throughout his life Dorian practices the Decadence he believes Lord Henry preaches. Dorian indulges every whim, becoming a connoisseur of jewels, art, and tapestries, and follows every desire, using drugs, engaging in promiscuous sexual activities, and even committing murder. While Dorian's body remains spectacularly beautiful, his soul, represented by the portrait, becomes

increasingly ugly with every reckless and criminal activity he embraces. Though, outwardly, Dorian still appears an ideal dandy, inside he is falling apart. As he realizes the decrepit state of his soul he feels increasingly guilty for his crimes. Dorian attempts to remove his true self from his body, but, as the picture shows, individuals cannot simply forget a part of their identity. After Dorian murders James Vane he attempts to turn his life around, telling Henry that he has "...done too many dreadful things in [his] life [and he is] ...not going to do any more" (Wilde 375). However, instead of expressing and coming to terms with the crimes he has committed, as Aestheticism suggests, he attempts to unite his body, mind, and soul, through further Decadent practices. Dorian tries to emerge from the reality he has created by destroying Basil and his portrait, the two things that make him face his sins. In the process, he also kills himself.

When Dorian stabs his portrait to destroy it, he also stabs a part of himself, his soul, and dies. Dorian's tragic story shows that Idealism and conformity push people to embody one specific identity with which they may or may not truly accord. In his youth Dorian appears the ideal dandy; as his life progresses he tries to embody and remain the prescribed ideal by divorcing his body from his true identity, his soul. As the picture begins to change, Dorian realizes he has not extinguished his true identity, and uses Decadent means to try to escape himself. He continually embraces another identity. Through Dorian's story, Wilde showed the detrimental effect Idealism, and hegemonic society, could have on the individual, and suggested that Decadent escapism was not a real solution to such a limited existence. He reemphasized the failure of Decadence as a means of self-expression by illustrating, through Dorian's crimes, the destructive impact one individual can have on the people around him, or her, and society as a whole. However, as Wilde pointed out Decadence's failure, he also used Basil and Dorian to show the potential that art and Aestheticism could have to help individuals reach full self-development in a socially responsible manner.

At first Dorian's portrait represents an ideal, one that Dorian believes he must live up to, and one that helps to persuade him to deny himself. As soon as Dorian makes his wish, however, his portrait begins to reflect the true Dorian, and provides him with an external expression of himself, one that he can potentially analyze, learn from, and use to grow. However, Dorian fails to engage in this part of Lord Henry's and Wilde's suggested process. Had Dorian embraced this part of the process, and acknowledged his actions and their effects, he would have been able to grow and embrace his true self, possibly realizing his "nature perfectly" (Wilde 158). A notion that Lord Henry and Wilde both believed to be the goal of life. Still, the picture's transformation, and its effect on Dorian suggest the power art has to interact with, and influence, society, and Wilde's novel highlighted the point that art should not be used recklessly, but approached with care and revered. Wilde had Dorian fail in order to point out the detrimental effects of external influence and Idealism and to point out Decadence's failure as a solution to these destructive forces. However, Dorian's experience also emphasizes the power art holds, and allows Wilde to suggest art's potential to aid individual self-development. Wilde did not want society to disappear; he wanted it to relax. He believed Victorian society should remove the standards, expectations, and regulations that it placed on individual members, and rather encourage them to develop freely.

In *Cosmopolitan Criticism: Oscar Wilde's Philosophy of Art*, Brown stated that Wilde's philosophy was not the conventional position of the fin-de-siècle Aesthete who asserts "the predominance of beauty or the autonomy and disinterestedness of art" (xv). Brown explained that Wilde, instead of divorcing ethics and aesthetics, understood the aesthetic to transform, not transcend, the ethical (xvi). Unlike previous Aesthetes, Wilde (like Pater) did not see art as explicitly above and dislocated from society, the individual, or life, merely because it was superior. Instead, Wilde believed that art, located beyond society, could help individuals reach self-realization, overall perfecting the individual, which, in turn, would improve society. Once freed from societal demands, constraints, and consequences, art could help individuals explore themselves and push society's

boundaries in a safe medium. This activity's benefits could then potentially be returned to society to allow it to grow and progress beyond its current state. Although this theory could have some perverse consequences if its adherents developed criminally along Decadent avenues, were people to develop aesthetically through art, as Wilde promoted, no harm should come to other members of society, and each individual would develop fully, eventually moving beyond such criminal impulses to a purer existence.

Wilde, Female Aesthetes, and the New Woman Writers

Oscar Wilde's position as a dandy, an Aesthete, and a perceived Decadent makes it hard to determine his view of women. On the one hand, he was head editor of the magazine *Woman's World*, defined by Talia Schaffer as the female Aesthetes' *Yellow Book*. On the other hand, several of his novels' characters deprecated and trivialized women, such as Lord Henry Wotton, the prime Aesthete of *Dorian Gray*, who says, "…no woman is a genius. Women are the decorative sex. They are charmingly artificial, but they have no sense of art" (Wilde 192). However, such experts on Wilde's ideas as Gary Schmidgall, Richard Ellmann, and Talia Schaffer suggested that though Wilde thought little of the enduring Victorian Ideal of obedient femininity, he found educated and cultured women good company and to hold great potential. From several of his comments during his time at *Women's World* it can be deduced that he was both impressed and threatened by much of their artistic work. This picture presents Wilde's mixed view of, and reaction to, women, one not uncommon among men of the late-Victorian period.

Wilde's contradictory view of women was typical of the fin-de-siècle. Several male artists, threatened by women's rise in the literary field, objectified women in their works and discredited female authors in an effort to reassert male dominance. The Decadent movement became a main avenue of expression for these feelings; every dandyish character could be used to portray male contempt for female professionalism. All female artists, political or Aesthetic, fought against this suppression and for artistic equality. In her *Introduction* to *Daughter's of Decadence: Women Writer's of the Fin-de-Siècle,* Showalter stated that Decadence "defined itself against the feminine and biological creativity of women [and that] New Women needed to purge aestheticism and decadence of their misogyny and to rewrite the myths of art that denigrated women" (x). Similarly Schaffer, in her book *The Forgotten Female Aesthetes: Literary Culture in Late-Victorian England,* argued that Decadence was a "defensive reaction [of elite men against popular women writers who were taking their] literary status"(6). Both Showalter and Schaffer concluded that female authors, regardless of their specific literary category, battled against male authors in a struggle for literary merit and success. However, female authors were also divided among themselves. I will focus on two main groups of these, the New Woman writers and the Female Aesthetes.

The definition of New Woman writers is varied and remains contested, though some consensus exists among scholars on a few of their qualities. New Woman authors were almost entirely middle-class and created polemical works. Though they varied in their narrative styles, they all concentrated on the same issues, mainly marriage, motherhood, education, and securing better occupational opportunities. By focusing on these issues, they confronted societal gender relations, most specifically the Victorian Ideal of Femininity, in an effort to promote a better life for women (cf. Mangum 2; Sutton-Ramspeck 1; Murphy 10; Langland 249; Heilmann 1). New Woman authors and Female Aesthetes led similar lives, moved in the same social circles, and had many of the same concerns, but, according to certain scholars, they differed in their purpose for composition.

Having affinities with both the male Aesthetes and the New Woman writers, Female Aesthetes were a distinct group. Schaffer defined Female Aesthetes as those authors who disengaged from gender debates, often used male pseudonyms, wrote non-realist or fanciful literature, and, most importantly, focused on the formal aspects of art (14-16). Though one could argue that many

New Woman authors fit this definition, Schaffer suggested that the two groups are separated by their motivation to write; Female Aesthetes wrote for art's sake, and New Woman authors wrote exclusively for social change (Schaffer 25). Before one makes such a distinction, it is important to consider what version of Aestheticism Female Aesthetes employed. Schaffer suggests that Female Aestheticism was built on Wilde's Aestheticism (Schaffer 2-4). As discussed above, Wilde's school of Aestheticism promoted individual self-realization through the use of art to create social change and lead to societal improvement. If, therefore, Female Aesthetes subscribed to Wilde's Aestheticism, they were, along with New Woman writers, writing for social change.

Consequently, regardless of a female author's stance as an Aesthete or a New Woman, she was, as Showalter and Schaffer suggest, writing to defend women's capabilities and advance the position of women in society. Many nineteenth century writers and contemporary scholars posed this literary battle as a fight between the sexes. However, if the Aestheticism used is Wilde's Aestheticism, one can assert that both Aesthetes, whether male or female, and New Woman writers wrote, that is, used their art, to work towards the same goal: to free the individual and, through that unshackling, improve society. In *The Picture of Dorian Gray* Wilde showed hegemonic idealism as destructive to society because it divides and breaks the individual, and he suggested that society should use art not as a means of social control, but as a tool to foster, and encourage, free individual development. Similarly, in Iota's New Woman novel, *A Yellow Aster*, the author used a portrait to illustrate the detrimental effects society's Idealism has on the individual, and to suggest that society needs to allow free individual development. Both authors, one an Aesthete and one a New Woman, used a portrait to expose the destructiveness of Idealism and to argue for free individual development. While these two authors may have had other social concerns and goals that differed and even possibly conflicted, nonetheless both Wilde and Iota shared the desire to dismiss Idealism and to promote individual self-realization.

A Yellow Aster tells the story of Gwen Waring, who is raised as an experiment to try to avoid traditional Victorian socialization. As a child and young adult she exercises her own will and follows her true desires. However, as she reaches adulthood, she realizes she can only move in two directions: either she can live as a spinster with her parents, whom she despises, or she can marry. Neither option appeals to Gwen, but she decides to "experiment" with marriage and pursues a union with Humphrey Strange (Iota 85). Gwen tries to treat her marriage as a light matter. However, as the reader enters into Gwen's thoughts, it becomes clear that Gwen's marriage is just a single factor in her greater personal struggle to resolve the disconnect between who she is and who she believes she should be.[1]

On her honeymoon, Gwen makes a comment that gets to the heart of her inner struggle. In a conversation with her husband, Humphrey Strange, she admits that before her marriage she used to wish to be like other girls and attract and enjoy men's attention. As she continues on, she wonders "what it is to be natural [and wishes that she] was just a good, common, frowsy red cabbage-rose" (Iota 110). Gwen wishes that she fit into the Victorian Ideal and was an emotional, self-sacrificing natural woman. She believes that women naturally, as they are biologically born in nature, develop into the Victorian Ideal. As a result, she feels she is abnormal, unnatural, and strange, as her last name fittingly points out. However, through Charlie Brydon's portrait of Gwen, Iota suggested that the Ideal is not natural at all, but is socially constructed.[2] Shortly after their honeymoon, Strange and Gwen visit Brydon in Paris and accidentally happen upon his painting of Gwen on her wedding day. They both see it at the same time, but their reactions are very different. Strange fills with "eager excitement, while Gwen's face [grows] cold and still, with a touch of sternness on it" (Iota 115). As Strange studies the picture his eyes become "brimful of a terrible joy, and of a more terrible sadness"(Iota 116). Strange loves the picture, but is crushed by the fact that it is not reality. Gwen's reaction to the painting reveals her inner struggle and turmoil. Though, at this point, Gwen is incapable of love, she is not a cruel,

unfeeling, or insincere woman. On the contrary, it tears her apart to be dishonest and she truly desires to fulfill society's expectations. As the three discuss the picture, they make no secret that Gwen, as she currently is, is not the woman in the picture.

When Gwen sees the picture, it is clear just how much the Ideal woman taunts her. As she studies the portrayal of the bride, she constantly criticizes it, and insists Brydon show the original. At her urging Brydon shows the couple the original sketch and explains "…but I was trying to paint a bride, and there, in the first study, you didn't look just like one…" (Iota 116). Brydon, the artist, has taken Gwen, as she truly is, and recreated her in his artwork to be what he, Humphrey, and implicitly, all hegemonic Victorian men want her to be: the Ideal of Victorian femininity. When Gwen sees the original sketch, however, she is pleased with it and feels it is a true likeness, stating, "…yes, that's me, myself!" (Iota 116). Contradicting her, Humphrey argues that the picture is not a likeness or an idealization, but rather prophetic; he still believes that Gwen will become the woman he and society expect her to be. In reaction, Gwen turns to him "with curling, scornful lips"(Iota 116). It is clear to her, and it weighs on her, that she is not what she believes she is supposed to be and that she is not what Strange—or anyone else in society—wishes her to be. Using Gwen's portrait, Iota suggested that the Victorian Ideal is not natural, not an inherent attribute of women, but rather is socially constructed by men's desires and fantasies. Throughout the rest of the novel, Iota used Gwen's inner struggle to illustrate the identity crisis women endure because of the imposition of the Ideal.

In the last third of the novel, Gwen's identity struggle is developed through her relationship with her portrait. Having never liked the picture, as time goes on, she begins to loathe it and all that it symbolizes, mainly society's expectations. Thinking of the picture she says, "'I wish I had never looked at her, I shall get to hate her yet; she confuses me, she complicates matters in the most annoying way!'" (Iota 125). Later, Gwen discovers the painting in her home and is filled with "loathing and jealous hatred" (Iota 163). Gwen Desires to destroy it and kill all the womanliness that the painting radiates hatred. Gwen truly desires to be what she believes is a natural woman, the Victorian Ideal, but she simply cannot force herself, or find a way to be that person. Feeling trapped by society, Gwen had followed its guidelines and married Humphrey, but in that act she forsook herself and ended up living a dishonest life. Logically, she should leave Humphrey or live out the rest of her days in misery. However, in the final pages Iota seemed to reverse course by neatly solving Gwen's internal anguish through motherhood, suggesting that when a woman becomes a mother she will find happiness and even be able to fulfill the feminine ideal, no matter how at odds with it she is.

In the end of her novel, Iota did not condemn Victorian feminine Idealism, but she somewhat undercut the reforms she promoted in the first half of her narrative by suggesting that motherhood can realign conflicted women with the Victorian Ideal and bring them to peace with themselves. This does not mean that Iota did not desire reform or that she wrote to promote Victorian hegemonic idealism. Rather, as Cunningham stated in *The New Woman and the Victorian Novel*, Iota tried to accomplish two goals: "firstly, to argue the moral and social case for a high degree of emancipation, and secondly to show how firmly entrenched were the creeds and conventions which oppressed women" (49). Understanding these goals, it is clear that Iota's novel served as a further exposition of the conflicted position women held in the 1890s; though Iota understood the internal suffering women faced through the imposition of the Ideal, she was raised to be that Ideal and was affected by the desire she had to belong in society. As most New Woman novelists, Iota in *A Yellow Aster*, offered an honest look into women's lives in Victorian society and exposesd some of its ills. Iota exhibited the high expectations women faced, showed the various duties that pressured women, and exposed the personal turmoil that women had to undergo if they did not desire, or fit into, the single role they were expected to fulfill. Iota's failure to point women in a new direction does not make her novel a failed text. On the contrary, it provides readers with an insight into the true struggle late-Victorian women faced.

Iota's depiction of the pressure Victorian Idealism placed on individuals as they developed differed from Oscar Wilde's. Wilde focused his analysis on male dandyism, and, by exposing the failure of Decadence, promoted Aestheticism as a means through which society could safely relax its idealistic demands and allow differentiated, free individual development. Iota, on the other hand, centered her discussion on society's demand that all females conform to one feminine ideal. Through her novels' symbolism, Iota exposed the internal war and suffering that this demand caused women in order to suggest that women's roles should be expanded. Though each author created a different case study and focused respectively on philosophical self-development versus the expansion of women's roles and rights, both authors used a portrait, an art form, to confront Victorian society's Idealism and expose its detrimental effects on individual development and existence. Though Aesthetic dandies and women may have had little in common in everyday life, and may have desired different concrete changes in society, by studying Wilde and Iota, one can see that both groups truly desired, and could have benefitted from, the dethroning of Victorian Idealism.

Notes

[1] The following section of this paper, focused on Iota's *A Yellow Aster*, was developed from an earlier paper completed in an independent study under Dr. Audrey Fessler in the spring of 2008. Further information is listed in the Works Cited section of this article.

[2] This idea, suggested by Dr. Audrey Fessler, developed in conversations held on August 22, 2008.

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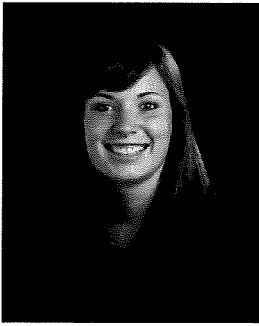
Autism and Assessing Preference for Attention

by
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Abstract

   The study explored whether attention can serve as a reinforcer and if preference for attention can be assessed with a preference assessment. Participants consisted of three children diagnosed with autism. The study included four phases: determining forms of physical attention (activities) to be assessed; utilizing a comparison design to teach the participants to label pictures of the activities; conducting a multiple-stimulus without replacement preference assessment to determine a hierarchy of preference for the activities; and utilizing an alternating treatments design to assess reinforcing effects of the activities. Results showed that several forms of physical attention can serve as reinforcers. Results from a Pearson's R correlation demonstrated that the preference assessment hierarchy was correlated with reinforcing effects for one of the three participants.

Introduction

   Autism is a pervasive developmental disorder that includes three main characteristics: deficits in social reciprocity, deficits in communication, and engagement in repetitive behaviors (Lord & Risi, 2000). Several studies have shown behavioral intervention to be an effective treatment for children with autism (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993; Sallows & Graupner, 2005; Cohen, Amerine-Dickens, & Smith, 2006). Lovaas (1987) showed 47% of participants who received 2-3 years of intensive therapy were able to achieve normal functioning, defined as having normal IQ scores and successfully completing the first grade. An additional 40% of those who received early intensive therapy showed significant improvements in functioning and IQ scores. Only 2% of those who did not receive early intensive therapy achieved the same results. Many researchers agree behavioral intervention has lead to substantial gains for many children with autism (Sallows & Graupner, 2005).

   The primary goal of behavioral intervention is to improve socially significant behavior (Cooper, Heron, Heward, 1987). Teaching skills requires identifying a reinforcer because it can be difficult to motivate children with developmental disabilities to comply with instructions. The lack of motivation often hinders teaching; therefore, items which are highly preferred, such as edible foods or tangible toys, are used to increase responding. When a behavior is immediately followed by a preferred item, and as a result the behavior is emitted more often in the future, the preferred item is referred to as a reinforcer. A possible solution for motivating individuals with developmental disabilities is varying reinforcers throughout therapy.

   Egel (1981) studied the difference between constant and varied reinforcement on the behavior of children with autism. In one condition (constant) the same reinforcer was presented for each correct response. In the second condition (varied) every third correct response was reinforced with one of three different reinforcers. Results showed a decline in correct responding and on-task behavior in the constant reinforcer condition and an increase in correct responding and on-taskbehavior in the varied condition. Implications suggested the use of varied reinforcement in therapy (Egel, 1981).

A common method for determining potential reinforcers is to determine highly preferred items with a preference assessment. There are four common preference assessment approaches: single-stimulus (SS), paired-stimulus (PS), multiple-stimulus (MS) and multiple-stimulus without replacement (MSWO).

Pace, Ivancic, Edwards, Iwata, and Page (1985) developed the single-stimulus approach (SS). Six participants with mental retardation were exposed to 16 different potential reinforcers comprised mainly of tangible and edible stimuli and a few forms of attention including clapping and hugging. Stimuli were presented individually, ten times each to the participants, and approaches to the stimuli were measured by observers. A reinforcer assessment was conducted to validate the procedure by demonstrating those frequently approached stimuli were stronger reinforcers than those that were not frequently approached.

Fisher *et al.* (1992) compared a paired-stimulus approach (PS) to the single stimulus approach (SS). The same stimuli used in Pace *et al.* (1985) were used in the Fisher *et al.* study. In the PS approach, participants were presented two stimuli concurrently and were instructed to "pick one." Each stimulus was paired with each of the other stimuli. Stimuli selected on a higher percentage of the trials in which they were available were interpreted as higher preferred items. Results showed the PS approach, in which one item was chosen over another, resulted in clearer preference hierarchies than the approach in which stimuli were presented singly.

Windsor, Piche, and Locke (1994) compared the paired-stimulus (PS) approach to a multiple-stimulus approach (MS). Unlike the single or paired-stimulus approaches, the multiple-stimulus approach presented all stimuli together. Stimuli included six edible items that were presented together ten times. Researchers instructed the participant to choose his or her most preferred item. Kendall rank correlation coefficients showed all of the stimuli in the PS approach to be consistent whereas only 5 of the 8 correlations in the MS approach were consistent. Results showed the MS approach was less time consuming than the PS approach, but a limitation of the approach was that the same item could have been chosen repeatedly. Results suggested the PS was more consistent than the MS approach.

DeLeon and Iwata (1996) extended the preference assessment literature by comparing the paired-stimulus, multiple-stimulus, and multiple-stimulus without replacement (MSWO) procedures. Seven edible and tangible stimuli, differing for each of seven participants with developmental disabilities were assessed. In the MSWO condition all stimuli were presented together. After the participant chose a stimulus it was removed from the array to prevent the participant from always selecting the same stimulus. The MS condition was similar except the stimulus was not removed from the array. The first stimulus chosen was the highest preferred and the last chosen was the least preferred stimulus. Results for all three approaches yielded the same highest preferred stimulus for four of seven participants. The Kendall correlation coefficient showed the PS and MSWO to have similar results. MS correlation coefficients were lower than PS and MSWO correlation coefficients. Results suggested the PS and MSWO were more consistent preference assessment approaches than the MS approach.

Each of the preference assessment approaches includes different presentation methods, which include presenting either tangible items or pictorial representations of items. Pictures are used to assess items that cannot be tangibly represented, such as community-based activities (Graff & Gibson, 2003). Studies have compared tangible and pictorial methods to determine if one method is more accurate than another. For example, Northup, George, Jones, Boussard, and Vollmer (1996) compared surveys, verbal, and pictorial presentation methods for children with attention deficit disorder and typical intelligence. Different categories of reinforcers were assessed including edibles, tangibles, activities, attention, and escape. Results showed verbal and pictorial presentation methods were more likely to identify items that function as reinforcers than were surveys.

Graff and Gibson (2003) compared tangible and pictorial preference assessments in individuals with developmental disabilities. In the tangible condition eight edible stimuli were assessed and in the pictorial condition pictures of the eight edible items were assessed. Results showed similar preference hierarchies for three of four participants. Reinforcer assessment results showed the highly preferred items on both tangible and pictorial assessments functioned as reinforcers.

Clevenger and Graff (2005) questioned whether prerequisite skills were needed for pictorial preference assessments. Researchers compared tangible and pictorial paired stimulus preference assessments in six people with developmental disabilities. Results showed similar hierarchies of preference for both the tangible and pictorial assessments for three participants who could match pictures and objects. Hierarchies of preference were not similar for three participants who could not match pictures and objects. Results suggested object to picture matching skills as a prerequisite for conducting a pictorial preference assessment.

In the preference assessment literature, researchers typically evaluate edible and tangible items (DeLeon and Iwata, 1996; Pace *et al.*, 1985; Egel, 1981; Windsor *et al.*, 1994). Little research has evaluated the reinforcing effects of attention. Attention has been evaluated as a reinforcer of problem behavior (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993; Iwata, Dorsey, Slifer, Bauman, & Richman, 1994; Fisher, Ninness, Piazza, & Owen-DeSchryver, 1996; Richman & Hagopian, 1999; Berg *et al.*, 2000); however, it has not been evaluated as a reinforcer of desired behavior for use during therapy. A few studies have looked at some forms of attention (Pace *et al.*, 1985; Northup *et al.*, 1996) but no studies to date have evaluated physical attention (physical play).

The goal of the current study was to promote the use of varied reinforcers by extending the preference assessment literature to include attention as a potential reinforcer. The current study utilized the MSWO preference assessment and pictorial presentation method to assess physical attention (physical play). Researchers evaluated whether physical attention could serve as a reinforcer and whether a preference assessment could be conducted to determine the reinforcing effects of physical attention.

Method
Participants
Cade and Nigel were 4-year-old males and Natasha was a 4-year-old female, all of whom met the diagnostic criteria for having an autistic disorder according to the DSM-IV (American Psychiatric Association, 1994). All participants were diagnosed by a physician independent of this study. At the time of the study Cade, and Nigel received forty hours a week of intensive in-home behavioral therapy. Natasha received about four hours of behavioral therapy in a setting on a college campus, as well as about three hours weekly in-home. All three participants displayed object and picture matching skills, as well as receptive and expressive language skills, during therapy prior to the study.

Setting and Materials
Sessions were conducted in the therapy room at each child's home. Sessions for Natasha were also conducted at the on-campus clinic setting. Materials included a digital camera, pictures of the activities printed on card-stock paper, data sheets, plastic forks, spoons, and spiders, colored blocks, clothespins, clear containers, and two timers.

Interobserver Agreement
A second observer recorded data across all phases for purposes of interobserver agree- ment. In Phase 2, agreements were defined as both observers recording either correct, error, or not applicable for the response. In Phase 3, agreements were defined as both observers having recorded the same selection or no selection for each trial. In Phase 4, agreements

were defined as both observers recording the same number of sorting responses. Interobserver agreement was computed by dividing agreements by agreements plus disagreements and multiplying by 100%. For Cade, data were collected across all phases on 32% of the sessions. Agreements ranged from 90% - 100% and averaged 99%. For Natasha, data were collected across all phases on 58% of the sessions. Agreements ranged from 90% - 100% and averaged 99%. For Nigel, data were collected on 37% of the sessions. Agreements ranged from 80% - 100% and averaged 97%.

A second observer independently recorded data for purposes of procedural integrity. For Phases 2, 3, and 4, data cards listed each step the experimenter should follow. The independent observer recorded whether the experimenter correctly or incorrectly followed these steps. A high degree of internal validity shows the changes in behavior are a function of the independent variable and not extraneous variables. Procedural integrity was computed by dividing correct responses by correct responses plus errors and multiplying by 100%. For Cade, data were collected on 29% of the sessions. Correct responses ranged from 83%-100% and averaged 97%. For Natasha, data were collected on 24% of the sessions. Correct responses ranged from 94% - 100% and averaged 99%. For Nigel, data were collected on 32% of the sessions. Correct responses ranged from 90% - 100% and averaged 99%.

General Procedure

The study consisted of four phases. In Phase 1, the researcher identified activities involving physical and verbal attention that could be potential reinforcers. Pictures of the therapist and participant engaging in these activities were taken with a digital camera to be used in a preference assessment. Pictures were then printed in color on 3 inch by 5 inch sheets of cardstock paper. In Phase 2, receptive and expressive labeling of the pictures were assessed. In Phase 3, a multiple stimulus without replacement (MSWO) preference assessment was conducted to determine preference for the activities identified in Phase 1 (DeLeon & Iwata, 1996). In Phase 4, a reinforcer assessment was conducted to establish whether the activities served as reinforcers for the child (Graff & Gibson, 2003).

Phase 1: Activity Identification

The parents and therapists who provided behavioral therapy for the child were asked to identify activities that appeared to be highly preferred by the child. Seven activities were chosen for all participants. The activities chosen for Cade included *Horse Ride*, a game in which the experimenter knelt on the ground and the participant rode on the experimenter's back. The therapist exhibited sounds and movements imitating a horse. *Blastoff* was a game in which the participant sat on a chair while the experimenter counted down from three to one and the participant said "blast off." The experimenter then lifted the chair and ran around the room while imitating the sound of a rocket blasting off. *Carousal* consisted of the experimenter holding the child in her arms and lifting him up and down while imitating the sound of a carnival ride. *Swing* consisted of the participant laying down in a blanket and the experiment lifting the blanket and swinging him back and forth while singing. *Spin* consisted of the experimenter holding the participant in her arms and spinning in a circle while saying "Woa." *Chase* was a game in which the experimenter chased the participant around the room while saying statements such as "Got you!" *Piggy* consisted of the experimenter running down the hall while holding the participant in a "piggy-back" position.

For Natasha, *Horse Ride*, *Spin*, and *Blastoff* were the same activities as described above for Cade. *Tickle* consisted of the experimenter lightly tickling Natasha. *Being An Animal* consisted of both the experimenter and Natasha positioning on hands and knees on the floor,

pretending to either be a cat or dog while making the vocalizations for the appropriate animal. *Tip Me* consisted of the experimenter holding Natasha in her arms with Natasha facing the experimenter. The experimenter would then lower Natasha's head towards the ground while stating "tip." The last activity was *Ready, Set, Go* which consisted of the experimenter and Natasha standing about four feet apart. The experimenter would say, "ready, set" and Natasha would then say "go" while running and jumping into the experimenter's arms.

For Nigel *Chase, Spin, Swing, Piggy,* and *Horse Ride* were the same activities as described for Cade. *Timber* consisted of either Nigel or the experimenter lying on the floor and the other person standing at his/her feet with his/her arms up. He/She proceeded to fall onto the other person while vocalizing "timber." *Can't Get Up* was a game that consisted of the therapist holding Nigel in her lap while he tried to get up. She told him "can't get up" and pulled him back into her lap.

Phase 2: Picture Identification

Receptive labeling. In the baseline condition the child sat at a table facing the experimenter, who placed pictures of the activities on the table in an array of three cards. The experimenter instructed the participant to select an activity. For example, "Give me horse ride." If the participant gave the wrong card (any card except for horse ride) it was set aside for teaching. If the participant gave the correct card (horse ride) the participant was given ten to fifteen seconds of the activity. Mastery criterion for baseline was choosing the correct picture for one trial across three sessions. Any picture that did not meet this criterion was taught in the treatment condition.

In the treatment condition, a constant prompt delay procedure was implemented (Snell & Gast, 1981). On the first day of teaching the participant was immediately physically prompted (0-second delay) to give the correct picture to the experimenter on the first four trials. The participant was not given access to the activity shown in the picture following each prompted trial but was given verbal praise (eg. "good job giving *Horse Ride*"). The fifth trial of the first day and all subsequent sessions consisted of a four-second prompt delay for all trials. If the participant gave the correct picture within four seconds of the instruction being given, praise and immediate access to the activity corresponding with the picture (e.g. participant given ten to fifteen seconds of *Horse Ride*) were delivered as a reward. If there was no response, or if the participant erred within four seconds of the instruction being given, a correction procedure was implemented. The correction procedure consisted of the experimenter returning to an immediate prompt (0-second delay to give the correct picture) for one trial. Following the prompt, the participant was given four seconds to respond correctly. If there was no response, or an error occurred, the correction procedure was repeated. The first trial following an error included an immediate prompt. On the next trial the participant was again given the opportunity to respond independently. The criterion for mastery was choosing the correct picture for six consecutive correct trials across two sessions.

Expressive labeling. In the baseline condition the participant sat in a chair facing the experimenter. The experimenter held up each picture and asked "What are they doing?" If the participant gave an incorrect response, the picture was set aside to be taught. If the participant gave the correct response, he was given ten to fifteen seconds of the activity on the picture. Mastery criterion in the baseline condition was saying the correct name of the activity on the picture for one trial across three sessions. All pictures that did not meet this criterion were taught in the treatment condition.

Treatment sessions for expressive labeling utilized the same constant prompt delay procedure as receptive labeling; however, the prompting procedure differed in that a verbal response was given rather than a physical response. On prompted trials the participant was

given verbal praise (*e.g.*, "yes, spin!"). Correct responses resulted in praise and access to the corresponding activity (*e.g.*, ten to fifteen seconds of *spin*). The criterion for mastery was correctly labeling the activity on the picture for six consecutive correct trials across two sessions.

Phase 3: Preference assessment

 Response Measurement. A selection response was defined as the participant touching one of the presented picture cards after the experimenter gave the instruction "pick one." The participant had fifteen seconds to select a picture. When a selection was made, the trial ended after the participant received fifteen seconds access to the activity. If no picture was selected within fifteen seconds after the instruction was given, the session ended and all remaining pictures were recorded as "not selected."

 Procedure. When the participant met the mastery criterion for receptive and expressive identification of all pictures, the pictures were tested for maintenance. The participant was unable to identify the activity *Piggy* and therefore it was removed from the study. Each session began with all six pictures sequenced randomly in two rows of three on the table, four inches apart. While the participant stood next to the table approximately six inches from the pictorial array, the experimenter instructed the participant to "pick one" and started the timer. After a selection was made the timer was reset for fifteen seconds and the child was given fifteen seconds access to the activity and the picture was removed from the table, according to the MSWO procedure. Prior to the next trial, the pictures were shuffled and replaced on the table. The second trial followed immediately. This procedure continued until all pictures were selected or until the participant made no selection within fifteen seconds after the instruction was given.

Phase 4: Reinforcer assessment

 Response measurement. In Phase 4, a multi-element within a reversal design was used to evaluate the reinforcing value for each activity. Each participant was required to complete a simple task that he or she had previously acquired in therapy. Cade sorted identical items. A correct response was defined as sorting two forks and two straws into the appropriate container. Natasha also sorted identical items, and a correct response was defined as sorting two clothespins into one container and two toy spiders into the other container. Nigel sorted by feature, and a correct response was defined as sorting all blue blocks into one container, all yellow blocks into another container, and all red blocks into the remaining container.

 Procedure. In the baseline condition the experimenter placed materials on the table, seated the participant at the table, instructed the participant to "sort", and started the timer. When a response was made, the materials were replaced on the table, and the participant was again instructed to sort. No programmed consequences were used in the baseline condition. Only correct responses were recorded. Data collected in the baseline condition served as a comparison for treatment to determine if responding would increase as a result of the activity being presented as a reinforcer. Baseline sessions lasted five minutes or until problem or escape behavior occurred.

 Treatment sessions lasted five minutes, and for every correct response fifteen seconds access of the activity randomly assigned for that session was given. For example, Cade was instructed to "pick one" and the experimenter started the timer. As soon as Cade selected a picture (*Horse Ride*) the therapist started the timer for fifteen seconds and gave Cade the corresponding activity (*Horse Ride*). When the timer went off the therapist again presented the sorting materials and instructed the participant to sort until five minutes ended or the participant engaged in problem behavior or escape behavior. Two sessions were conducted per day and only one activity was assessed each session in a counterbalanced, random order. For example, the participant might have received *Swing* as the reinforcer during the morning session and *Spin* as the reinforcer in the afternoon session. The

next day he or she might have received *Chase* as the reinforcer in the morning and *Horse Ride* as the reinforcer in the afternoon. A reversal to the baseline condition was implemented after treatment. The reversal to baseline condition was identical to the previous baseline condition.

Results
Phase 2

Figure 1 shows Cade receptively identified pictures of *Blastoff, Carousal, Piggy*, and *Spin* in the baseline condition; therefore, *Horse Ride* and *Swing* were taught during the treatment condition. All targets attained mastery; however, Cade lost the ability to choose *Piggy* from an array of pictures.

Figure 2 shows Cade expressively identified blast off in the baseline condition; therefore, *Carousal, Piggy, Spin, Horse Ride*, and *Swing* were taught during the treatment condition. All targets attained mastery; however, Cade lost the ability to label *Piggy* and therefore that target was dropped from the study.

Figure 3 shows Natasha expressively identified the picture of *Tipping*; therefore, all other pictures were taught during the treatment condition. Natasha showed difficulty identifying the picture of *Being An Animal* which was then dropped from the study. Natasha met criterion for all other targets.

Figure 4 shows Natasha receptively identified all targets in the baseline condition; therefore, it was not necessary to teach the pictures expressively and experimenters moved to Phase 3.
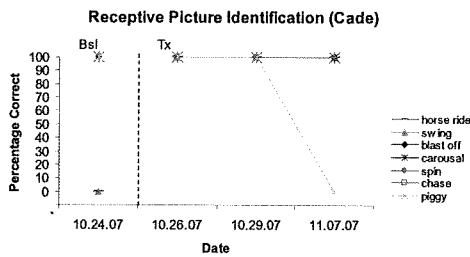
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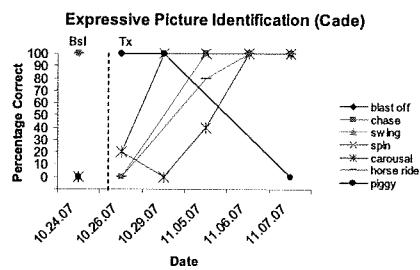
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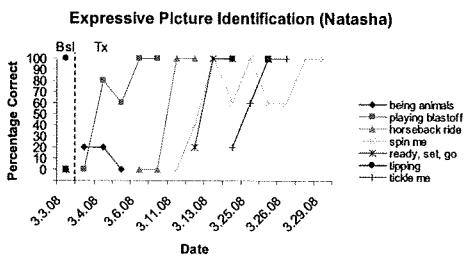
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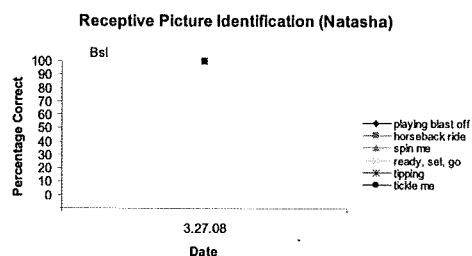
Figure 4

Figure 5 shows Nigel expressively identified swinging in blanket in the baseline condition; therefore, *Spin, Tip Me, Piggy, Timber, Can't Get Up*, and *Chase* were taught during the treatment condition. Nigel met criterion for all targets.

Figure 6 shows Nigel receptively identified all targets in the baseline condition; therefore, it was not necessary to teach the pictures expressively.

Phase 3

Figure 7 displays the rank for each activity across seven sessions. Activities are presented from left to right, rank-ordered. A rank of 6 represents the first activity chosen and the highest preferred activity for that day. A rank of 1 represents the last activity chosen and the lowest preferred activity for that day.

Figure 8 shows the average rank across seven sessions for each activity. The hierarchy of preference shows *Carousal* (4.85) and *Chase* (4.71) to be the highest preferred activities and *Spin* (2) and *Horse Ride* (1.71) to be the lowest preferred activities.
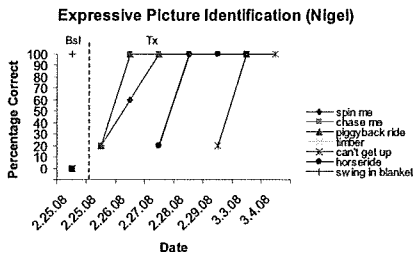
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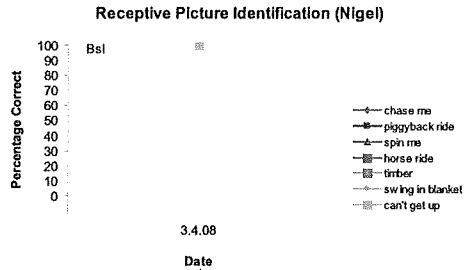
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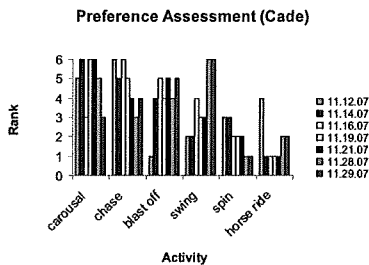
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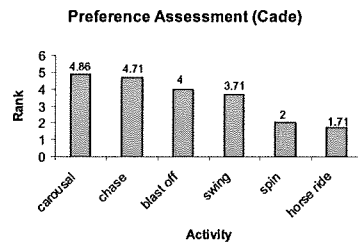
Figure 8

Figure 9 displays Natasha's rank for each activity across six sessions. The preference as sessment for Natasha was only conducted six times due to little change in preference in the prior three sessions and limited time to complete the study.

Figure 10 shows the average rank across six sessions for each activity. The hierarchy of preference showes *Tickle* (5.83) was the highest preferred activity. *Ready, Set, Go* (2.67) and *Spin* (2.17) were less preferred; however, results did not create a clear hierarchy of preference for the activities.

Figure 11 displays Nigel's rank for each activity across seven sessions.

Figure 12 shows the average rank across seven sessions for each activity. The hierar-chy of preference shows *Chase* (7.0) was the highest preferred activity chosen first in all sessions; whereas *Horse Ride* (1.4) was the lowest preferred activity.

Phase 4

Figure 13 shows results for the reinforcer assessment for Cade. During the first trial of the baseline condition Cade sorted during 30% of intervals. Without reinforcement his sorting rate quickly declined to 0% of intervals. When Cade was given an activity as a reward, sorting occurred more often than during baseline. Sorting for all activities occurred during a

range of 40% and 80% of intervals. Then, during the reversal to baseline condition, sorting sharply increased to 100% of intervals before declining and stabilizing during 30% of intervals.
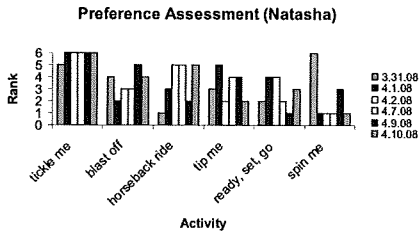
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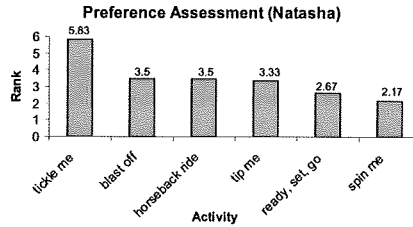
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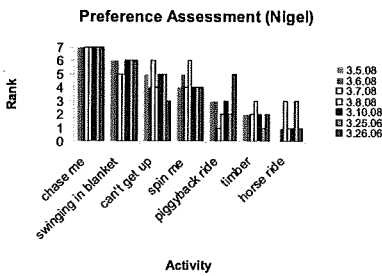
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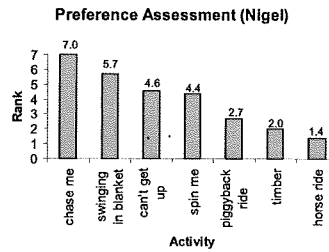
Figure 12

Figure 14 shows results for the reinforcer assessment for Natasha. During the first trial of the baseline condition Natasha sorted during 40% of intervals. Sorting declined to 20% before treatment began. During the treatment condition, when certain activities were given as a reward, sorting did not increase from baseline. For example, when *Tickle* was the reward, Natasha only sorted during 30% (1st session) and 0% (2nd session) of intervals. For *Ready, Set, Go* she sorted during 10% and 30% of intervals. For some activities there was an increase from baseline. For *Tip Me,* she sorted during 50% and 70% of intervals. For *Blastoff,* she sorted during 50% and 90% of intervals. The other activities did not demonstrate a clear increase from baseline. For *Horse Ride,* sorting occurred during 90% and 20% of intervals and for *Spin* sorting occurred during 80% and 10% of intervals. The reversal to the baseline condition showed when the activities were no longer given as a reward, sorting decreased 50% to 0%.
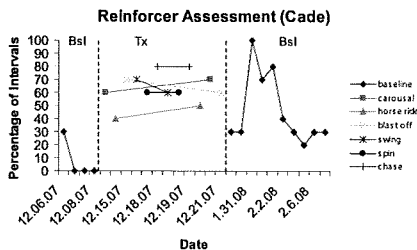
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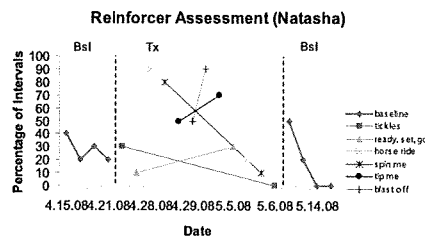
Figure 14

Figure 15 shows results for Nigel's reinforcer assessment. During the baseline condition, there was a decrease in sorting from 80% to 10% of intervals. Treatment began when sorting stabilized at 10% of intervals. During the treatment condition, when most activities were given as rewards, sorting increased from baseline. For example, when *Chase* was the reward, Nigel sorted during 80% and 70% of intervals. For *Can't Get Up,* he sorted during 50% and 70% of intervals. For *Timber,* he sorted during 40% and 50% of intervals. Some activities, such as *Piggy* (60% and 30%) and *Spin* (30% and 40%), showed less of an increase from 10% during the baseline condition. Two activities did not increase sorting, including *Horse Ride* (30% and 10%) and *Swing* (40% and 10%). A reversal to the baseline condition showed a decrease in sorting from 30% to 10%.

Table 1 displays results for a Pearson's *r* bivariate correlation between preference assessment rank and the percentage of sorting during the reinforcer assessment. Alpha was set at .05. Results for Cade were statistically significant demonstrating that the preference assessment hierarchy was correlated to the amount of sorting during the reinforcer assessment, $r(6) = .811$, $p = .050$. Data for Natasha, $r(6) = -.370$, $p = .471$, and Nigel, $r(7) = .533$, $p = .218$, were not significant.
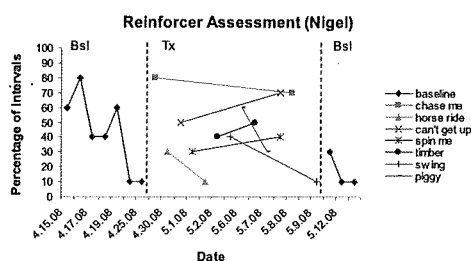
Figure 15

Table 1. *Pearson's r Correlation Between the Preference Assessment and the Reinforcer Assessment*

	Pearson's *r* Correlation	Significance Level
Cade	.811	.050*
Natasha	-.370	.471
Nigel	.533	.218
Note. Significance level set at p ≤ .05.		

Discussion

Motivating children during therapy can be difficult, and research suggests motivation can be increased by varying reinforcers (Egel, 1981). Preference assessment studies have typically evaluated edible and tangible items including several types of foods, drinks, and toys for use as reinforcers. Little research has evaluated the use of physical attention (physical play) as a reinforcer for behavioral therapy. If physical play were shown to be a reinforcer, therapists would be provided another kind of reinforcer to employ during therapy. The current study assessed if physical play could serve as a reinforcer. Preference assessments are among the most common methods for determining potential reinforcers; therefore, this study also assessed whether a preference assessment hierarchy would be correlated to the reinforcing value of the physical play activities.

Results from the reinforcer assessment (Phase 4) demonstrated that physical attention (play) can serve as a reinforcer. Results varied, but generally showed an increase in sorting behavior

from baseline (in which no reinforcement was given) to treatment (in which different physical play activities were given), and then a decrease from treatment to the reversal to baseline condition. During the reversal to baseline condition for Cade there was an initial sharp increase in sorting that can be interpreted as an extinction burst. When behavior is put on extinction, or no reinforcement is given, there is often a sharp increase in behavior before the behavior begins to decline (Cooper *et al.*, 1987). After the extinction burst, Cade's sorting behavior declined. Data during the reversal to baseline condition for Natasha and Nigel showed a decrease in sorting. Results of the current study demonstrate that all six forms of physical play increased Cade's sorting behavior; two of six activities increased Natasha's sorting behavior; and five of seven activities increased Nigel's sorting behavior. Implications suggest physical play can be used as a reinforcer during therapy.

If physical play is considered for use as a reinforcer during therapy, therapists must be able to determine if the child prefers the activity and, therefore, if the activity likely has reinforcing value. A multiple-stimulus without replacement preference assessment was conducted with the use of pictures. A hierarchy of preference was determined for each participant and then compared to amounts of sorting during the reinforcer assessment. It was hypothesized that the highest preferred activities would be correlated with the highest amounts of sorting and the least preferred activities with the least amount of sorting. Results from the bivariate Pearson's r correlation were statistically significant for one of three participants. These results are inconclusive.

A limitation of the current study was the small sample size. Although results suggest physical attention functions as a reinforcer, further research is needed to determine if items that are highly preferred in a preference assessment are correlated with higher amounts of sorting than items of lower preference.

Replication of the current study on the use of attention as a reinforcer would be beneficial. One idea is to evaluate verbal attention alone as a reinforcer. The current study did not separate verbal from physical attention. Future research could compare verbal and physical attention.

Another idea for future research is to compare attention to edible and tangible items and determine whether children have a preference for one category over another. At times during the experiment it appeared as though a visible tangible reinforcer was competing with the activity being given during the reinforcer assessment. Competing reinforcers could partially explain why some activities did not function as reinforcers, but further research is needed to establish this.

Researchers could also expand on the method for determining preference for attention. Pictorial presentation methods are recommended for participants who have object and picture matching skills. Methods need to be assessed with participants who lack these skills. With so little research concerning attention and preference there are a multitude of research ideas that could extend from this study.

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Correlates of Students' Perceptions of Their Educational Mentoring Experiences

by Michael A. Ojibway

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Abstract

Underrepresented (or "ethnically diverse") students of color have consistently displayed lower retention and graduation rates when compared to White/Non-Hispanic (or "non-diverse") students in postsecondary education. Because mentoring relationships have been proposed to be important for academic success (Campbell & Campbell, 2007; Johnson & Huwe, 2003), we investigated the mentoring perceptions of 189 current ethnically diverse and non-diverse students at the University of Wisconsin-Eau Claire. Ethnically diverse and non-diverse students reported nearly identical ideal mentor preferences and neither group reported a strong preference for a mentor of the same gender or ethnicity. Ethnically diverse students were less likely to report being in an informal mentoring relationship and voiced greater instances of negative regret towards their mentor than non-diverse students. We discuss our findings in the context of previous studies showing the effectiveness of informal mentoring relationships over formally assigned ones and, hence, raise the implications of our findings as factors to consider for designing successful academic interventions for ethnically diverse students (Hopkins, 2003; Rose et al., 2005).

Introduction

According to the University of Wisconsin (UW) System's Plan 2008, UW schools suffer from low levels of minority enrollment and retention. Dwindling recruitment and retention levels among minority students constitute fairly common and consistent trends at traditional public American universities and causes the concern reflected in the body of literature devoted to the study of minority success in higher education. An increasingly popular goal among institutions of higher education involves the support of major university-wide initiatives that promote the expansion of ethnic and cultural diversity. Although the prediction of academic success for any ethnic group involves numerous variables, mentoring relationships have been proposed to be positively associated with academic success (Johnson & Huwe, 2003). If mentoring facilitates psychological adjustment overall, would one be wrong to presume that minority students engage in significantly fewer effective educational relationships?

Defined as a more experienced (usually older) person who acts as a guide, role model, teacher, or sponsor of a less experienced (usually younger) individual, a mentor is someone outside of the immediate family who provides his or her protege knowledge, advice, challenge, counsel, and support in the area of interest. In this study, we were interested in assessing and categorizing diverse and non-diverse students' perceptions of educational mentors, that is, individuals who have supported their academic development. An obstacle to a replicable investigation of the effectiveness of educational mentors is that most literature pertaining to mentoring, its impact on increased employee performance and retention, refers to a corporate environment. Few studies focus on mentoring's effects on postsecondary students' retention and academic performance (Brashear, Bellenger, Boles,& Barksdale, 2006). The lack of literature relevant to mentoring and minority academic performance and retention is even more pronounced.

Although literature on educational mentoring is comparatively thin, mentoring has been positively associated with increased grade point averages, loftier achievement goals, and a reduction in high-risk behaviors such binge drinking among undergraduate students (Johnson & Huwe, 2003; Araujo & Wong, 2005; Maney, 1990; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). Perhaps, as the literature suggests, few studies focus primarily on the effectiveness of educational mentoring among minority student populations because of the specific challenges that confront minority student mentoring. These include various cultural emphases, including an extreme deference to authority, emotional pressure from extended family members to contribute to the care of elders within a community, and a misperception of cross-cultural competence (Carter, 2000; McGregor, 2006). Past research on educational mentoring has overlooked distinct and influential behavioral parameters existent among ethnically diverse cultural groups. The current study, therefore, systematically surveys participants of both White/Non-Hispanic and ethnically diverse status.

Cultural differences aside, other obstacles can prevent the intentional formation of an effective mentoring relationship. These include, but are not limited to, personal time constraints, ethnicity and gender preference, and the extensive cost of training and matching effective mentoring pairs (Williams, Levine, & Malhotra, 2004). Although one might assume that minority students would prefer a mentor of his or her own ethnicity, the literature suggests otherwise. Lyons and Oppler (2004) found that factors of the mentoring relationships, such as frequency of meeting and assignment interaction, played a more valuable role than gender or ethnic make-up did in promoting effective mentor-protégé pairs. Thus, the current research employs an ideal mentor preference assessment, which includes a section that categorizes participants' preference of mentor ethnicity and gender. Similar to previous researchers (*e.g.*, Carrera, 2002), we hypothesize that ethnically diverse students will rate the ethnicity and/or gender of their ideal mentor as minimally important.

Similarly, substantial evidence exists to support the prediction that factors other than gender or ethnic make-up warrant a successful mentor-protégé relationship. Informal mentoring relationships originate from similar personal interests and involve a voluntary interaction between the mentor and protégé. Informally maintained mentoring relationships have been shown to produce greater levels of productivity, as well as enhanced satisfaction and gratification, among both mentors and protégés (Hopkins, 2003; Rose *et al.*, 2005). To assess this possibility, the current study includes a thorough mentor functions scale and a mentor assignment categorization response. In a two-part hypothesis, we propose that: 2a) ethnically diverse students will be less likely than non-diverse students to report the existence of informal mentoring relationships; and, 2b) students involved in informal mentoring relationships will have more favorable, and fewer unfavorable, perceptions of their relationship than will those in formally assigned mentoring relationships.

Finally, while no study has explicitly examined the potential discrepancies between mentor assignment and ethnic diversity status, our investigation will indirectly attempt to do so through a mentor function and assignment comparison. This study cross-checks the participants' preference for mentor ethnicity, and includes a variety of assessment and demographic sections to reveal correlational relationships affecting the educational success of minority students. The implications of potential mentor assignment discrepancies across ethnic diversity status may hint at the existence of an unwelcoming or isolating learning environment, one not conducive to minority students' academic performance and success.

Method
Participants

A total of 189 undergraduate students from a regional, public university participated. Participants ranged in age from 18 to 43 years, with the typical student averaging 21 years of age. Twenty-two percent of the participants identified themselves as ethnically diverse, and the other 78 percent were White/Non-Hispanic ("Non-Diverse"). The majority of participants were Caucasian and female.

Measures

Participants completed a nine-item Mentor Overview section as part of a larger questionnaire assessing the perceived and actual effectiveness of their current or most recent educational mentoring relationship. Items on the Mentor Overview section measured the total number of past mentors, mentors' age, gender, race, and ethnicity, and the mode of assignment of the current or most recent mentor. In addition, it queried participants' perceived regrets about the current or most recent relationship, and a global assessment of the current or most recent mentoring relationship.

Participants also completed a modified version of the Ideal Mentor Scale from Rose *et al.* (2003). The original 20-item scale, designed to formulate a projection of the preferred characteristics of an ideal educational mentor, measures character preference on the basis of integrity, relationship, and guidance. Each item was rated on a five-point Likert-type scale (1=Not at all Important, to 5=Extremely Important). Sample integrity items included (My ideal mentor would...) "give proper credit to people at my level" and "respect the intellectual property rights of others." Sample relationship items included (My ideal mentor would...) "take me out for dinner or a drink after work" and "relate to me as if he/she is a responsible, admirable older sibling." Sample guidance items included (My ideal mentor would...) "show me how to employ relevant learning techniques." and "help me to maintain a clear focus on my learning objectives." The original scale was modified to include categorical ideal mentor preferences regarding age ("be older than I am"), compatibility ("share my interests and hobbies"), political influence ("hold similar political attitudes as me"), gender ("be male/be female"), peer influence ("be about my age"), and ethnicity ("be the same race/ethnicity as I am"). Mean scores were calculated for each construct and appear in Table 1.

Table 1. Ideal Mentor Preference Ratings in Descending Order from Most to Least Important

Preference Category	Example ("My ideal mentor would..."	Non-Ethnically Diverse Mean (SD)	Ethnically Diverse Mean (SD)
Integrity	... give proper credit to people at my level.	3.97 (.51)	3.92 (.45)
Guidance	... help me to clarify my learning objectives.	3.51 (.63)	3.61 (.55)
Age	... be older than I am.	2.75 (1.12)	2.69 (1.24)
Relationship	... take me out for dinner after work.	2.54 (.60)	2.50 (.62)
Compatability	... share my interests and hobbies.	2.13 (.86)	2.19 (1.10)
Political	... hold similar political attitudes as me.	1.95 (1.04)	1.64 (.76)
Gender 1	... be female.	1.45 (.95)	1.68 (1.19)
Gender 2	... be male.	1.14 (.46)	1.14 (.41)
Peer Influence	... be about my age.	1.38 (.62)	1.48 (.80)
Ethnicity	... be the same race/ethnicity as me.	1.19 (.49)	1.40 (.67)

Note. Ideal Mentor Scale scores could range from 1 to 5 ("Not at all important" to "Extremely important"). Preference ratings for gender and ethnicity were essentially at floor; no students reported the shared ethnicity of their mentor as ""Very important" or "Extremely important."

While reporting on their current or most recent mentor, participants completed the Mentor Functions Scale (Johnson & Huwe, 2003), which measures the perceived effectiveness of the mentoring relationship. The nine-item inventory was rated on a five-point Likert-type scale (1= Strongly disagree to 5=Strongly agree). Sample items from the Mentor Functions Scale included

"My mentor calls forth and affirms my life and career aspirations" and "My mentor continually reassures me of the quality of my work." Mean scores were calculated for the nine-item inventory as a function of mentor assignment.

Later in the questionnaire, participants completed the Goal Orientation Inventory. The scale was designed to assess the academic goal orientation of students in a competitive academic environment, *i.e.*, postsecondary education. Each item on the seventeen-item inventory was rated on a five-point Likert-type scale (1=Strongly disagree to 5=Strongly agree). Sample items from the Goal Orientation Inventory included "A major goal I have in my courses is to get higher grades than other students" and "In my classes I focus on developing my abilities and acquiring new ones."

Near the end of the questionnaire, participants completed an extensive demographical section outlining the various categories of their current academic achievement/performance, parental education levels, and family/household income.

Procedure

This study followed a correlational design. The questionnaire was developed in an online format through http://www.surveymonkey.com to ensure maximum participation and participant anonymity. The sample population was targeted via random email prompts from a diverse sampling of academic departments and ethnic diversity status (Biology, Business, Geography, American Indian Studies, Psychology, Multicultural Affairs ethnicity listserves). Self-identified ethnically diverse students (African American, American Indian, Latino/a) were sent multiple prompts to ensure an adequate level of participation among an underrepresented student population. Prompts included a brief introduction of the study and an interactive hyperlink to the Surveymonkey.com questionnaire. Participants were provided an extensive debriefing after completing the final demographic section of the survey instrument. The total procedure took approximately fifteen minutes. See appendices A-E10 for a series of detailed screenshots of the online survey instrument.

Results

Table 1 displays descriptive statistics for Ideal Mentor Preference construct ratings as a function of ethnicity. As displayed, Hypothesis 1 was supported in that both non-diverse and ethnically diverse students demonstrated nearly identical trends in their ideal mentor preference ratings for all sections of the Ideal Mentor Scale (Rose *et al.*, 2005). Further, the diversity status groups shared a remarkably similar trend in their top five ideal mentor preference ratings (Integrity, Guidance, Age, Relationships, and Compatibility). Although non-diverse students rated that their mentor be of their same ethnicity slightly lower in importance ($M = 1.19$, $SD = .49$), than did ethnically
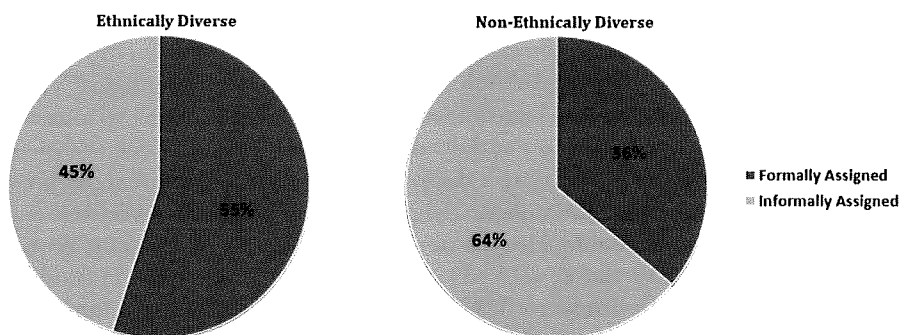
Figure 1: Characterization of Mentor Assignment as a Function of Ethnic Diversity Status.

diverse students (M = 1.40, SD = .67), t (186) = -2.28, p = .02, ratings were essentially at floor for both groups. Similarly, both ethnically diverse and non-diverse students rated having a mentor of the same sex as minimally important (ratings were essentially at floor).

Figure 1 displays the characterization of mentor assignment as a function of ethnic diversity status. A chi-square analysis revealed that the percentage of participants engaging in informal mentoring relationships did differ significantly by ethnic diversity status. As predicted in Hypothesis 2a, fewer ethnically diverse students (45%), than non-diverse students (64%), reported an informal mentoring relationship.

In support of Hypothesis 2b, participants who engaged in informal mentoring relationships evaluated their mentor more positively (M = 4.13, SD = 0.52) on the Mentor Functionsscale than did those who engaged with formally assigned mentors (M = 3.66, SD = 0.82), $t(181)$ = 4.79, p = .00.
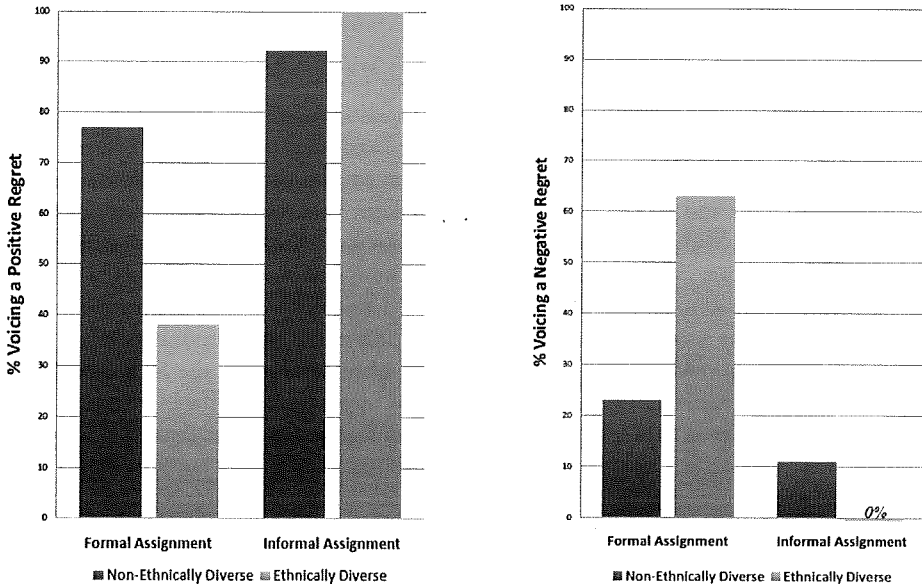
Note: Formal $\chi2$ (1) = .326, p = .07; Informal $\chi2$ (1) = .33, p = .566   *Note: Formal $\chi2$ (1) = .326, p = .071; Informal $\chi2$ (1) = .513, p = .474*

Figures 2 and 3: Percentage of students reporting positive regrets about their mentor or mentoring relationship.

We also analyzed the content of proétél regrets to test this hypothesis. Figures 2 and 3 display the percentage of students reporting positive regrets about their mentor or mentoring relationship ("My only regret is that our relationship had to end when my mentor retired") and the per centage of students reporting negative regrets about their mentor or mentoring relationship ("She pretty much rendered herself useless by not really doing anything") as a function of their ethnicity and method of mentor assignment. Figure 2 displays inflated levels of positive regret for students involved in informal mentoring relationships. The percentage of participants who were engaged in formal and informal mentor relationships did not differ significantly by ethnicity, Formal $\chi2$ (1) = .326, p = .07(p > .05); Informal $\chi2$ (1) = .33, p = .566 (p > .05). However, in considering the small sample size of ethnically diverse participants, ethnically diverse students in formally assigned relationships, were measurably less likely to voice positive regrets compared to their non-diverse counterparts, as demonstrated in Figure 2. These findings suggest that ethnically diverse students do not perceive formally assigned mentoring relationships as favorably as do non-diverse students.

Figure 3 displays a similar trend, with both ethnically diverse and non-diverse students in informal mentoring relationships less likely than those in formally assigned relationships to voice complaints (negative regrets) about their mentor, $\chi 2$ (1) = .36, p = .06. Further, among those in formally assigned mentoring relationships, ethnically diverse students were somewhat more likely, than non-diverse students, to voice complaints of regret, *Formal* $\chi 2$ (1) = .326, p = .071; *Informal* $\chi 2$ (1) = .513, p = .474. Finally, informally assigned ethnically diverse students tended to have higher achievement levels ($M = 3.23, SD = 0.37$) and empowering learning goals ($M = 4.37, SD = 0.44$) than did formally assigned ethnically diverse students (achievement $M = 3.28, SD = .60$; empowerment $M = 4.17, SD = 0.46$). Because of our small sample, no statistically significant differences were observed, $ps > .10$.

Discussion

The minimal importance ratings for the ethnic make-up of ideal mentors support previous research suggesting that shared interests, assignment interaction, and frequency of meeting are more important than are the gender or ethnic make-up of the protégé-mentor relationship (Lyons & Oppler, 2004). No participants in this study reported the shared ethnicity of their ideal mentor as "Very Important" or "Extremely Important;" this suggests that the core values students seek, in an ideal educational mentor, relate more closely to personal interests and values than to ethnic background. Although prior research also suggests that mentor-pairing by race/ethnicity may contribute to higher levels of perceived relationship satisfaction and pair similarity (e.g., Ensher & Murphy, 1997), our study demonstrates the minimal preference ethnically diverse students place on the ethnicity of their ideal mentor when prompted with a series of ideal mentor character traits. Ethnically diverse students, and faculty, are commonly disproportionately underrepresented in institutions of higher education when compared to White/non-Hispanic students, and faculty. Further, in an academic learning environment in which ethnically diverse students typically far outnumber ethnically diverse faculty and staff members, our findings suggest that mentor-pairing by ethnicity alone may not be necessary, especially given that it may result in mentor fatigue or "burn-out" (Tatar & Horenczyk, 2003).

Our study also demonstrated that both ethnically diverse and non-diverse students place little importance on the gender of their ideal mentor. These findings support previous research that suggests mentor matching by gender produces little or no apparent advantages when compared to an un-mentored control group (Campbell & Campbell, 2007). As indicated in Table 1, the personality traits of the mentor (integrity and guidance), maturity (age), and shared values/interests(compatibility) seem to represent the foundational elements of an effective educational mentoring relationship among both diversity status groups. As displayed in Table 1, both ethnically diverse and non-diverse students demonstrated a remarkably similar trend in the categorical preference rating of their ideal mentors. The two groups demonstrated an identical order of preference among their top five ideal mentor preference constructs (Integrity, Guidance, Age, Relationships, and Compatibility). The nearly identical trend in mentor preference ratings supports previous research that suggests both ethnically diverse and non-diverse students find value in educational mentoring relationships that emphasize autonomy, shared interests, and trust-building (Liang & Grossman, 2007).

In the broader picture, our research holds implications for thinking about the way university administrators and faculty members assign, or approach, ethnically diverse students for mentoring purposes. We have demonstrated that ethnically diverse students do not necessarily prefer an educational mentor of their ethnicity. Although it is important to keep in mind individual differences in student preferences, our mean importance ratings imply that educators who make mentoring relationship decisions could benefit from focusing less on the ethnic make-up of the relationship and more on the quality of the interaction.

As displayed in Figure 1, Hypothesis 2 was supported: Over half (55%) of ethnically diverse students reported that they were currently or most recently in a formally assigned mentoring relationship compared to only 36% of non-diverse students. The literature suggests that informal mentoring relationships are more functionally effective and benefit both the mentor and protégé (Hopkins, 2003; Gail et al., 2005). If ethnically diverse students are less successfull in entering, and maintaining, informal mentoring relationships, or if educators are not intentionally seeking out ethnically diverse students (perhaps because they are worried that these students prefer mentors of the same ethnic background), then these trends may partially explain these students' low levels of recruitment and retention in post-secondary educational institutions. Formally and informally assigned students did not differ in their ACT scores, current college GPA, or learning goals; demonstrating that students engaging in informal mentor relationships are not necessarily higher achieving and/or more likely to seek out/ be sought out by a potential mentor.

Hypothesis 2b, that students involved in informal mentoring relationships would have more favorable (and less unfavorable) perceptions of their relationships than would those in formally assigned mentoring relationships, was supported. Figures 2 and 3 display the percentage of students reporting positive ("My only regret is that our relationship had to end when my mentor retired") and negative ("She pretty much rendered herself useless by not really doing anything") regrets as a function of their ethnicity and mentor relationship. Figure 2 displays inflated levels of positive regret for students involved in informal mentoring relationship. Figure 2 also suggests that ethnically diverse students in formally assigned relationships were less likely to voice positive regrets compared to their non-diverse counterparts. Thus, formal mentoring relationships might not be as useful or functional for ethnically diverse students as they appear to be for non-diverse students. Some institutions of higher education have implemented multicultural mentor matching programs that pair ethnically diverse underclassman with ethnically diverse and non-diverse upperclassman of similar academic and personal interests. Our findings support previous research that suggests ethnically diverse students might benefit more from a structured social program that encourages informal mentoring on the basis of shared personal and academic interests among peers and faculty members (Ulloa & Herrera, 2006).

Figure 3 displays a similar trend, with students, both ethnically diverse and non-diverse, in informal mentoring relationships being far less likely, than those in formally assigned relationships, to voice complaints (negative regrets) about their mentor. Further, ethnically diverse students with formally assigned mentors were more likely, than non-diverse students, with formally assignedmentors to voice complaints. Overall, these findings imply that ethnically diverse students might benefit from interventional peer/faculty mentor initiatives aimed at providing an atmosphere in which effective mentoring relationships can be formed on the basis of shared interests and trust. Previous literature suggests that ethnically and culturally diverse students require greater and more consistent social support from peers and faculty members to avoid developing feelings of social withdrawal and isolation in a competitive learning environment (Gaw, 2007). Overall, our findings indicate that ethnically diverse students may benefit more directly from a structured informal mentoring intervention program aimed at encouraging consistent and voluntary social interaction between ethnically diverse and non-diverse students and faculty alike than a systematically and/or formally assigned mentoring matching program. Our findings also indicate that ethnically diverse and non-diverse students generally prefer similar characteristics and/or traits in an ideal educational mentor. Mentor pairing programs that match mentor-protégé pairs on the basis of ethnicity or gender alone may be indirectly limiting the potential academic development and performance of ethnically diverse students in higher education.

One caveat to our study is that its disproportionately high number of Caucasian female participants. Specialized targeting methods must be implemented to initiate adequate participa-

tion from an underrepresented ethnically diverse student population. Future research should focus more directly on academic performance/achievement, academic goal orientation, and level of extraversion in the assessment of the effectiveness of formally versus informally assigned mentoring relationships. Despite the limitations of our research, we propose that the findings are robust. They implicate mentoring relationships as a potential route to boosting retention rates, and academic personal growth, among ethnically diverse and non-diverse students alike.

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Appendix A

Actual Email prompt

Dear Fellow Student,

My name is Michael Ojibway and I am a senior Psychology major here at UWEC. My research advisor (Dr. Bleske-Rechek) and I are examining minority and majority students' perceptions of their educational mentoring experiences. Please don't worry if you are unsure of what a "mentoring experience" is -- we will explain in the questionnaire, and we need your feedback whatever your educational experiences have been. Your participation in the short 15 minute questionnaire that we have designed will provide valuable information to the UW System as it deals with issues of student recruitment, retention, and achievement.

Please be reassured that your participation is anonymous (everyone is receiving the same survey link, and no ID is required to enter the survey site). If you are a Psychology major/minor or are taking Psych 100/101/330 and require participation evidence, you can print your final page and then be awarded 30 minutes of participation credit.

We hope you will consider completing this brief survey. We need data from students of both sexes and of all ethnic backgrounds; thus, we are counting on you to help! We aim to inform the UW System of those variables linked with positive educational experiences for minority and majority students alike.
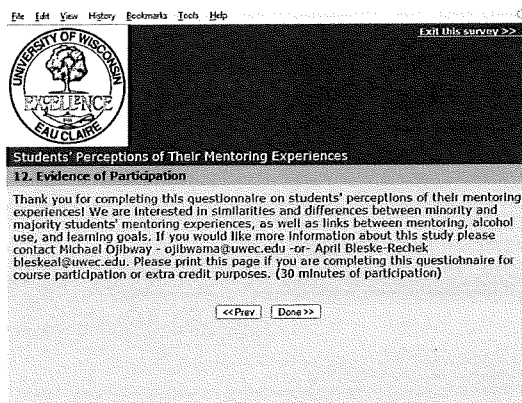
Please click on the following link or copy and paste it into your web browser, to begin!
http://www.surveymonkey.com/s.asp?u=949653728666

Thank you very much for your participation, Michael Ojibway (ojibwama@uwec.edu)

Appendix B
Evidence of Participation
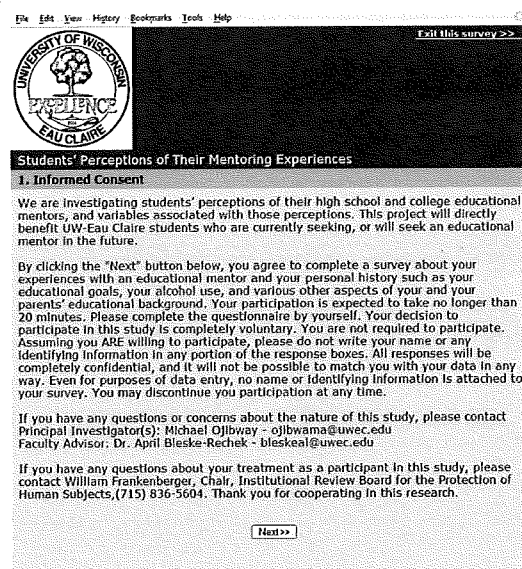
Thank you for completing this questionnaire on students' perceptions of their mentoring experiences! We are interested in similarities and differences between minority and majority students' mentoring experiences, as well as links between mentoring, alcohol use, and learning goals. If you would like more information about this study please contact Michael Ojibway - ojibwama@ uwec.edu -or- April Bleske-Rechek at bleskeal@uwec.edu. Please print this page if you are completing this questionnaire for course participation or extra credit purposes. (30 minutes of participation)

Appendix C
Informed Consent Form

Appendix D

Educational Mentor Stimulus Prompt

Appendix E1

Appendix E2

Students' Perceptions of Their Mentoring Experiences

4. Ideal Mentoring Scale Continued

Right now, at this stage of my education, my ideal mentor would...

	Not at all important	A little important	Moderately important	Very important	Extremely important
... be interested in speculating on the nature of the universe or the human condition.	○	○	○	○	○
... treat me as an adult who has a right to be involved in decisions that affect me.	○	○	○	○	○
... help me plan the outline for a presentation of my academic work.	○	○	○	○	○
... inspire me by his or her example and words.	○	○	○	○	○
... rarely feel fearful or anxious.	○	○	○	○	○
... help me investigate a problem I am having with an academic goal or project of mine.	○	○	○	○	○
... accept me as a junior colleague.	○	○	○	○	○
... seldom be sad or depressed.	○	○	○	○	○
... advocate for my needs and interests.	○	○	○	○	○
... talk to me about his or her personal problems.	○	○	○	○	○

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Appendix E3

Students' Perceptions of Their Mentoring Experiences

5. Ideal Mentoring Scale Continued

Right now, at this stage of my education, my ideal mentor would...

	Not at all important	A little important	Moderately important	Very important	Extremely important
... generally try to be thoughtful and considerate.	○	○	○	○	○
... be older than me.	○	○	○	○	○
... value me as a person.	○	○	○	○	○
... have coffee or lunch with me on occasion.	○	○	○	○	○
... keep his or her workspace neat and clean.	○	○	○	○	○
... believe in me.	○	○	○	○	○
... meet with me on a regular basis.	○	○	○	○	○
... relate to me as if he/she is a responsible, admirable older sibling.	○	○	○	○	○
... be the same race/ethnicity as me.	○	○	○	○	○
... help me to realize my life vision.	○	○	○	○	○

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Appendix E4

Students' Perceptions of Their Mentoring Experiences

6. Ideal Mentoring Scale Continued

Right now, at this stage of my education, my Ideal mentor would...

	Not at all important	A little important	Moderately important	Very important	Extremely important
... help me plan a timetable for my research.	○	○	○	○	○
... work hard to accomplish his/her goals.	○	○	○	○	○
... provide information to help me understand the subject matter I am researching.	○	○	○	○	○
... be generous with time and other resources.	○	○	○	○	○
... be about my age.	○	○	○	○	○
... be male.	○	○	○	○	○
... be the same race/ethnicity as me.	○	○	○	○	○
... share my interests and hobbies.	○	○	○	○	○
... be a cheerful, high-spirited person.	○	○	○	○	○
... be calm and collected in times of stress.	○	○	○	○	○
... be a role model.	○	○	○	○	○
... share my religious beliefs.	○	○	○	○	○
... recognize my potential.	○	○	○	○	○

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Appendix E5

Students' Perceptions of Their Mentoring Experiences

7. Mentor Functions Scale

Instructions: For each statement, please check the button that most closely represents your level of agreement or disagreement regarding your current or most recent educational mentor. Items are written in the present tense, so if the person is no longer your mentor, please respond with reference to the time during which he/she was your mentor.

	strongly disagree	disagree	undecided	agree	strongly agree
My mentor calls forth and affirms my life and career aspirations.	○	○	○	○	○
My mentor knows me personally.	○	○	○	○	○
My mentor listens to me.	○	○	○	○	○
My mentor inquires about my interests and dreams.	○	○	○	○	○
My mentor treats me as though I am his or her colleague.	○	○	○	○	○
My mentor makes me feel good about myself.	○	○	○	○	○
My mentor continually reassures me of the quality of my work.	○	○	○	○	○
My mentor brings valuable and important opportunities to my attention.	○	○	○	○	○
My mentor challenges me on a regular basis.	○	○	○	○	○

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Appendix E6

Students' Perceptions of Their Mentoring Experiences

8. Goal Orientation

Please check the button that most closely resembles your level of agreement with each statement below:

	strongly disagree	disagree	undecided	agree	strongly agree
It is very important for me to do well in my courses.					
It is important for me to confirm my intelligence through my schoolwork.					
It is very important for me to do well in my courses compared to others.					
It is very important to me to confirm that I am more intelligent than other students.					
I strive to constantly learn and improve in my courses.					
I seek out courses that I will find challenging.					
I really want to get good grades in my classes.					
In school I am focused on demonstrating my intellectual ability.					
I try to do better in my classes than other students.					

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Appendix E7

Students' Perceptions of Their Mentoring Experiences

9. Goal Orientation Continued

Please check the button that most closely resembles your level of agreement with each statement below:

	strongly disagree	disagree	undecided	agree	strongly agree
When I take a course in school, it is very important for me to validate that I am smarter than other students.					
In school I am always seeking opportunities to develop new skills and acquire new knowledge.					
I really enjoy facing challenges, and I seek out opportunities to do so in my courses.					
A major goal I have in my courses is to perform really well.					
One of my important goals is to validate my intelligence through my school work.					
A major goal I have in my courses is to get higher grades than other students.					
In my classes I focus on developing my abilities and acquiring new ones.					
It is very important to me to feel that my coursework offers me real challenges.					

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Appendix E8

Students' Perceptions of Their Mentoring Experiences

10. Alcohol Use

For each question, please check the button that most closely characterizes your alcohol consumption.

	never	monthly or less	2 to 3 times a month	2 to 3 times a week	4 or more times a week
How often do you have a drink containing alcohol?	○	○	○	○	○

	None	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
How many alcoholic drinks do you have on a typical drinking day?	○	○	○	○	○	○

	never	less than monthly	monthly	weekly	daily or almost daily
How often do you have six or more drinks on one occasion?	○	○	○	○	○
How often during the past year have you found that you were unable to stop drinking once you had started?	○	○	○	○	○
How often during the past year have you failed to do what was expected of you because of drinking?	○	○	○	○	○
How often during the past year have you needed a drink first thing in the morning to get yourself going after a heavy drinking session?	○	○	○	○	○
How often during the past year have you had a feeling of guilt or remorse after drinking?	○	○	○	○	○
How often during the past year have you been unable to remember what happened the night before because you were drinking?	○	○	○	○	○
Have you or someone else ever been injured as a result of your drinking?	○	○	○	○	○
Has a relative, friend, or doctor or other health worker been concerned about your drinking or suggested you cut down?	○	○	○	○	○

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Appendix E9

Students' Perceptions of Their Mentoring Experiences

11. Demographic Information

Please indicate your choices on the line or by checking the appropriate corresponding button.

✱ What is your sex?
- ☑ Male
- ○ Female

✱ What is your age, in years?
22

✱ What is the highest level of education you have completed?
- ☑ Less than High School
- ○ High School/GED
- ○ Some College
- ○ 2 Year College Degree (Associates)
- ○ 4 Year College Degree (BA, BS)
- ○ Master's Degree (MA, MS, MSW)
- ○ Doctoral Degree (PhD, EdD)
- ○ Professional Degree (MD, JD)

✱ What was your estimated cumulative (overall) GPA coming into this semester?
2

✱ What was your ACT composite (overall) score?
2

✱ What is your own annual income?
- ☑ Less than $10,000
- ○ $10,000-$19,999
- ○ $20,000-$29,999
- ○ $30,000-$39,999
- ○ $40,000-$49,999
- ○ $50,000-$59,999
- ○ $60,000-$69,999
- ○ $70,000-$79,999
- ○ $80,000-$89,999
- ○ $90,000-$99,999
- ○ $100,000-$149,999
- ○ More Than $150,000

Appendix E10

* During the majority of your formative years (ages 0-18), what was the typical annual household income from your parent(s) or guardian(s)?

- ○ Less than $10,000
- ○ $10,000-$19,999
- ☑ $20,000-$29,999
- ○ $30,000-$39,999
- ○ $40,000-$49,999
- ○ $50,000-$59,999
- ○ $60,000-$69,999
- ○ $70,000-$79,999
- ○ $80,000-$89,999
- ○ $90,000-$99,999
- ○ $100,000-$149,999
- ○ More Than $150,000

* Which of the following best represents your social class of rearing?

- ☑ Working Class
- ○ Lower Middle Class
- ○ Middle Class
- ○ Upper-Middle Class
- ○ Upper Class

* What is your racial/ethnic heritage? (Check all that apply)

- ☐ African American/Black
- ☑ American Indian or Alaskan Native
- ☐ Southeast Asian: Cambodian, Hmong, Laotian, Vietnamese
- ☐ Other Asian/Pacific Islander
- ☐ Hispanic/Latino
- ☐ White/Non-Hispanic
- ☐ Other (please specify)
  - [_____]

* What is the highest level of education your mother has completed?

- ☑ Less than High School
- ○ High School/GED
- ○ Some College
- ○ 2 Year College Degree (Associates)
- ○ 4 Year College Degree (BA, BS)
- ○ Master's Degree (MA, MS, MSW)
- ○ Doctoral Degree (PhD, EdD)
- ○ Professional Degree (MD, JD)

* What is the highest level of education your father has completed?

- ☑ Less than High School
- ○ High School/GED
- ○ Some College
- ○ 2 Year College Degree (Associates)
- ○ 4 Year College Degree (BA, BS)
- ○ Master's Degree (MA, MS, MSW)
- ○ Doctoral Degree (PhD, EdD)
- ○ Professional Degree (MD, JD)

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Error Control in Dialog Systems

by
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ABSTRACT

In this interdisciplinary project, we examined the role of error detection, avoidance, and correction in spoken dialog systems. Currently used error control methods often assume that (1) a user will provide all necessary information during a dialog exchange, (2) only one user will be speaking at a time, and (3) the user(s) will have access to a keypad should the need arise to spell a word after a misunderstanding in speech recognition. These are "dangerous" assumptions, since users are often accustomed to saying only what they feel is necessary. They do not always have their hands free for typing, and they may be taking part in a group event where multiple users speak all at once. We developed an improved suite of algorithms that addresses the problems associated with these common assumptions, while minimizing errors and improving the performance of these systems.

1. INTRODUCTION

Spoken dialog systems deal with the interaction of computers and users' spoken natural languages, such as English or Japanese. Studies of these systems confront the problems of automating the analysis, generation, representation, and acquisition of natural languages.[1] As one might expect, spoken dialog systems may encounter several problems during any step of the comprehension process, whether during acquisition of the language, during interpretation of the utterance, or when recovering from a misunderstanding of the utterance.

In the approach presented here, two languages were used to devise a better test error control. These two languages, English and Japanese, involve unique problems for spoken dialog systems and were chosen because of their common use in the business world. An example of one such problem is the extended vowels in many Japanese words. This intonation can prove difficult for the system to recognize, and hence allows for an incorrect interpretation of the utterance. By using these two languages, it became easier to eliminate such errors. Finally, by combining commonly used methods for error control with our own, our approach expanded the scope of the pre-existing Sphinx projects in testing.[2]

2. METHODS

The methods we use for traversing the course of the dialog exchanged bore resemblance to those presented in similar research.[3] Our method took additional steps to account for multiple or non-compliant users. Additionally, our method used a spelling recognizer to provide hands-free recovery from misunderstandings of speech.

2.1 Multiple Users

After a spoken dialog system receives speech input, it parses the utterance into its respective semantic forms. Once translated into its semantic forms, the dialog is again parsed, this time

to find meaning between one or more sentences that may have been spoken at the same time. If all semantic forms align to form one sentence easily, the system assumes that only one user was speaking at the time that the utterance was recorded. Should incongruencies appear in the semantic form representation, such as multiple agents or instruments, the system will initially check for understanding, as one sentence may contain more than one subject or verb. If an understanding still remains unresolved, the system will then assume that multiple users were speaking at the time of the recording.

Under this latter assumption, the system will attempt to parse the semantic forms together to form multiple sentences from which meaning may be derived. The process continues until the system can present the users with one meaning that appears correct. In some cases, multiple possibilities may exist, in which case the system will request confirmation from the users that what it understands is correct.

2.2 Incompliant Users

A system's first step in working with non-compliant users is to determine whether or not the user complied with the system's request. A system accomplishes this by comparing the utterance to possible responses that the system seeks. Should users say more or less than what is requested of them, the system tries to find meaning in the provided information. For example, should the system ask the user, "Do you want the yellow or the blue house?" the user may respond, "No" when the system is not looking for a yes or no answer. Since the provided answer is not similar to either anticipated answer, the system treats the user as incompliant.

When the system recognizes that a user has not been compliant, it will rephrase the question for clarification, including a line telling the user what type of input is desired. Should the user still choose to not comply, the system will adjust to accommodate the type of answer provided. For instance, should the user still choose to provide a yes or no answer for the question outlined above, the system will accept the provided answer and move forward to the next question.

2.3 Error Recovery

When the system encounters a recognition error or the provided information does not exist in the system's database, it will request the user to spell the desired input. Previous research[4] has covered possible problems encountered with speaking out the spelling of a word (or words), but these errors can be addressed. Before a user is requested to spell a word, the system will tell the user which spelling format is desired. As is with any input, the system will check to ensure that the user complied with the system's request. Should the user provide similar sounding letters, such as 'C,' 'T,' and 'E,' the system will verify what it understood.

Should the user misspell a word, the system will attempt to find the most closely related word that it knows, and request verification. When the user denies that the system's interpretation is accurate, the system will once again request that the user spell the word. Should the user spell the word the same way again, the system will assume that the provided spelling is a new entry. By allowing only spoken data entry, the system provides a smoother transaction while accommodating the possibility that a user is unable to type the appropriate response.

3. NEXT STEPS

Our research focused on completely implementing the suggested techniques into a pre-existing system with modifications to account for our strategies. Though our approach did not employ use and manipulation of spectrograms to parse speech and determine more accurate spelling, these features lie in the system's future. The result we envisioned was the elimination of several error control problems and an improved spoken dialog system.

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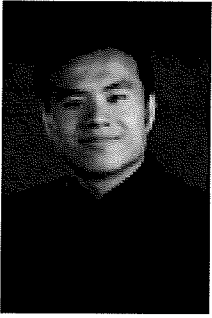
The Essential Aspects of Traditional and Christian Hmong Weddings in America

by:
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ABSTRACT

For almost thirty years now, many thousands of Hmong refugees, an Asian ethnic minority, have called the United States "home." In that time span, many cultural and religious changes have affected all major Hmong life events and the ceremonies that surround them. This work addresses qualitative changes occurring in the marriage process, one of the most important life events in the Hmong culture, and delineates between two religious groups within the Hmong-American population, Traditionalists (those who maintain the traditional Hmong beliefs) and Christians (those who have converted to Christianity). This project also queried, "What is the most important aspect of the Hmong-American marriage process?" by analyzing the results of interviews conducted with six wedding negotiators (elder men who represent either the groom's family or the bride's family, and are learned in the customs, rituals, and recitations of the marriage process). Finally, the data gleaned from articles and interviews present changes in wedding negotiations that impact the future survival of the Hmong culture.

INTRODUCTION

Throughout history the Hmong, always a minority group, have encountered discrimination. For example, in China the Hmong were gradually forced to live in the mountains, where less arable lands were available. Along with discrimination came forced assimilation, something that the Hmong resisted throughout their history. The fact that the Hmong people still exist today, and have not been swallowed up by the dominant culture attests to the Hmong's historical success at maintaining their unique culture. The Hmong present an interesting case when it comes to assimilation in the United States. As Hein points out, the Hmong, unlike other immigrant groups to the United States, such as Koreans or Mexicans, had developed a distinct "pre-existing ethnic identity" because in every other country they lived in throughout history, they had always been labeled "minority".[1] Although the Hmong have resisted assimilation attempts before, can they maintain their distinct cultural and religious practices in America?

One answer arises from discussing the cultural and religious changes that have occurred within the central life event of marriage. This work presents some qualitative differences between the marriage processes of Hmong-Americans who maintain traditional Hmong beliefs and those who have converted to Christianity. Second, this study queries, "What is the most important aspect of the Hmong-American marriage process?" Last, it analyzes changes to marriage that have occurred within the Hmong community, and explains how these pertain to the future survival of Hmong culture in America.

HISTORY

According to the earliest known records[2] the Hmong existed in China for thousands of years. By the 19th century, through continued warfare and resulting migration, hundreds of thousands of Hmong eventually found their way into the northern parts of Southeast Asia or, more specifically, Thailand, Vietnam, and Laos. In the 1960s and 70s, during the Vietnam War, the United States called upon

the Hmong living in Laos to fight for them against the Pathet Lao, communist party members who collaborated with the Viet Minh in hopes of overthrowing the Laotian royal government. Because the United States had signed a treaty stating that it would maintain Laos and Thailand as neutral countries during the Vietnam War, their alliance with the Hmong remained covert. This part of the war would later be known as the C.I.A.'s "Secret War in Laos."[3] Once the United States officially pulled out of Southeast Asia in the late 1970s, the Laotian government fell to the Pathet Lao, and the Lao Hmong became enemies of the state. Thousands of Lao Hmong fled for their lives across the Mekong River into neighboring Thailand, where dozens of refugee camps housed the masses of displaced persons. From Thailand, hundreds of Hmong immigrated to Australia, French Guiana, and France. The rest, numbering in the thousands, settled in the United States. In 2007 the United States Census Bureau estimated that its Hmong population had reached 201,701.[4]

RELIGION

For thousands of years, the Hmong have practiced animism, the belief that spirits inhabit all things (animals, mountains, trees, people, etc.). Hmong religious ceremonies and customs involve a shaman, a man or a woman who, by going into trance, possessed the gift of communicating with spirits in the supernatural world. Shamans interceded with spirits on behalf of ordinary Hmong persons to cure sickness, to witness major life events that required rituals (like death), or to obtain blessings. Furthermore, the Traditional Hmong religion requires deep respect of, and reverence for, deceased ancestors, because, they believe, even after death, the souls of the deceased linger and affect the lives of those living in the present.

Some literature refers to the traditional Hmong religion as "Shamanism." Although this terminology has become quite common, this current study avoids it for two reasons. The first is that, as Her points out, the Hmong do not themselves have a term for their religion.[5] "Shamanism" fails to encapsulate the Hmong worldview because the Hmong language itself does not use the term "shaman" in referring to the religion. Second, although the role of the shaman is important in the Hmong religion, the emphasis lies with traditions, rituals, and ceremonies, rather than with the shaman. This paper references the Hmong religion as Hmong Traditionalism or just Traditionalism, and those who practice it as Traditionalists.

In the middle of the 20th century, Protestant Christian missionaries came to many areas of Southeast Asia. Those who came to Laos evangelized among the Hmong and, eventually, thousands converted. Hmong people who became Christian started to transform some of their traditional cultural practices while disposing of others. One of these changed practices was the marriage process. Problems began to arise when Hmong Christians would tell Traditionalists' family members that they could no longer observe certain Traditional practices (e.g., bowing during ceremonies) because of their new religious beliefs. According to Hones, "Conversion to Christianity brought changes to Hmong clan and family relationships" which divided the converted and non-converted.[6] Since Hmong Traditionalism is so deeply rooted within the culture, many Hmong who did not convert saw their Christian brothers, sisters, and friends as traitors to the Traditional way of life. For many Hmong converts, balancing familial obligations and religious convictions became an increasingly difficult situation; would they disappoint their Traditionalist families or their Christian religious leaders? Also, a number of the Hmong converts started to view Traditionalist clansmen as blind and backwards. These antagonistic attitudes, arising from both sides, created tension. Hostility between Traditionalists and Christian Hmong groups could sometimes heat up to the point where parents would disown family members for failure to participate in Traditional rituals. In almost all cases, the conflict arose from those who converted to Christianity and not the other way around. This animosity between the two religious groups still exists, carried over from Laos to the United States.[7] For some families, the only persons recognized as close relatives are those who share the same clan name, as well as the same religion.

DIALECT

Two major dialects of the Hmong language are spoken among Hmong-Americans,. The first is Hmoob Dawb (pronounced "hmong der"), which literally translates to White Hmong. The second dialect is Moob Ntsuab (pronounced "mong jua"), which translates to Blue Mong[8]. Between the two dialects, a number of words differ, but the majority are the same with some small distinctions. The following example helps to illustrate the difference:

English:	My mother said that she let me go swimming.
White Hmong:	Kuv niam hais tias nws pub kuv mus da dej.
Blue Mong:	Kuv nam has tas nws pub kuv moog dlaa dlej.

The differences can be seen (and heard) but do not appear too prominrntly. Even so, enough variation exists that, at times, White Hmong speakers and Blue Mong: speakers have a hard time communicating. This dialect issue underscores another dividing factor among the Hmong; they are separated by clan name and religion, but also by dialect. For example, a young man whose clan name is Yang and whose dialect is Blue Mong recognizes as close relatives only those who share those same attributes (i.e., Yang and Blue Mong). When it comes to cultural practices, the White Mong and Blue Mong have some distinct differences, ones that will be detailed in a later section on Hmong marriage practices.

INITIATING A MARRIAGE

In the Hmong culture, there exist five legitimate methods to initiate a marriage—1) marriage by begging (tshoob zawj),[9] 2) marriage by following (tshoob raws),[10] 3) marriage by kidnapping (tshoob zij),[11] 4) marriage by force (tshoob yuam),[12] and 5) marriage by the Levirate rule (niamtij-txis-kwv).[13] This study explores only the first four because the fifth method is extremely rare for Hmong in the United States.

Marrage by Begging

Marriage by begging (tshoob zawj) begins this discussion, which then turns to the other methods as they differ from this initial one. Descriptions here derive from the Traditional Traditionalist perspective, and, where Christians have modified this, a further discussion appears in a later section.[14] Marriage by begging is considered the most respected, and honorable, method of initiating a marriage. It is also the most expensive. Although the term "begging" is used, it in no way implies that the groom's family seem less than desirable. There are many different ways by which a marriage by begging could come about, but the following provides a typical example. A young Hmong man and a young Hmong woman are in a romantic relationship.[15] They have decided that they want to get married, and she has expressed to him that her parents desire him to initiate the marriage by begging. He must first inform his parents of his plans, then his parents would inform the father's male relatives (cousins, uncles, grandfathers, etc.). The young man's male relatives would then inform the young woman's parents about the interest that their younger relative has in marrying their daughter. Note that the young man himself does not inform the young woman's parents of his intentions.[16] This communication arangement clearly demonstrates that for the Hmong marriage is not simply a union between two individuals, but rather a union between two extended families. If the young woman's parents favor this marriage, the two families set up a date for a wedding negotiation, a discussion between the groom's family and the bride's family about past family conflicts, the wedding date, the division of the cost of the wedding, and the amount of the bride price. The bride price is an amount of money given as a gift from the groom's family to the bride's parents, who use it as they see fit. Currently (in 2009), the average bride price is $5,000. With marriage by begging, it must be stressed, the young man and woman still live separately in their respective homes, typically with their parents. It is assumed that the couple

has not initiated a sexual relationship. Yang points out that in the Hmong culture, young women who engage in pre-marital sex are seen as "undesirable wives".[17] Therefore, marriage by begging is considered the most honorable method since the prospective bride and groom have refrained from sexual activity, which would have dishonored their families.

When the time comes for wedding negotiation, a group representing the groom arrives at the young woman's parents' house; this includes the groom, his best man (*phij laj*)[18]--a male friend or relative who helps the groom with ceremonial drinking, traditional ritual, and as support; the maid of honor (*niam tais ntsuab*),[19] a female relative of the groom who acts as the bride's chaperone to witness her fidelity; two wedding negotiators;[20] (*mej koob*),[21] older male relatives who know the proper Hmong marriage protocols and represent their side of the family during the wedding nego-tiations); and other male relatives. The bride's parents have also contacted their male relatives, from the father's side of the family, to witness during the negotiation process as well. They too provide two wedding negotiators who represent their side in the arrangements. Two wedding negotiators lead the group from the groom's side. They carry a black umbrella, a custom that symbolizes their intent to conduct marriage negotiations. Typically, once the *mej koob* arrive, they must stand waiting outside the home until greeted at the door and handed two shots of alcohol as a means of welcoming them. Shots of alcohol, used in the Traditional Hmong marriage process to initiate discussion, symbolize both sides' agreement upon an issue. The rest of the groom's party stands outside the door at this time, and the four negotiators sing back and forth *zaj tshoob*--recitations and songs that wedding negotiators use to communicate with one another.[22] Eventually the four negotiators reach a consensus, at which time the bride's home opens to them, and everyone from the groom's party is welcomed in. Wedding songs may continue for a while longer. When these have finished, the bride's party members set up a table in either a dining or living room and here the actual wedding negotiations begin. At this point, the bride and her family, including her older male relatives, as well as the groom's male relatives, excuse themselves from the room of the negotiation table. Only the four wedding negotiators, the groom, and his best man remain at the negotiation table. Instead of occupying the same room, the bride's and the groom's families will   separate, isolating themselves into either bedrooms or into the basement. The negotiators, representing the respective families, and sharing with their counterparts the desires and the questions of the families they represent, have the duty to relay back, to the family they represent, the information given them. The family members discuss this information among themselves and make decisions. Since negotiations can involve many things, like the resolution of past family conflicts, the bride price, the wedding songs, etc., they can last upwards of fourteen hours.[23] Throughout this process, drink-ing alcohol shots signifies that agreements are made.[24]

Negotiators broach the bride price last. According to proper method, before the bride price is even introduced, the groom's wedding negotiators first give a monetary gift to the bride's parents and then to her family members, the bride's immediate brothers, sisters, and grandpar-ents. These additional monetary gifts make marriage by begging the most expensive method. After the acceptance of the gifts, the actual bride price negotiations begin. The parents of the bride have the right to ask for an increase or decrease in the amount of the bride price. Once the bride's family accepts a bride price amount, the gift is given in cash, first from the groom's negotiators to the bride's negotiators, and then to the bride's parents. At this point, in the Hmong tradition, the young man and young woman are officially married. Once the groom's party departs for home, usually the same evening, the bride can also leave with them and still maintain her family's good name.

The date of the marriage ceremony/wedding feast would have been decided during the negotiations. This event, at the bride's parent's house, brings together friends and family members to celebrate the new union between the two families. Much cooperation between

extended family members is expected in order to organize and prepare all the aspects of this event. This could happen in the same weekend as the wedding negotiations or take place months later, depending upon what the two families have decided. Wedding feasts involve much eating and drinking. Those who attend the wedding negotiations also attend the marriage ceremony, and operate in the same roles they held in the negotiation (e.g., the best man, the wedding negotiators, etc). The bride and maid of honor dress in traditional Hmong attire, while the groom and his best man wear dress pants and a button up shirt. Everyone else, guests, parents, etc., dresses in casual clothing.

During the marriage ceremony, the groom and his best man, and sometimes his wedding negotiators, are expected to bow down before the bride's parents in reverence and respect. They also bow down to respect the bride's relatives and past ancestors. To execute this bow, persons go down on their knees, place their knuckles on the floor, and with their thumbs pressing into the ground, lower their heads to the floor. This demonstrates respect for the bride's family, that they, the groom's family, hold the bride's family in high regard. Along with alcohol, the groom's family members pass out cigarettes to symbolize wealth and prosperity, the assumption being that the family has sufficient disposable income to use it on this luxury. Also, during the marriage ceremony, the groom and bride sit at a table surrounded by elders from both sides of the family. The bride's uncles can lecture the newlyweds at this point and share with them advice on how to obtain a healthy and happy marriage. Depending upon the uncles, this can last for hours. With each lecture, two shots of alcohol are drunk to symbolize that they, those at the table, understand the message and will take it to heart. When this process finishes, the uncles repeat the list of monetary gifts. Each gift, whether money or actual, is meticulously recorded so that the newlyweds can later know who gave what. The groom's wedding negotiators receive these documents, as well as the monetary gifts, then give them over to the groom. Once this occurs, the marriage ceremony officially ends and the groom, bride, and family now head to the groom's parents' home, where a small feast to thank the wedding negotiators takes place and a small gift of money is given to them as a symbol of appreciation. This gift usually amounts to $100. Once the wedding negotiators depart, the marriage by begging process officially ends.

Marriage by Following

Next to marriage by begging, marriage by following (*tshoob raws*) stands as by far the most common means to initiate a marriage. First, a young man and a young woman, already in a serious dating relationship, discuss and decide that they want to get married, but for some reason the young woman's parents do not approve of the young man.

Bypassing her parents' permission, the young woman goes to the young man's parents' house and both declare to his parents that they desire to be married. At this point, the potential groom's parents will contact their male relatives, who in turn contact the young woman's parents, about the couple's decision to marry. From here, the bride's parents can object to the marriage, but the vast majority simply accept the marriage since their daughter willingly chose to follow the prospective groom home. The bride's family assumes that the man and woman have had sexual intercourse, another reason to accept the marriage.

Marriage arrangements would then proceed forward in similar fashion to marriage by begging with some few alterations. One obvious difference involves the man's and woman's cohabitation under his parents' roof, so during the wedding negotiations at the bride's parents' house, the bride arrives with the groom's party. Another difference is that, unlike marriage by begging, monetary gifts do not need to be given to the bride's family before beginning the bride price negotiations. Other than that, the negotiations and marriage ceremony/wedding feast proceed as in marriage by begging.

Marriage by kidnapping

Marriage by kidnapping (*tshoob zij*), a rare and controversial method, has been, and still is, used by Hmong-Americans to initiate a marriage. The following example describes this scenario. A young man sees a young woman to whom he is attracted at an annual soccer tournament that attracts thousands of Hmong each year. For various reasons, e.g., shyness, physical deformities, family reputation, etc., he may feel that he has no chance to woo the young woman. Instead he contacts his friends and/or cousins and tells them that he has found the woman he wants to marry. With their help, he finds the woman when she is alone and the group physically kidnaps her, bringing her to his parents', or a relative's, home. From there, the young man contacts his parents, who then contact their male relatives. The male relatives then communicate with the young woman's parents to let them know that their younger relative intends to marry their daughter.

The young woman's parents have two culturally appropriate options. The first is to accept the marriage, allowing their daughter to marry this man. Note that although this method is culturally accepted, either the groom's family or the bride's does not desire it. From here, wedding negotiations would occur. The second culturally acceptable option is to object to the marriage and demand their daughter's return. Although they have rejected the request, the capturers are not obligated to return the young woman. If the young woman's parents do not know the captors, they would contact their own relatives to help retrieve her. The young man's family would keep the young woman hidden during this time, and the young man would try to woo her to gain her voluntary acceptance of the marriage. If the young woman is found within three days, her family can demand their daughter's return with monetary restitution, an amount of money that could exceed a bride price. If the daughter is not found after three days, the Hmong community assumes that the young woman's family has given up finding her and that they have accepted the marriage.

At this point, the groom's family would proceed to wedding negotiations, as soon as possible, to please their new in-laws. The negotiations and marriage ceremony would resemble those of a marriage by following, but understandibly more tension would surround the circumstances. During the negotiations the groom's wedding negotiators would be twice as diligent to appease the bride's family because of the method used to initiate the marriage. During the marriage ceremony, the bride's parents may "punish" the young man by forcing him to bow excessively, to the point where he gets bruised knees and knuckles. Also, they may force him to drink excessive amounts of alcohol so that he becomes extremely intoxicated.

A third option for a bride's family confronted with a daughter's kidnapping, one that was unavailable back in Laos and Thailand, but used infrequently in the United States, is to call the local authorities. Since it is illegal to kidnap a person in the United States, and because of the potential consequences of violating federal law, the chance of a daughter's return is high. Also, the likelihood of the man's going to prison is equally high. Because of the latter prospect, this method has witnessed a sharp decline in the United States. After all the controversy though, if the marriage process is successfully completed, it would nonetheless be seen as legitimate within the Hmong community.[25]

Marriage by Force

The last method, marriage by force (*tshoob yuam*), is rare and used only in special circumstances. The following is an example of how this method would be used. A young man and young woman who still lives under her parents' roof go out on an evening date. Her parents tell them that she needs to be home at a certain time, e.g., 9 pm, but in their enjoyment of the night, the couple loses track of time and she returns two hours later than the agreed curfew. Her parents become furious and demand that the young man marry the young woman. They assume, even without physical evidence, that the couple has had sexual intercourse. At this point, the man, without intention of

marriage, would have to bring the woman home to explain the situation to his parents. His parents would then contact their male relatives, who would then communicate with the young woman's parents about proceeding to a wedding negotiation.

The marriage ceremony would resemble the marriage by following procedures. Sometimes prospective brides in this marriage method are still in high school (sometimes even in middle school).[26] Many of these marriages have a short duration. Sometimes the brides will be sent back to their own parents within a few years, or even a few months.

METHODOLOGY

This study employs an ethnographic approach to collecting data—specifically, by conducting personal interviews with six wedding negotiators, and witnessing a Christian Hmong marriage ceremony. Despite a paucity of sources in general, some secondary literature appears on Hmong marriage customs. The six wedding negotiators this researcher interviewed were all residents of the Midwest and ranged in age from 35 to 59 years old. Three of the negotiators were Christians and the other three were Traditionalists. Each negotiator was interviewed in the privacy of his home and each interview was conducted in the Hmong language. The interview schedule consisted of ten questions pertaining to Traditional and Christian Hmong weddings.[27] With their permission, the interviewees' answers were recorded with a voice recorder. Data collection results were transcribed and translated into English.[38]

FINDINGS
Traditionalist Weddings vs. Christian Weddings

Although the differences between Christian and Traditionalist weddings are few, the distinctions are enough to set them apart from one another. One specific difference that negotiators cited was Christians' refusal to bow down before the bride's parents during the marriage ceremony. Christians saw this aspect of the Traditionalist marriage process as something incompatible with their faith. In their eyes, bowing constituted the worship of human beings, something that belongs to God alone, and hence, in violation of one of Christianity's main precepts.[29] To the Traditionalists, the Christian's lack of compliance in this practice is seen simply as disrespect to the bride's family. To avoid this issue, many parents, especially Christians, encourage their children to only marry other Christians so that religious disputes will not occur. The practice of marrying persons with similar ethnicity, religion, and social class (homogamy) is not unique to the Hmong.[30] According to one of the interviewed negotiators, when marriages occur between Hmong who practice Traditionalism and those who practice Christianity, the marriage process always follows the Traditionalist way instead of the simplified Christian process.

Another cited difference involved alcohol consumption. Christians did not drink as much alcohol during the negotiation process or the marriage ceremony as Traditionalists did. In some cases, Christians even used soda instead of alcohol during the negotiations. One probable explanation for this substitution is the impact of Christian fundamentalism; many Hmong converts chose a more conservative form of Christianity in which use of alcohol is prohibited. The majority of Hmong Christians in America belong to the Christian Missionary & Alliance, a conservative denomination. As of 1996 this included 25,806 members in 78 churches.[31] Membership has surely continued upwards since then. Along with sobriety, Christian Hmong also no longer use cigarettes in the marriage ceremony. They see no value in this practice.

The simplification of the wedding negotiations marks the last major difference between Traditionalist and Christian nuptials. Instead of arriving at the door and singing wedding songs, the negotiators and the groom's party are immediately invited inside the bride's parents' home where negotiations begin right away. According to the Christian negotiators, they eliminate

unnecessary steps in this way. One Christian said, "I think that, us Christians…right now we have straightened out the wedding process" (personal communication). In his eyes, the practice was faulty in the beginning and needed redeeming. The simplified Christian process is not seen in the same light by the Traditionalist negotiators. One said, "[For the] church, their children who get married, they do it very, very easy… Perhaps some don't even know how the wedding is supposed to go" (personal communication) In his view Christians have simplified the process, not because there was something wrong with it, but because Christians remain ignorant of the process, of how it is "supposed" to be.

The Importance of the Wedding Negotiator

The importance of the wedding negotiator, however, was a topic both Traditionalists and Christians agreed upon. Wedding negotiation, despite its lacking full time occupational status, and commensurate pay, requires, nonetheless, a significant time commitment. All these men held full time jobs yet voluntarily gave their weekends to assist family and community members with children interested in getting married. Those interviewed had learned how to negotiate weddings from their fathers or uncles who also served as negotiators. Learning the Hmong marriage procedures, traditional recitations, and wedding protocals can take years to master. Also, those interviewed described the primary task of the negotiators as "conflict resolution." One negotiator said, "To be a wedding negotiator means that you are a man of words. You know how to resolve conflicts in many different situations" (personal communication). Another said, "If I am one who knows, knows how to do wedding negotiations, then I must go and help them out to satisfy their hearts… All the harsh words, heavy words, wrong doings, big or small, will be forgiven, and since I know how to resolve these issues, they continue to call upon me" (personal communication). Another negotiator said, "…the wedding negotiator goes with them [the groom's family] to resolve any issues with the mom and dad so that they [the bride's family] don't lose life or hold bitterness, so that both sides of the family can forgive each other of any wrong doings, and so that both sides can live peacefully" (personal communication).

Use of Wedding Songs

A modification to the traditional Hmong marriage process that both the Traditionalists and the Christians have employed is the discontinuation of the use of wedding songs.[32] This phenomenon came about in response to the circumstances of life in the United States. In Laos and Thailand, wedding negotiations and marriage ceremonies would last for three to four full days. The Hmong in the United States, with the time constraints of fulltime jobs and family commitments, no longer have the temporal luxury to do this. Therefore, for practical reasons, most people have eliminated that element of the marriage process.

Most Essential Element in the Marriage Process

One unanticipated result of the interviews was the range in the negotiators' responses regarding what they considered the "most important" aspects of the marriage process. Had this researcher asked a typical sample of the American population what they considered the most important aspect of a marriage, the vast majority would likely have answered "love." The interviewed negotiators, however, instead of giving one "main" answer, responded with many. While four did agree that the bride price was an important aspect of the marriage,[33] the six negotiators gave all of the following responses to the question, "What is the most important aspect of the wedding process?":[34]

  Negotiator 1: "[T]he most important thing is this, when the table is set up, this question must be asked to the bride and her parents, "Does [sic.] you (your daughter) have any boyfriends, or are you (your daughter) involved in an arranged marriage?" This is so that the boy will know if he can legitimately marry her."

Negotiator 2: "When we bring the umbrella over there… our tradition states that the land will see and realize that [the young man] is going to get married to a woman. This means that when you are walking anywhere, people will automatically realize that you are getting married. If you don't bring the umbrella, then they won't know why you are there. The Hmong people say, 'Maybe he's doing business, or maybe he's out buying food, or maybe he's going to the garden or maybe no one knows what he is doing.' Hmong people wouldn't know. But, when you bring the umbrella, they know that you are bringing this to get a wife."

Negotiator 3: For the wedding process, the most important thing is that the groom is really going to be able to take care of his family and follow that of his clan's ways… This is what is important…"

Negotiator 4: Then the most important part is when [the uncles] come and lecture, telling [the bride] that she is the groom's parents' daughter now, and lectures the couple on how they should go and live their life together…. The uncles tell them what they need to do to live their lives so it will be good."

Negotiator 5: "The most important thing is this; if a man just marries quietly without a wedding, without paying a bride price, then in the young man's youth, he will want the bride but when he is old, he will not want her anymore, so there must be a bride price…"

Negotiator 6: "Hmong people say a lot of things but the most important thing is that the boy and the girl truly must love each other. If they truly love each other then it doesn't matter if it's a wedding where the bride is asked in her house or if she follows the groom home. The most important thing is that they love each other. Both parents want to hear that the groom and bride will truly marry and stay together. So with the other things, like rituals and traditions, they were only created by Hmong to make things look good and official. The most important thing is that both are willing and happy to marry one another. Then the wedding can take place."

The diversity of answers makes one conclude that the Hmong regard the entire marriage process as "important," that it cannot be reduced down to parts. One aspect intertwines with others and together they contribute to the whole. This interpretation reflects the essential Hmong point of view, that the cosmos and life within it operate in a holistic manner.

CONCLUSION

The collected data revealed that the "many" differences purported to exist between the Traditionalist Hmong-American and Christian Hmong-American wedding practices, in fact, add up to only a few. The main differences are that Christians do not bow during the marriage ceremony, drink less or include no alcohol during the wedding negotiations and marriage ceremony, and simplify some wedding procedures. Other than these, wedding negotiations for both groups follow the same path. Both religious groups have abandoned use of wedding songs during wedding negotiations, and for the same reason: to shorten the amount of time required to accomplish the task.

This study shows a number of changes in the Hmong marriage process since the Hmong arrived in the United States. Also, with conversion to Christianity, a portion of the Hmong community has changed the marriage process even more. This relatively recent transformation of traditional aspects of the Hmong culture, e.g., marriage practices, may mean that within a few more decades future generations of the Hmong may no longer recognize the current Hmong-American culture. Also, with so many cultural practices and rituals depending upon the Hmong language, one wonders how the traditions, including those surrounding marriages, will continue as younger generations lose their proficiency in the Hmong language. Some further research questions that can illuminate this larger issue include: does the geographic location of the Hmong population in the U.S. affect the transformation of the culture(s); how intrinsically linked is Hmong Traditionalism

to the Hmong language, and will it survive without it; and what will the tension and separation of the Hmong Christians and the Hmong Traditionalists do to their cultural progress; and last, will each group progress differently, and if so, how?"

Notes:
1. Jeremy Hein, "The Hmong Cultural Repertoire: Explaining Cultural Variation Within an Ethnic Group," Hmong Studies Journal 2, no. 2(1998):2.
2. The earliest records are written in Chinese because the Hmong did not have a written language until the middle of the twentieth century.
3. For more information about the "Secret War," refer to K. Quincy, Harvesting Pa Chay's Wheat: The Hmong and America's Secret War in China (Spokane, WA: Washington University Press, 2000).
4. www.factfinder.census.gov.
5. V. K. Her, "Hmong Cosmology: Proposed Model, Preliminary Insights," Hmong Studies Journal 6(2005):2.
6. D. T. Hones, "The Word: Religion and Liturgy in the Life of a Hmong American," Religious Education 96, no. 4(2001):495.
7. There are a small number of Hmong families who practice both Traditionalism and Christianity, but the vast majority practices either the former or the latter due to the social constrictions that are placed on the families by both religions. For example, church leaders will denounce the practice of Traditionalism, while families who go to church may be scorned by their Traditionalist relatives.
8. The reason why it is spelled Mong instead of Hmong is because Blue Mong speakers lack the "h" sound in their dialect.
9. Pronounced "chone zer."
10. Also known as Marriage by Elopement, and Pronounced "chone dar."
11. Also known as Marriage by Capture, and Pronounced "chone zee."
12. Pronounced "chone yua."
13. This rule is a marriage custom practiced by many different ethnic groups throughout the world. It is when a widow marries the younger brother of her late husband. For more information, refer to P. V. Symonds, Calling in the Soul: Gender and the Cycle of Life in a Hmong Village (Spokane, WA: Washington University Press, 2005):43. N. K. Mua, Hmong Marriage in America: The Paradigm Shift for a Healthy Generation (Bangkok: Prachoomthong Printing Group, 2002):19.
14. The reason I use "traditional Traditionalist" here is because even they have modified the process from the original version.
15. Traditionally the age that Hmong marry is 14-20 for the girls and 17-25 for the boys. From T. Moua, "The Hmong Culture: Kinship, Marriage and Family Systems" (Masters thesis, University of Wisconsin-Stout, 2003):15.
16. Typically the young woman's parents already know about the seriousness of the relationship.
17. J. A. Yang, "Marriage by Capture in the Hmong Culture: The Legal Issues of Cultural Rights Versus Women's Rights," Law and Society Review at UCSB III92004):41.
18. Pronounced "pee la."
19. Pronounced "nia thai jua."
20. The Blue Mong only use one wedding negotiator. The White Hmong use two.
21. Pronounced "me kone."
22. Hein, pp. 6-7.
23. They can also be quick and last only four hours. Typically this process is fairly time consuming.
24. To be a wedding negotiator, one needs to have a high tolerance for alcohol.
25. G. M. Scott, Jr., "To Catch or Not to Catch a Thief: A Case of Bride Theft Among the Lao

Hmong Refugees in Southern California," Ethnic Groups 7(1988):144.

26. Throughout my middle and high school years, a number of girls in my grade left school to marry men from other cities.

27. Refer to Appendix A.

28. Refer to Appendix B.

29. Exodus 20:5.

30. R. Hutchinson and M. McNall, "Early Marriage in a Hmong Cohort," Journal of Marriage and the Family 56, no. 3(1994):580.

31. T. T. Vang, "Coming a Full Circle: Historical Analysis of Hmong Church Growth 1950-1998" (PhD diss., Fuller Theological Seminary, 1998).

32. According to the interviewed wedding negotiators, some still use them. These are, however, the minority.

33. Refer to Appendix A.

34. These are in no specific order.

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