OUR Journal

Oregon Undergraduate Research

Volume 12, Issue 1, Winter 2018

Oregon Undergraduate Research Journal
12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

Volume 12, Issue 1, Winter 2018

TABLE OF CONTENTS

WELCOME

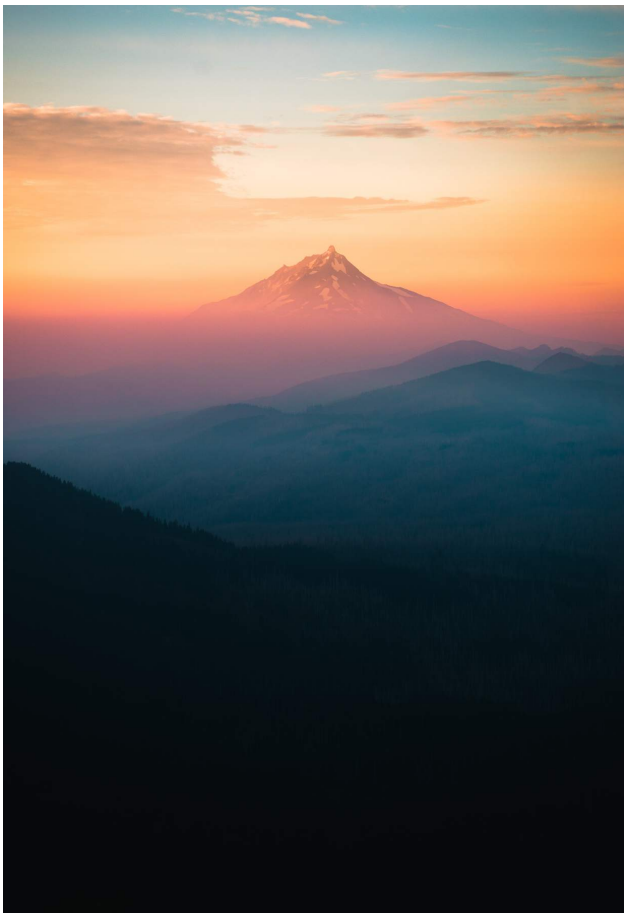
ARTICLES

Oregon Undergraduate Research Journal
12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

Cover Art—"Mountains Before The Eclipse"

Sherman Tran, Human Physiology*

This photograph was taken at dusk the night before the solar eclipse from Three Fingered jack in between Whitewater and Milli fires. Not only was this an amazing sight with just the right colors, but the beauty of the Oregon Cascades was made even more significant because the photographer, Sherman Tran, and fellow climbers had not been able to see around the area at all due to surrounding wildfire smoke. A few hours before sunset, they were close to packing up their gear and campsite to go back to Eugene. However, shifting winds caused the smoke to slowly move away. The group then went up to a ridge with 360 degree visibility for sunset and Tran was able to snap this photograph.



*Sherman Tran is a senior planning to graduate this spring with a degree in human physiology and a minor in biochemistry.

Oregon Undergraduate Research Journal
12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

Letter from the Editor

Allison M. Zhou, Biology*

Dear readers,

Research ebbs and flows. Something that has always fascinated me about the research process is that it almost never has a clear ending. There will always be more to study, investigate, and analyze. I believe that this endlessness is what makes research such a noble pursuit. A researcher must not only have an intellectual thirst for new discoveries and advancements, but also must possess a strong predisposition for embracing challenges and long-term analytical thinking.

This is our 12th issue of OURJ and while I have served on the editorial board for seven terms now, the submissions we receive never cease to amaze me. This issue, which presents papers exploring prostate cancer treatment options, snow leopard conservation, and the different features of gossip, is a wonderful reminder of the brilliant research university we are a part of and the great breadth and diversity of research work that undergraduates are involved in on this campus.

As diverse as the submissions we receive and publish, our current editorial board consists of individuals with equally diverse academic backgrounds and interests. Last spring we bid farewell to our graduating senior editors Jocelyn Taylor, Ainsley Taylor, and Sandra Dorning. We wish them the very best in all of their post-graduation pursuits. This past fall and winter we added several new editors to the board. My editorial board worked tirelessly to edit and publish this issue. Our path to publication was neither short nor easy. I extend a sincere thank you to all of my editors for their hard work and dedication, to Barb Jenkins of UO libraries for her support and guidance as our faculty advisor, and to the authors who contributed to this issue with their excellent research work. Finally, thank you readers for your continued support and interest in undergraduate research.

Without further ado, please enjoy the 12th issue of OURJ.

*Allison is a senior in the Clark Honors College planning to graduate with a degree in Biology and a minor in Chemistry this spring. She has been on the OURJ editorial board since winter 2016, and has served as Editor-in-Chief since June 2017. She is currently writing her honors thesis on infant attention to novel object distributions. Please direct correspondence regarding this issue of OURJ to ourj@uoregon.edu.

Guest Editorial—"Reflecting on Research"

Nicole Dudukovic, Ph.D., Psychology

What determines what we will remember from a specific situation? Why is my memory for an event different from those who experienced the event with me? How do our memories change with time? Those were some of the burning questions that inspired me to get involved in research as an undergraduate and are questions that still motivate me today.

I learned a number of important lessons from my time as an undergraduate researcher. The research process can be both incredibly exciting and equally frustrating. Few things compare to the excitement you feel when you make a new discovery, but the process of getting there inevitably involves a number of wrong turns. Those wrong turns are often glossed over in textbooks or research articles, and thus, it came as a surprise to me when my first research project on memory yielded uninteresting and uninformative results. It was also true that the more I learned about memory, the more I realized how much I didn't know. My undergraduate honors thesis project demonstrated that the act of retelling an event changes your memory for event details, but it left me with many questions about *why* this was the case. I also started to grasp that knowledge is not as black and white as it is often presented, and I began to appreciate some of the nuances. For example, memory research has traditionally focused on what is true on average for people's memories, ignoring individual differences, but those differences became salient to me when I was collecting and analyzing my own data. Overall, my years as an undergraduate researcher taught me about the importance of being persistent, keeping an open and curious mind, and being accepting of shades of gray.

As a Psychology instructor, one of my favorite classes to teach is Scientific Thinking in Psychology because it focuses on the fundamentals of the research process. Many students come into the course with little or no experience with scientific research. Even those who are Psychology majors are often apprehensive about research. I try to change their minds, to show them the value of conducting research and the value in critically evaluating research. One of the concepts I emphasize in the course is the importance of evidence. In an era of "fake news," we all need to know how to assess the information that is out there and be educated consumers of research. In my opinion, every student has the responsibility to be an informed citizen, and to achieve this, you need to have the skills to evaluate claims that you encounter in the media.

The best way to truly understand the research process is through hands-on involvement. I would love to see even more undergraduate students becoming involved in research, as I believe completing a research project is a key component of a liberal arts education. Some students think that research is only for those who want to go to graduate school, but research is for everyone! Just as the products of research have the potential to benefit all communities, the research process itself is valuable to all. Learning first-hand about how knowledge is built in your chosen field makes you a better-educated and more informed student and citizen.

Oregon Undergraduate Research Journal
12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

Meet the Editorial Board

STARLA CHAMBROSE

Starla is a freshman in the Clark Honors College majoring in Biology and History. She is interested in studying how the human genome can shed light on a variety of historical and demographic questions. She has a black belt in Taekwondo and completed the Oregon Music Teachers Association Piano Syllabus. In her free time, Starla enjoys going to sporting events, travelling, and watching Disney movies.

GRIETA KING

Grieta is a senior majoring in Advertising and minoring in African Studies. She studied abroad in Zanzibar, Tanzania. She enjoys painting, reading, taking care of her plants, eating delicious food, swimming, biking, hiking, and skiing. After college, Grieta plans to work in the mountains and do extensive hiking before pursuing a career working for a magazine publication.

JOSHUA PEARMAN

Joshua is a sophomore in the Clark Honors College majoring in psychology. He is a research assistant in the Social Affective Neuroscience Lab, and is working on developing research and data analysis skills to get into graduate school for Industrial-Organizational Psychology. Outside of academics, Joshua enjoys reading sci-fi novels and watching films.

DOUG SAM

Doug is a senior in the Clark Honors College studying environmental studies and geography and minoring in sociology. His research interests include environmental history and Indigenous geographies. He hopes to one day become a professor of geography. Doug also serves as the president of the Clark Honors College Student Association, on the UO common Reading Committee, and works for Orientation Programs welcoming new students to campus.

Oregon Undergraduate Research Journal
12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

AMBER SHACKELFORD

Amber is a junior majoring in planning, public policy, and management with minors in environmental studied and political science. She plans on pursuing a graduate degree in urban planning and dreams of being a city planner in Portland, her hometown. In her spare time, Amber enjoys hiking, aerial arts, and planning vacations to faraway places.

SRAVYA TADEPALLI

Sravya is a junior studying political science and journalism and she is passionate about public policy and encouraging substantive political discourse and debate. Sravya placed 2nd at the USA World Schools Debate Invitational as a member of the South Oregon contingent in 2015 and now works as a debate coach for the Corvallis School District. She is also assistant news director at KWVA Radio, where she co-hosts a weekly roundtable show on Oregon politics.

Oregon Undergraduate Research Journal *Fischer*
12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

A Comparison of Robotic Assisted Laparoscopic Prostatectomy and External Beam Radiation Therapy for Urinary and Sexual Function in Men Treated for Prostate Cancer

Julia Fischer*, Human Physiology

ABSTRACT

INTRODUCTION: Prostate cancer is the second most commonly diagnosed cancer in men. Robot Assisted Laparoscopic Prostatectomy (RALP) and External Beam Radiation Therapy (EBRT) are standard treatments for clinically localized prostate cancer, but both of these treatments have negative consequences for urinary and sexual function in patients.

PURPOSE: To compare changes in urinary and sexual function for men treated with RALP and EBRT.

HYPOTHESIS: It was hypothesized that patients treated with EBRT would have better recovery of sexual function, and patients treated with RALP would have better recovery of urinary function.

METHODS: Urinary and sexual function for patients treated for prostate cancer was examined using Expanded Prostate Index Composite (EPIC) questionnaires. These questionnaires were completed before treatment and two years after initial treatment in 32 men treated with EBRT, and 104 men treated with RALP. The difference between initial treatment scores and 2-year scores were analyzed with a general linear model(GLM) procedure to assess the quality of life outcomes for EBRT and RALP.

RESULTS: No significant difference was found for change in urinary function for either treatment group ($p = 0.41$). EBRT was found to significantly increase recovery sexual function compared to RALP ($p = 0.04$).

CONCLUSION: EBRT is a superior treatment for preserving sexual function in men with prostate cancer, whereas there is no significant difference in recovery of urinary function.

---

* Julia Fischer grew up in Hillsboro Oregon and graduated with a major in Human Physiology and minors in Biology and Chemistry from the University of Oregon in 2017. She interned for two years at Oregon Urology Institute (OUI) and conceived of this project with the help of OUI physicians and staff. Along with her internship with OUI, she was also involved in the Human Physiology department as a Learning Assistant and participated in the Oregon Marching Band as a Drum Major. Julia is interested in infectious disease and public health, and got to experience these interests while working with ANOVA Health Institute in Tzaneen South Africa during the summer of 2016. Julia aspires to be a physician specializing in pediatric infectious disease. This year she will be working as a medical scribe and applying to medical school, as well as continuing to teach as a Human Physiology Learning Assistant. Please direct correspondence to juliafischer3.14@gmail.com.

OVERVIEW OF PROSTATE CANCER ANATOMY AND PHYSIOLOGY OF THE PROSTATE

The prostate is a male specific organ that encircles the urethra and borders the inferior aspect of the bladder (see fig.1). The prostate contains the ejaculatory duct, which is the end of the spermatic tube that extends all the way down from the testes. Sperm travel through this tube to arrive at the urethra during ejaculation. Nerves that supply the urethra and penis run posterior-laterally along the prostate and are contained in the neurovascular bundles (see fig. 2). The function of the prostate is to create and secrete certain components found in semen. One of these components is prostate specific antigen (PSA), which is a protein that helps maintain a low viscosity in semen to allow the sperm to swim freely (Lee et al. 436).

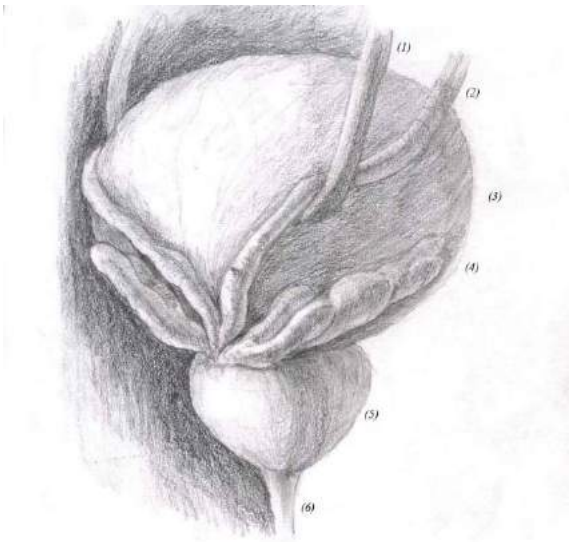


Fig 1. Anatomy of the Prostate (1) Ureter, (2) Vas Deferens, (3) Bladder, (4) Seminal Vesicle (5) Prostate (6) Urethra from Martin Allums; 2017

Prostate Cancer

Prostate cancer is the second most frequently diagnosed cancer in the United States, falling only behind skin cancer (Haas et al. 1). In a healthy functioning prostate the PSA that is produced is almost entirely secreted into the urethra during ejaculation, with only small levels leaking into bloodstream circulation (Stenman et al. 1). When prostate cells become cancerous they rapidly proliferate and create an excess amount of PSA. This is more PSA than can be secreted into the urethra during ejaculation, and the excess is leaked into circulation and that be detected by a blood tests and indicate abnormal prostatic tissue growth (Smith et al. 29). Thus, PSA screenings are conducted by physicians in men over fifty to look for sharp increases in PSA that could indicate prostate cancer (Smith et al. 29).

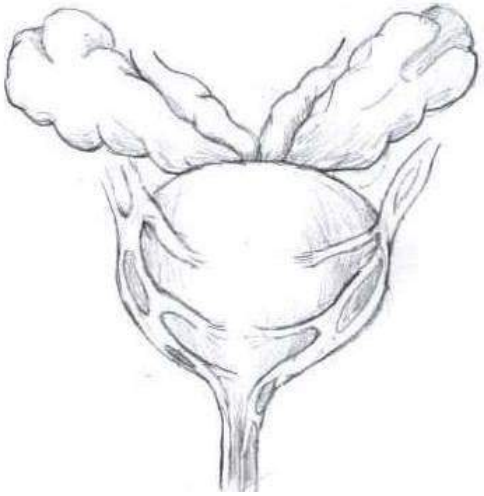


Fig 2. Neurovascular Bundles of the Prostate from Martin Allums; 2017

While elevated PSA levels may indicate a cancer, there are other conditions that can cause PSA levels to rise. Benign Prostatic Hyperplasia (BPH) is a common condition among men over the age of fifty which can also results in elevated levels of PSA (Stenman et al. 1). BPH is a condition where the prostate grows larger without evidence of malignancy (Stenman et al. 1). This additional growth of prostate cells will also produce an excess of PSA, which will be detected in a blood test. Other conditions such as a bladder or prostate infection can also cause the PSA to spike. If no inflammation or infection of the prostate is clinically apparent, then further evaluation of elevated PSA includes Transrectal Ultrasound (TRUS) guided biopsy of the prostate to deduce if prostate cells have become cancerous (Heidenreich et al. 70).

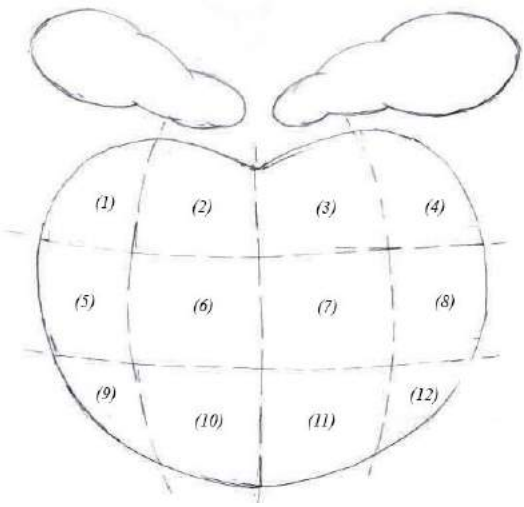


Fig 3. Transrectal Ultrasound Guided Biopsy Specimen Sites from Martin Allums; 2017

A Transrectal Ultrasound (TRUS) guided biopsy takes up to twelve samples of prostatic tissue in each region of the prostate to test for malignancy (see fig. 3). The samples taken from the TRUS biopsy are examined and given a Gleason Score. The Gleason Score represents the number of cancerous cells within a sample and their histological appearance in an assigned grade from 1–5 (Humphrey 293). A grade of one represents cells that are packed closely together but are still separated with a uniform appearance and well differentiated growth patterns. A grade of five represents the most altered appearance of the cells with large, observable, different shaped masses (Humphrey 293). The grades 2–4 represent the range of appearances of the cancer cells between the grades 1 and 5 (Humphrey 293). The Gleason Score is calculated by summing the two largest grades assigned to the histological sample of the prostate tissue, generating a value of 2–10 (Humphrey 293). Patients with a Gleason Score of 2–6 are candidates for active surveillance, essentially close surveillance of PSA progression without definitive treatment to avoid over-treatment (Shah 1810). Patients with a Gleason Score of seven or greater are in need of definitive therapy (Shah 1810).

Another tool used to assess the extent of the cancer is the Tumor-Node-Metastasis (TNM) staging system. The TNM cancer staging system is used to assign a stage to cancerous prostatic samples (Edge et al. 1471). The TNM outlines the location of the cancer in relation to the prostate gland and the rest of the body. The T in the score denotes a tumor in the prostate, the N signifies a tumor in a lymph node, and the M indicates metastasis in other locations in the body. A common score is T2a, which indicates a tumor involving one half a prostatic lobe or less. The TNM staging can be diagnosed from a TRUS biopsy, or by palpation of the prostate via rectal exam (Edge et al. 1417).

Treatment of Prostate Cancer

Definitive Treatment Options

Surgical removal of the prostate is a common procedure used to treat prostate cancer. The surgical techniques of prostatectomies have evolved in the last two decades from the traditional Radical Retropubic Prostatectomy (RRP) which was considered the standard of care for treatment of prostate cancer (Coelho et al. 2003). A RRP is an invasive procedure which involves a large open incision in the abdomen and surgical dissection of the prostate (Barré 72). New surgical techniques have developed such that laparoscopic dissection (a minimally invasive procedure with a few small incisions) of the prostate can be achieved with the assistance of a da Vinci Robotic Surgical System. This new technology allows surgeons to perform a Robot Assisted Laparoscopic Prostatectomy (RALP) with minimal invasion compared to the open incision of the RRP (see fig. 4). RALP operations can be performed as Nerve Sparing (NS) procedures, where the neurovascular bundles are dissected away from the prostate in an attempt to preserve the urinary and sexual function of the patient (Coelho et al. 2006). As there is a neurovascular bundle that runs on both sides of the prostate, a NS procedure can be bilateral, where both neurovascular bundles are dissected away, or unilateral, if only one is dissected away. The type of NS procedure depends on the girth and location of the tumor. If the tumor extends into the regions of these neurovascular bundles, the neurovascular bundles will not be dissected away in an attempt to remove all cancerous cells (Talcott et al. 1117).

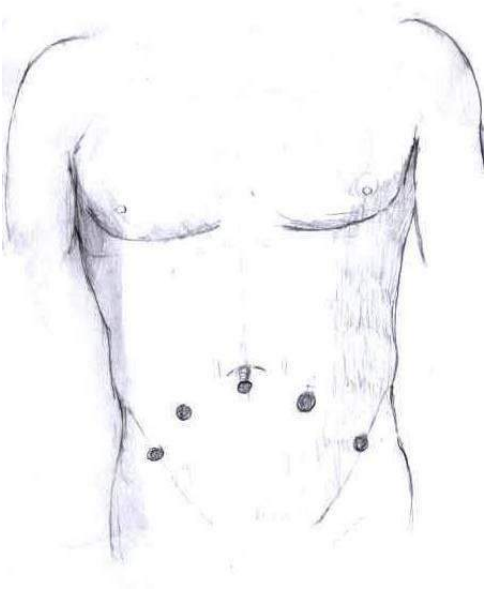


Fig 4. Surgical Incision Sites for RALP from Martin Allums; 2017

External Beam Radiation Therapy is another common treatment for prostate cancer. EBRT is radiation delivered from an external source directed at the prostate from different angles to preserve the tissue around the prostate (Heidenreich et al. 72). If a patient has received a prostatectomy as initial treatment and there is reoccurrence of prostate cancer, they can go on to receive EBRT (Heidenreich et al. 76). However, once a patient receives EBRT for their initial treatment, they have received a lifetime dose of radiation to that area and are not able to receive additional radiation treatment for their prostate cancer should it recur (Heidenreich et al. 76).

Another treatment for prostate cancer is Androgen Deprivation Therapy (also referred to as hormone therapy). The growth of most prostate cancer cells is dependent on androgens (sex hormones), most often testosterone or dihydrotestosterone (Miyamoto et al. 332). To treat prostate cancer, hormone deprivation therapy aims to stop the production of testosterone. This is achieved by either pharmaceutically or surgically castrating the patient, or stopping the body's natural production of androgens (Miyamoto et al. 332). Androgen deprivation therapy is not a

curative treatment, it is used to slow the disease progression and extend patient life (Miyamoto et al. 344). This therapy is often used with patients whose initial treatment of RALP or EBRT has not been successful, resulting in the disease spreading to other areas of the body (Heidenreich et al. 76).

Introduction

Patients who undergo treatment for prostate cancer find it difficult to maintain a high quality of life due to impaired urinary and sexual function, since nerves that supply the urethra and penis are contained in neurovascular bundles that run posterior-laterally along the prostate (Walsh et al. 473). Surgical removal or radiation of the prostate can damage these nerves and have a severe impact on urinary and sexual function of patients after treatment, which can lead to a lower quality of life (Walsh et al. 473). Quality of life for patients being treated for prostate cancer is a major factor in the decision of which treatment to choose. Poorer quality of life due to incontinence and erectile dysfunction can lead to depression, poorer quality of sleep, and lower levels of overall of health (Coyne et al. 1388).

For cancer that is localized to the prostate, both Robot Assisted Laparoscopic Prostatectomy (RALP) and External Beam Radiation Therapy (EBRT) are considered acceptable treatments (Schreiber et al. 21). Patient input is essential in the treatment decision, thus randomized-control studies are difficult to perform to determine which treatment has better quality of life outcomes. Researchers have heavily relied on retrospective studies to assess the benefits of one treatment versus another, but these studies often yield no clear distinction. EBRT and RALP are both associated with a decline in Health Related Quality of Life (HRQOL) directly after treatment, but thus far there is no clear indication as to which is the superior treatments in terms of the recovery of urinary and sexual function (Miller et al. 2775; Frank et al. 2151). Many studies that investigate this were performed prior to 2006, when RALP surgical techniques became more widespread, and therefore only included comparisons of Radical Retropubic Prostatectomy to EBRT. These studies found that patients treated with EBRT had better recovery of urinary and sexual function than those treated with RRP (Litwin et al. 2239; Potosky et al. 1358). The purpose of this study was to compare recovery of urinary and sexual function using information from the Prostate Cancer Health Related Quality of Life (HRQOL) database in patients that were treated with RALP or EBRT to determine if EBRT results in better sexual and/or urinary function recovery in patients two years after initial treatment compared to RALP. The study used the Expanded Prostate Index Composite (EPIC) questionnaire to measure the patients' urinary, bowel, hormonal, and sexual irritation. It was hypothesized that the changes in sexual function EPIC scores would indicate better sexual function recovery for patients treated with EBRT than RALP, and changes in urinary function EPIC scores would indicate better recovery of urinary function in patients treated with RALP than EBRT.

Methods

Patient Selection

This study compared External Beam Radiation Therapy (EBRT) to Robot Assisted Laparoscopic Prostatectomy (RALP), so patients selected for this study were good candidates for both EBRT and RALP at the time of their initial treatment. Almost all patients are good candidates for EBRT, but not all qualify for RALP. Therefore, only EBRT patients that were specifically noted to also qualify for RALP were selected for this study (see table 1). Surgical guidelines denote that patients should live long enough to benefit from lack of malignancy. As RALP is an invasive procedure, a patient should have a life expectancy of 10 years or more to receive treatment (Lepor 182). Although the probability that a man 70 years old will live 10 more years after prostatectomy is about 58% (Lepor 183), Oregon Urology Institute physicians do not discriminate treatment based on age and will select RALP if a patient has an estimated ten-year life expectancy. Thus, patients were selected for this study if it specified in their charts that they were good surgical candidates at the time of their initial treatment consultation. Patients selected had a Gleason Score of 6-8, which indicated that they needed initial treatment. Patients with a Gleason score of 9-10 are classified in the high-risk category and most often receive multiple treatment types such as surgery or radiation with hormone deprivation therapy (Fowler, Jr et al. 3221). Multiple treatments could confound the study results, so these patients were not included. Selected patients had a TNM score in the range of T1a-T3a, indicating they still had organ confined prostate cancer, and were therefore eligible for prostatectomy (Lepor 183). Patients who were selected for the RALP subject group underwent a form of a nerve sparing procedure (Bilateral, Right, Split, etc.) to improve erectile function.

Candidacy Criteria	
EBRT	**RALP**
Good surgical Candidates	
Gleason Score 6-8	
TNM score T1a-T3a	
	Nerve sparing operation

Table 1
Criteria for subject selection of each treatment group

Data Collection

Sexual and Urinary Function Data

Measurements for Sexual and Urinary function have been acquired through the EPIC. EPIC questionnaires inquire about the patient's urinary, bowel, hormonal, and sexual irritation, which reflects their urinary, bowel, hormonal, and sexual function (Wei et al. 899). The EPIC questionnaires relates the scores (1-5 or 1-4) in a section and calculates a percentage that gives a summary of the function for that section. Thus, if the top score is selected by the patient for each question in a section such as urinary function, that patient would receive 100 for that section

when their EPIC score is calculated. Higher scores represent less irritation and better function. The scores recorded for sexual and urinary function were used in this study, and all other information was omitted. A packet with this questionnaire is sent out to patients willing to participate in the Prostate Cancer Database before their treatment, then quarterly for the first year following treatment, and then annually. The two-year time point was chosen to assess recovery of urinary and sexual function since improvement in both generally does not occur past twenty-four months (Penson et al. 42; Donovan et al. 1429).

Treatment Related Information

Many co-variants were included in this study. Smoking status was determined based on smoking status at time of treatment. Co-morbidities were recorded from conditions recorded in patients' chart at time of treatment. Race was recorded from self-reported race in patients' charts. Use of hormone therapy was determined from listed medications on the patient's chart. Erectile aid use before and at the two-year time point was determined based off medication lists and notes made in the patient's chart. Other information regarding Gleason Score and other biopsy information was recorded from the biopsy pathology report, and the TRUS surgical report. Surgery related information, such as procedures performed and diagnostics, were recorded from the prostatectomy pathology report and the surgical notes.

Statistical Analysis

The patients' clinical presentations were analyzed with Welch's t-test (two tailed t-test with unequal variance). Demographic characteristics, which were included as possible confounding variables, were analyzed with Fisher's exact test. A Wilcoxon rank-sum test was used to compare baseline BMI of patients in each treatment group, as there were not normal distributions. General Linear Models (GLM) were used to assess significant differences between treatment groups, and identify if any variables were confounding the relationship between treatment groups and EPIC scores for urinary and sexual function.

Table 2 shows the clinical presentations of each treatment group. The patients in both treatment groups were largely similar. One statistically significant difference was the TNM Stage between the two treatment groups. The RALP treatment group had a slightly higher average TNM staging of T2b than the EBRT group's T2a.

Patient Demographics

Table 2
Comparison of Clinical Presentations for EBRT and RALP Patients
*Statistically significant with Welch's T-test p< .05.

	EBRT		RALP	
	Average	Mode	Average	Mode
Age at start of tx (yr)	66 SD: 7	59	64 SD: 6.8	68
PSA Level (ng/mL)	5.7 SD: 3	5.5	6.1 SD: 4.3	5.5
Prostate Size (mL)	43 SD: 15.8	-	39.8 SD: 20.2	33
Gleason Score	6.4 SD: 0.5	6	6.6 SD: 0.7	6
1st Grade	3.1 SD: 0.3	3	3.2 SD: 0.4	3
2nd Grade	3.3	3	3.4	3

	SD: 0.5		SD: 0.5	
Biopsies (% of positive samples)	35.6 SD: 22.4	25	35 SD: 20.4	33
Highest % of Cores	49 SD: 28.7	80	46 SD: 29.9	80
Clinical TNM Stage*	t2a	t1c	t2b	t2c
BMI	29.1 SD: 4.4	-	27.9 SD: 3.9	25.9

Fisher's exact test revealed significant differences in the amount of cardiac disease between treatment groups. The EBRT group had more instances of cardiac disease, with 41% of the patients with cardiac disease (see table 3). This prevalence of a disease, which influences the patient's overall health, suggests that the EBRT patient group was generally less healthy than the RALP group. Fisher's exact test revealed statistically significant differences in the number of patients treated with hormone therapy between groups during the time interval this study analyzed. The EBRT group had more patients treated with hormone therapy within the two-year interval post initial treatment (16% vs. 1%) (see table 3). As there is decreased libido, as well as other symptoms, related to the use of hormone therapy, the patient's sexual function EPIC scores could be affected by this treatment. The demographic categories of race and use of erectile aid were not included in the GLM analysis due to an unacceptable amount of missing data.

Table 3

Comparison of Covariates in Treatment Patient Population

*Indicates statistically significant differences between the treatment groups $p < .05$ ** Indicates statistical significant differences between treatment groups $p < .001$ ° Indicates variable not included in analysis due to missing data

	Number of Patients (%)	
	EBRT	**RALP**
Patients Included		
Total number of patients	32	104
Lost to follow up	0 (0%)	7 (6.7%)
Deceased	0 (0%)	2 (2%)
Radiation after initial tx	0 (0%)	10 (10%)
Pt w/ family history of prostate cancer	11 (34%)	32 (31%)
Comorbidities**		
No comorbidities	12 (38%)	94 (90%)
Cardiac disease**	13 (41%)	2 (2%)
Hypertension	1 (3%)	5 (5%)
Arterial disease	0 (0%)	1 (1%)

Smoking Status*		
Pt never smoked	12 (38%)	58 (56%)
Pt current smoker	2 (6%)	1 (1%)
Pt former smoker	18 (56%)	39 (38%)
Race°		
Alaskan native	1 (3%)	0 (0%)
White	23 (72%)	65 (63%)
Race not reported	8 (25%)	39 (37%)
Erectile Aid Use°		
No Erectile aid use before tx	6 (19%)	92 (88%)
Erectile aid use before tx	26 (81%)	11 (11%)
Erectile aid use not reported before tx	0 (0%)	1 (.01%)
No Erectile aid after tx	22 (69%)	32 (30%)
Erectile aid use after tx	9 (28%)	50 (48%)
Erectile aid use not reported after tx	1 (3%)	22 (21%)

Hormone Therapy*		
Received hormone therapy	5 (16%)	1 (1%)
No hormone therapy	27 (84%)	103 (99%)

Statistical Tests

Figure 5 shows the distribution of urinary change scores for EBRT and RALP. The unadjusted GLM model illustrated in Table 4 had an overall F value of 0.52. This F value is not less than 0.05, suggesting that this model is not a successful fit, so an adjusted model was run.

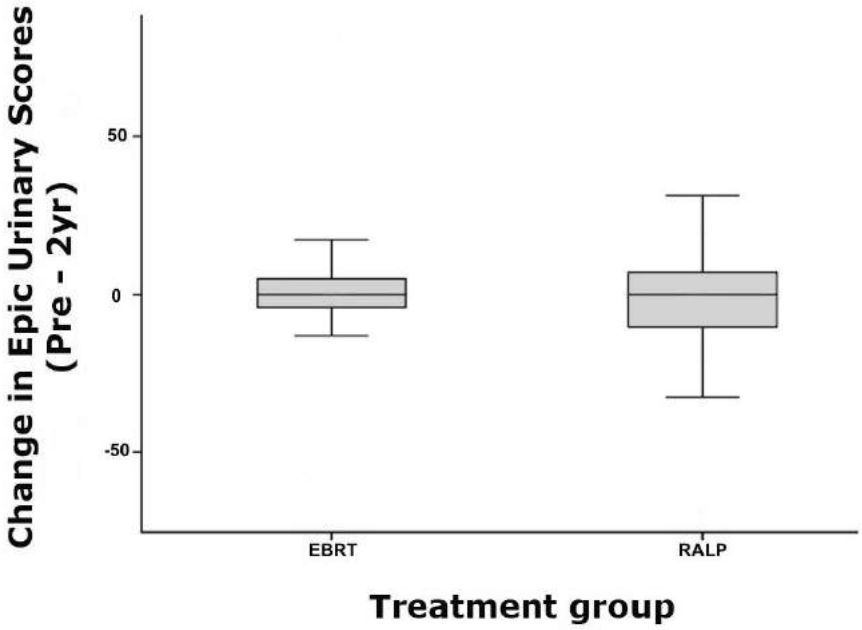


Fig 5. Distribution of Urinary EPIC Score Change

In this figure, zero denotes baseline. As two-year scores were subtracted from pre-treatment scores, negative scores indicate improvement from initial urinary function and positive scores represent a worsening from initial urinary function.

Table 4
Reported Values from the Urinary Function Unadjusted GLM Model

Unadjusted GLM Model		
Mean	**R^2**	**Pr > F**
-1.22	0.003	0.52
	Estimate	**Pr > |t|**
Intercept	-1.79	0.35
EBRT	2.71	0.52
RALP	0.00	

Table 5 shows the reported values of the fully adjusted GLM model that included possible confounding variables. The variables that were found to confound the association (to have an effect on change in urinary EPIC score independent of treatment group) of study variables were cardiac disease, arterial disease, age, body mass index (BMI), smoking, hypertension, and hormone treatment. None of these variables were found to modify the association (act in association with treatment group to affect urinary EPIC score) of study variables. The F-value for the fully adjusted GLM model was 0.0076, indicating a good fitting model (see table 5). The R^2 value generated by this analysis was 0.18. This indicates that the treatment groups and all of the confounding variables explain 18% of the variation in urinary change for all the patients included in this analysis (see table 5). EBRT had 4.45 greater increase in urinary change score than RALP, indicating a worsening in urinary function from baseline (as positive values represent a worsening in function) (see table 5). This association is not statistically significant with a p-value of 0.40. Thus, no statistically significant change was detected between urinary score change for EBRT and RALP. The mean value of all patients included in the GLM procedure was -0.81 (see table 5). As this value is negative, it shows that there was a general improvement of urinary function in men treated for prostate cancer with either treatment.

Table 5
Reported Values from the Urinary Function Fully Adjusted GLM Model

	Adjusted GLM Model	
Mean	**R^2**	**Pr > F**
-0.81	0.18	0.0076
	Estimate	**Pr > |t|**

Intercept	10.19	0.61
EBRT	4.45	0.41
RALP	0.00	

Figure 6 shows the unadjusted GLM model of change in sexual function from pre-treatment to two years post treatment. The F-value reported in Table 6 for this model was 0.012 indicating the model was a good fit. The R^2 value is 0.05, indicating that 5% of the variation in change sexual function from pre-treatment to 2 years is explained by type of treatment (see table 6). The difference in sexual function for patients undergoing EBRT was -11.9, which was statistically different ($p = 0.01$) (see table 6). As negative numbers represent an improvement in sexual function from baseline, this indicates that EBRT patients had better sexual function than RALP patients.

Fig 6. Distribution of Sexual EPIC Score Change

In this figure, 0 denotes baseline. As two year scores were subtracted from pre-treatment scores, negative scores indicate improvement from initial urinary function and positive scores represent a worsening from initial urinary function.
*Indicates a statistically significant difference ($p < 0.05$)

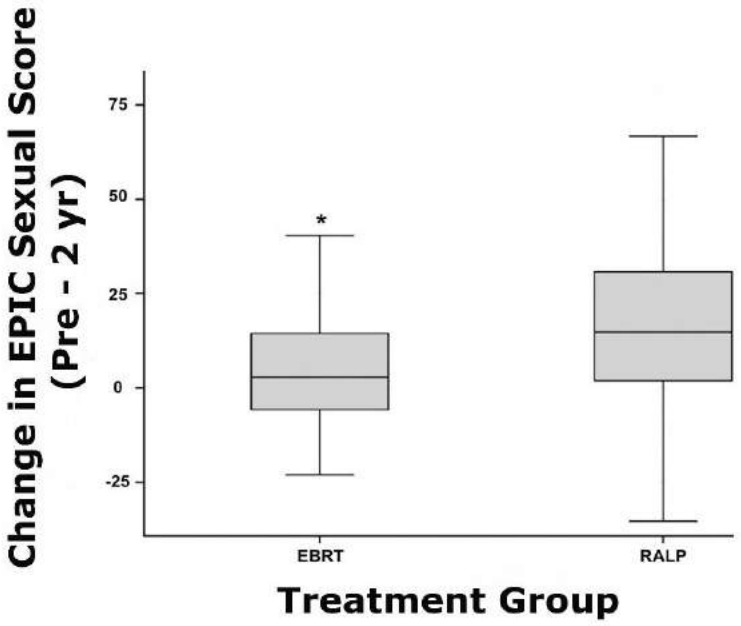


Table 6
Reported Values from Sexual Function GLM Unadjusted Model

	Unadjusted GLM Model	
Mean	**R^2**	**Pr > F**
15.94	0.052	0.012
	Estimate	**Pr > |t|**
Intercept	18.34	<.0001
EBRT	-11.88	0.012
RALP	0.00	

Table 7
Reported Values from Sexual Function Fully Adjusted GLM Model

	Adjusted GLM Model	
Mean	**R^2**	**Pr > F**
15.94	0.06	0.028
	Estimate	**Pr > |t|**
Intercept	18.43	<.0001
EBRT	-10.42	0.036
RALP	0.00	

The fully adjusted GLM procedure included hormone treatment in the analysis, as it was found to confound the relationship between treatment group and change in EPIC sexual function score. However, it was found that hormone treatment did not modify the association (act in conjunction with type of treatment) to affect change in EPIC score. The F value for the fully adjusted GLM model shown in Table 7 was 0.028, demonstrating a model of good fit. The R^2 value was 0.06, which indicates that treatment group can explain 6% of the variation in change in sexual function from

baseline to two years (see table 7). The difference in change between the EBRT patients and the RALP patients was -10.4, which is a statistically significant difference ($p = 0.04$) (see table 7). As negative numbers represent an increase in function, EBRT patients have better sexual function than RALP patients.

Discussion

This study compared External Beam Radiation Therapy (EBRT) to Robot Assisted Laparoscopic Prostatectomy (RALP) in terms of urinary and sexual function change from pre-treatment. The purpose of this comparison was to determine if either treatment provided better outcomes for patients. It was hypothesized that RALP patients would have better improvement in urinary function, and EBRT patients would have better improvement in sexual function.

The study's results found no significant difference between the treatments for change in urinary function at the two-year time point. This indicates that neither treatment is superior at preserving urinary function. The mean value of all of the patients included in the analysis of urinary function was negative. This indicates that, in general, all patients who undergo treatment for prostate cancer experience improved urinary function from before their initial treatment. This study's finding of no significant difference between urinary function change and treatment groups does not coincide with a study performed by Chien in 2017. This study found that urinary function was significantly worse in RALP patients compared to other treatments such as EBRT (Chien et al. 520). As there are still few studies that compare RALP to EBRT these conflicting findings cannot be reconciled.

A significant difference was found in the change in sexual function scores between treatment groups. The EBRT patients had a difference in change of -10.4 from the RALP patients. As negative numbers indicate an improvement in function, EBRT patients' sexual function improved when compared to RALP patients ($p = 0.04$). This indicates that EBRT is the superior treatment in the preservation of sexual function. These findings agree with Chein's 2017 study that found EBRT patients had better sexual function when compared to RALP patients.

This study has limitations that affect the conclusions that are drawn. As this study was performed with self-report EPIC questionnaires, there is the chance that the answers the subjects provided are not an accurate representation of their urinary or sexual function. There was also a much smaller sample size of EBRT patients compared to RALP patients, largely due to extensive missing data in pre-treatment scores for patients treated with EBRT. The missing data likely results from differences in EPIC packet distribution across sites where treatment is being delivered. The Research Department is located at the main campus, the same site where RALP patients receive treatment. This allows more effective pre-treatment packet delivery to RALP patients when compared to patients being treated at the satellite EBRT clinic, where the Research Department has much less direct influence over packet delivery. This study also relied heavily on data in patient charts for assessment of cofounding variables. If these charts were not updated or did not contain the information gathered by this study, the effect of these cofounding variables determined in this study could be inaccurate. As was mentioned, there was extensive

missing data for two variables: erectile aid use and race. A study that was designed to collect this information in a more reliable way, rather than relying on information included in a patient's chart, would be able to assess confounding variables to a more accurate degree. The diversity of patients is also a limitation. The racial demographic of subjects included in this study was comprised almost entirely of white men, which makes it difficult for the findings to be representative of the entire population of men with prostate cancer. In addition to race, this study was unable to include socioeconomic status and other influences such as access to health care facilities in the analysis. This severely limits the implications of the study's findings when applied to larger populations, since these are important indicators in health outcomes and could have confounded the results of this study. A study that examined a group of more diverse subjects, and included other determinants of health outcomes such as socioeconomic status would be able to draw more extensive conclusions.

This is one of the first studies that compares RALP to other treatments. More studies that compare RALP to other treatments are needed to assess which treatment will best suit patient needs. As use of erectile aids was not able to be included in this analysis due to extensive missing data, studies that analyze the role of erectile aid use in sexual function change after prostate cancer treatment should be conducted to evaluate how erectile aid use affects the change in sexual function in relation to different treatment types.

Conclusion

Health related quality of life in regards to urinary and sexual function varies by treatment. This study supports that EBRT is a better therapy for preserving sexual function, and demonstrates that either treatment will preserve urinary function to a similar degree. These findings will supplement the growing information about how different prostate cancer treatments will affect a patient's quality of life after treatment, thus providing the option for treatments to be specified to a patient's needs. The more patients can be informed about their health care choices the more they can understand the implications and consequences of their choices to make a decision about treatment that is best for them. Studies such as this that compare RALP and EBRT within a larger and more diverse population are needed to support and add to this study's finding, thereby achieving a greater understanding of how these treatments affect quality of life after treatment.

Acknowledgements

There are many wonderful people who helped me through this rewarding process, and I appreciate the opportunity to formally thank them now. I would like to thank Dr. Carrie McCurdy for agreeing to be my Primary Thesis Advisor. Thank you for your guidance that allowed me to find the most incredible resources that were invaluable to the development of this project. Thank you to Dr. David DiMarco for helping me navigate the nuances of clinical research for prostate cancer. I appreciate your expertise in this field. Thank you to Dr. Kelly Sutherland for being a wonderful CHC advisor, and for agreeing to be on my Thesis Committee. I have greatly valued your guidance in my time here at the University of Oregon. I am so grateful

to Gerald Rouleau, a former OUI intern and a wonderful statistical analyst, who saved my sanity by agreeing to help me with the statistical analysis. The analysis you conducted was invaluable to the validity and importance of this project. Thank you Jon Runyeon, for kindly offering to let me do an abdominal prosection on a cadaver in the anatomy lab so I could understand the prostate anatomy on a more in-depth level. The experience helped me understand the significance of the abdominal anatomy in this project. Perhaps I am most appreciative to Stephanie Kerns and Renee Podesta, who must have decided that I was sassy enough to get along with and chose to give me the opportunity of being an intern at OUI. You have both been so helpful and encouraging as I have worked to pull this project together, and I am so grateful. Thank you to Martin Allums, who created the fabulous illustrations that made this project look much more professional than I could have ever imagined. I look forward to the day when every medical textbook I open is bursting with your illustrations. Finally, I would like to thank my parents Liz and Doug Fischer. Your support and never-ending encouragement has always allowed me to do way more than I ever should, and kept me sane while I muddled through it. In the end I know that I am Julia Pauline Fischer, and I am loved very much. Thank you for being my parents, I love you.

Works Cited

Barré, Christian. "Open Radical Retropubic Prostatectomy." *European Urology*, vol. 52, no. 1, 2007, pp. 71–80, doi:10.1016/j.eururo.2006.11.057.

Chien, Gary W., et al. "Health-Related Quality of Life Outcomes from a Contemporary Prostate Cancer Registry in a Large Diverse Population." *BJU International*, vol. 120, no. 4,2017, doi:10.1111/bju.13843.

Coelho, Rafael F., et al. "Retropubic, Laparoscopic, and Robot-Assisted Radical Prostatectomy: A Critical Review of Outcomes Reported by High-Volume Centers." *Journal of Endourology*, vol. 24, no. 12, 2010, pp. 2003–15, doi:10.1089/end.2010.0295.

Coyne, Karin S., et al. "The Impact of Overactive Bladder, Incontinence and Other Lower Urinary Tract Symptoms on Quality of Life, Work Productivity, Sexuality and Emotional Well-Being in Men and Women: Results from the EPIC Study." *BJU International*, vol. 101, no. 11, June 2008, pp. 1388–95, doi:10.1111/j.1464-410X.2008.07601.x.

Donovan, Jenny L., et al. "Patient-Reported Outcomes after Monitoring, Surgery, or Radiotherapy for Prostate Cancer." *New England Journal of Medicine*, vol. 375, no. 15,2016, pp. 1425–37, doi:10.1056/NEJMoa1606221.

Edge, Stephen B., and Carolyn C. Compton. "The American Joint Committee on Cancer: The 7th Edition of the AJCC Cancer Staging Manual and the Future of TNM." *Annals of Surgical Oncology*, vol. 17, no. 6, 2010, pp. 1471–74, doi:10.1245/s10434-010-0985-4.

Fowler, Floyd J., et al. "Comparison of Recommendations by Urologists and Radiation Oncologists for Treatment of Clinically Localized Prostate Cancer." *JAMA*, vol. 283, no. 24, 2000, p. 3217, doi:10.1001/jama.283.24.3217.

Frank, Steven J., et al. "An Assessment of Quality of Life Following Radical Prostatectomy, High

Dose External Beam Radiation Therapy and Brachytherapy Iodine Implantation as Monotherapies for Localized Prostate Cancer." *The Journal of Urology*, vol. 177, no. 6, 2007, pp. 2151–56, doi:10.1016/j.juro.2007.01.134.

Haas, Gabriel P., et al. "The Worldwide Epidemiology of Prostate Cancer: Perspectives from Autopsy Studies." *The Canadian Journal of Urology*, vol. 15, no. 1, 2008, pp. 3866–71.

Heidenreich, Axel, et al. "EAU Guidelines on Prostate Cancer." *European Urology*, vol. 53, no. 1, 2008, pp. 68–80, doi:10.1016/j.eururo.2007.09.002.

Humphrey, Peter A. "Gleason Grading and Prognostic Factors in Carcinoma of the Prostate." *Modern Pathology*, vol. 17, no. 3, 2004, pp. 292–306, doi:10.1038/modpathol.3800054.

Lee, Chung, et al. "Demonstration of the Role of Prostate-Specific Antigen in Semen Liquefaction by Two-Dimensional Electrophoresis." *Journal of Andrology*, vol. 10, no. 6, 1989, pp. 432–38, doi:10.1002/j.1939-4640.1989.tb00134.x.

Lepor, Herbert. "Selecting Candidates for Radical Prostatectomy." *Reviews in Urology*, vol. 2, no. 3, 2000, pp. 182–89.

Litwin, Mark S., et al. "Quality of Life after Surgery, External Beam Irradiation, or Brachytherapy for Early-Stage Prostate Cancer." *Cancer*, vol. 109, no. 11, 2007, pp. 2239–47, doi:10.1002/cncr.22676.

Miller, David C., et al. "Long-Term Outcomes among Localized Prostate Cancer Survivors: Health-Related Quality-of-Life Changes after Radical Prostatectomy, External Radiation, and Brachytherapy." *Journal of Clinical Oncology*, vol. 23, no. 12, 2005, pp. 2772–80, doi:10.1200/JCO.2005.07.116.

Miyamoto, Hiroshi, et al. "Androgen Deprivation Therapy for Prostate Cancer: Current Status and Future Prospects." *The Prostate*, vol. 61, no. 4, 2004, pp. 332–53, doi:10.1002/pros.20115.

Penson, David F., et al. "5-Year Urinary and Sexual Outcomes After Radical Prostatectomy: Results From the Prostate Cancer Outcomes Study." *The Journal of Urology*, vol. 179, no. 5, 2008, pp. S40–44, doi:10.1016/j.juro.2008.03.136.

Potosky, Arnold L., et al. "Five-Year Outcomes after Prostatectomy or Radiotherapy for Prostate Cancer: The Prostate Cancer Outcomes Study." *Journal of the National Cancer Institute*, vol. 96, no. 18, 2004, pp. 1358–67, doi:10.1093/jnci/djh259.

Schreiber, David, et al. "Clinical and Biochemical Outcomes of Men Undergoing Radical Prostatectomy or Radiation Therapy for Localized Prostate Cancer." *Radiation Oncology Journal*, vol. 33, no. 1, 2015, pp. 21–28, doi:10.3857/roj.2015.33.1.21.

Shah, Rajal B. "Current Perspectives on the Gleason Grading of Prostate Cancer." *Archives of Pathology & Laboratory Medicine*, vol. 133, no. 11, 2009, pp. 1810–16, doi:10.1043/1543-2165-133.11.1810.

Smith, Robert A., et al. "Cancer Screening in the United States, 2009: A Review of Current

American Cancer Society Guidelines and Issues in Cancer Screening." *CA: A Cancer Journal for Clinicians*, vol. 59, no. 1 2009, pp. 27–41, doi:10.3322/caac.20008.

Stenman, Ulf-Håkan, et al. "Prostate-Specific Antigen." *Seminars in Cancer Biology*, vol. 9, no. 2,1999, pp. 83–93, doi:10.1006/scbi.1998.0086.

Talcott, James A., et al. "Patient-Reported Impotence and Incontinence after Nerve-Sparing Radical Prostatectomy." *Journal of the National Cancer Institute*, vol. 89, no. 15, 1997, pp. 1117–23, doi:10.1093/JNCI/89.15.1117.

Walsh, Patrick C., et al. "Radical Prostatectomy with Preservation of Sexual Function: Anatomical and Pathological Considerations." *The Prostate*, vol. 4, no. 5, 1983, pp. 473–85, doi:10.1002/pros.2990040506.

Wei, John T., et al. "Development and Validation of the Expanded Prostate Cancer Index Composite (EPIC) for Comprehensive Assessment of Health-Related Quality of Life in Men with Prostate Cancer." *Urology*, vol. 56, no. 6, 2000, pp. 899–905, doi:10.1016/S0090-4295(00)00858-X.

12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

The Role of Religion and Spirituality in Snow Leopard Conservation on and Around the Tibetan Plateau

Hannah Taub*, Environmental Studies

ABSTRACT

As an endangered species, snow leopards are in critical and immediate danger of extinction. In the last few decades, concerted efforts on the part of conservation organizations and various governments have created stricter legal protections and designated hundreds of kilometers of land as snow leopard habitat reserves. However, given the sparsely populated, remote and rugged landscape that snow leopards roam, difficulties arise when monitoring the species and patrolling the protected areas. Tibetan Buddhists and indigenous communities inhabit land that often overlaps with snow leopard range and their spiritual traditions and practices embody an environmental ethic that puts particular emphasis on respect for animal life, specifically including snow leopards. Geographical proximity and spiritual values that align closely with conservation principles support the argument that indigenous and Tibetan Buddhist communities are valuable, underutilized resources in the efforts to protect snow leopards in and around the Tibetan Plateau. Incorporating the traditional, local knowledge of and reverence for snow leopards with scientific approaches would create a more successful and culturally-sensitive method of conservation.

INTRODUCTION

The role of various actors in wildlife conservation is complicated and highly place-specific. Stakeholders, including governments, NGOs (non-governmental organizations), and local community members, all contribute to or otherwise influence conservation in some degree. Yet the interplay among these interests often complicates the implementation of effective conservation efforts across a cohesive geographic, spatial and temporal range. It is increasingly recognized that more coordinated efforts to consider local knowledge and needs are valuable to the realization of conservation goals (DeCaro & Stokes, 2008). Further, cultural and spiritual ideas, whether religious or indigenous, can encompass an environmental ethic that complements and lends emotional capacity to conservation rhetoric. Snow leopard conservation stands to benefit uniquely from a stronger relationship between traditional and religious communities and conservation groups. Tibetan Buddhist monks are an especially valuable potential ally for conservation groups since they inhabit areas close to snow leopard habitat and are often in positions conducive to influencing nearby communities

* Hannah Taub is from Washington, D.C., and she is a senior in the Clark Honors College, pursuing a major in Environmental Studies and minors in French and Geology. Her thesis project is focused on the land rights of Indigenous Peoples in Sweden, but she is passionate about wildlife conservation and loves big cats! On campus, Hannah contributes to Envision Journalism and Siren Magazine, and volunteers as a DJ at KWVA. Please send correspondence to htaub@uoregon.edu.

As an apex predator and keystone species, the snow leopard is an iconic fixture of the Tibetan Plateau and the surrounding area. Further, the species is a cultural focal point for those who live within its range. From an ecological and environmental standpoint, the protection of this big cat species is absolutely crucial. Until recently, snow leopard populations faced persecution across their range, except in areas where Buddhism is prevalent (Loginova, 2016). Buddhists consider all beings to be interconnected, and animal killing is generally discouraged in communities where Tibetan Buddhism is practiced. Since the species' addition to the IUCN Red List of Threatened Species in 1972, countries that have snow leopard habitat have started various initiatives to address the issue, including the creation of national nature reserves and increased cross-border collaboration on conservation and habitat preservation. However, threats such as poaching, retaliatory killing, impacts from increased human activity on snow leopard range, and climate change continue to put stress on snow leopards and their habitat.

In their paper describing obstacles to successful conservation efforts in China, Li, Xiao and Lu (2016) highlight recent efforts to integrate local ways of life with conservation initiatives, such as programs providing compensation to herders who lose livestock to snow leopards. It is widely accepted in conservation discourse today that community engagement is best achieved through local, pre-existing organizations (Jackson and Lama, 2016). Existing evidence also shows that Buddhist monks have played an integral role in educating the community about snow leopard conservation in one conservation area in China (Li et. al, 2016). This latter point is especially intriguing, given that the modern discourse around animal conservation is heavily rooted in modern science frameworks, which tend to discount, downplay, or entirely ignore the potential role of religion, culture, and traditional ways of life in wildlife conservation, both historically and today.

CONTEXT

The Dalai Lama, the spiritual leader for Tibetan Buddhists, has highlighted the need for resistance to the current separation of religious and scientific communities, stating, "I have argued the need for and possibility of a worldview grounded in science, yet one that does not deny the richness of human nature and the validity of modes of knowing other than the scientific" (Dalai Lama, 2001). The participation of Buddhist monks on the Tibetan Plateau in snow leopard conservation is one successful example of increased inclusion of non-scientific worldviews and frameworks in scientific efforts. Clearly, conservation and the sciences have something to gain from an increased reliance on local community resources and a wider understanding of spiritual and religious concepts.

In Tibet, the issue of wildlife conservation is complicated by the political turmoil between Tibet and China, and by the remoteness of the landscape itself. However, low population density in snow leopard habitat is beneficial to their conservation because it minimizes the extent to which the big cats and their lands are interfered with and encroached upon. Additionally, the snow leopard's existence across multiple borders creates opportunities for international cooperation and increased dialogue, as countries in the region can unite over a common interest in protecting snow leopard populations (Riordan & Shi, 2016). In the rugged and unforgiving

snow leopard habitat, NGOs, the governments in Tibet and China, and individuals and groups that share the snow leopards' home base all provide input and work to varying degrees to protect the snow leopard. Existing studies suggest Buddhist monks, whose monasteries are often in some of the most isolated and unpopulated areas of Tibet, can play a unique role in the protection of the elusive snow leopard (Li et. al, 2014).

Given the closeness of monasteries to snow leopards in Tibet, Tibetan Buddhist monks are a critically underutilized resource in the realm of species observation for conservation purposes (Li, Yin & Lu, 2016). Because of their elusiveness, the morphology and genetics of snow leopards remains unsatisfactorily studied and such a gap in knowledge could mean conservation strategies are not as effective as they could be (Kitchener, Driscoll & Yamaguchi, 2016). Increased reliance on local communities for aiding in data collection could serve to improve conservation efforts in the long run. It is significant for snow leopard observation potential that "snow leopard global range overlaps substantially with the area of Tibetan Buddhism influence, including the whole Tibetan Plateau, part of Mongolia and Russia, Bhutan, Nepal, and northern India," especially since the sites of Tibetan Buddhist monasteries are often located directly within areas of snow leopard habitat (Li, Yin & Lu, 2016). Beyond the particularly well-suited location of many Buddhist monk communities for surveillance and monitoring of the species, the spiritual aspects of the monks' way of life lends itself particularly well to snow leopard conservation.

THE COMMUNITY ROLE OF BUDDHIST MONKS

Research has highlighted how the Buddhist emphasis on the interconnectedness of all beings lends itself to the protection of wildlife (Li, Yin & Lu, 2016). The monks can play a leadership role in the education and inspiration of the community by rallying local herders, whose interests

may normally be focused on their livelihoods and their livestock, to consider the snow leopards in need of protection from a religious point of view. The obligation to protect nature from a spiritual standpoint is often more convincing to locals, who respect and follow the teachings of the monks, than coercive pressures from the government or environmental rhetoric from outside NGOs.

Contrary to the typical image of monastic isolation, Tibetan monks often play a positive and engaged role in the wider communities they live near. In her study titled, "The relationship between monastic and local communities: the example of Lhagang Village in Kham Minyag," author Sonam Wangmo (2016) describes the mutually beneficial relationship between monasteries and their neighboring communities:

> Lay communities provide labor, supplies and goods, while in return the monastic community fulfills a wide range of the lay community's spiritual needs, in particular the performance of rituals to generate merit for laypeople, to increase their success and happiness, and to protect the community from natural disasters.

Tibetan Buddhist monasteries are often integral institutions that provide education and various services to nearby communities. From a conservation standpoint, monasteries represent an untapped resource for disseminating information to and influencing the behavior of local communities.

Scientists studying snow leopards in the Tibetan Plateau region have expressed concern that researchers "lack sufficient understanding of current socio-ecological systems to identify ultimate and proximate drivers of pastoralist behavior, and thus policy initiatives aimed at sustainability may well fail" (Harris, 2008). Without support from the community it affects, a given policy is likely to be ineffective. The current conservation discourse supports the idea that policy design and implementation is most successful when it involves local organizations and stakeholders (Liu et. al, 2016). Such efforts at inclusion can be complicated by conflicts of interest, both within and between groups (Liu et. al, 2016).

An existing program that works to integrate local and outsider conservation efforts is the Annapurna Conservation Area Project (ACAP) in Nepal. Local community members formed Snow Leopard Conservation Committees (SLCCs), whose efforts are framed by the area's particularly cohesive society and by the non-killing principles inherent to Tibetan Buddhism, (Jackson and Lama, 2016). Such projects interweave conservation into the daily practices of the community, raising general awareness of the importance of conservation. For example, one "local religious leader was honored with a plaque for helping stop snow leopard killing and wildlife poaching by local residents," proving the local pride in and emphasis on protecting the species (Jackson and Lama, 2016). Recognition of community support for conservation goals is especially important when species conservation efforts derive from entities outside of the community (Jackson and Lama, 2016).

CONSERVATION CONFLICTS

Whereas community investment in conservation efforts is effectively supported through the framework of Tibetan Buddhism and the traditional relationship between the local community and nearby monasteries, the frameworks of the national government are sometimes at odds with these goals. The economic interests of the Chinese government sometimes override their intention to support and spearhead conservation initiatives, as is the case in the ongoing highway construction projects in the Tibetan Plateau area (Liu et. al, 2016). The religious interests of local communities are ignored and disrespected by the government project, a fact that is particularly evident in plans for the highway to cut through a site considered sacred in Tibetan Buddhism (Liu et. al, 2016). Although it is increasingly accepted that "protected area networks should integrate nature reserves managed by government with sacred lands protected culturally, especially where these two have significant overlap," there is still significant room for improvement in engaging locals and addressing their needs in conjunction with those of the snow leopard conservation work (Liu et. al, 2016). Increased awareness of the needs and potential contributions of local communities can lead to a more sustainable and culturally sensitive conservation model. Both NGOs and governments have a long way to go toward

understanding the needs of local people who live in the remote regions inhabited by snow leopards, especially if they intend to rely on these communities to aid in conservation of the endangered big cat species.

On the Tibetan Plateau, humans and snow leopards share the landscape – but they do not always do so harmoniously, given that snow leopards often eat the livestock that many Tibetans depend on for income. Snow leopards inhabit mountainous regions of Central Asia, and are uniquely adapted to the cold climate, high altitude and rugged landscape characteristic of their terrain (Kitchener, Driscoll & Yamaguchi, 2016). Their diet consists primarily of ungulates such as sheep and goats, which is a key point in the conflict between locals who wish to maintain and protect their livestock and conservation interest groups. Snow leopards are particularly at risk for revenge killings, since they have been observed to linger at sites where they capture prey, in potential range of angry herders (Fox & Chundawat, 2016). It is essential that conservation groups recognize this conflict, and work must be done to balance the protection of Tibetan herders' livelihoods with that of the snow leopard. Efforts to do so are already occurring in some provinces of China, where "damage caused by snow [leopards] has received government compensation to ease conflicts with local people and to promote support for snow leopard conservation" (Riordan & Shi, 2016). The economic loss that stems from livestock being hunted by predators can be offset by such compensation schemes, potentially lessening the incidence of revenge killings. If the needs of the community are considered in tandem with conservation goals, a more integrated and successful campaign against snow leopard extinction can be waged.

CURRENT EXAMPLES OF MONASTERY INVOLVEMENT IN CONSERVATION

In their study of monastery-based snow leopard conservation, Li et al. (2016) described how Tibetan Buddhists actively participated in conservation projects in areas where they inhabit snow leopard range. For example, local monks in the Chinese Sanjiangyuan region of the Tibetan Plateau estimated the size of the regional blue sheep population by conducting census interviews in the community (Li et al. 2016). As respected community members, it is likely that the monks were able to gain access to and response from local individuals more easily than if foreign researchers had attempted to conduct the survey themselves. This study provides a practical example of how monks could aid in monitoring and data collection efforts for snow leopards.

Another example that recognized the opportunity for cooperation and synergy in snow leopard conservation by involving Tibetan monks is a 2009 study conducted by the Center for Nature and Society at Peking University in which several monasteries participated (Li et al., 2016). Notably, one of the authors of the study, published in *Conservation Biology*, is the premier wildlife conservation biologist working on snow leopards, George Schaller. In this project, rules were implemented designating sacred lands to each participating monastery, in which activities counter to conservation efforts were prohibited (Li et al., 2016). Such a cooperative project gives agency and direction to monasteries and Buddhist communities existing in the snow leopard range that may already be playing an inadvertent role in supporting conservation endeavors. A particularly successful realization of this potential monastic support

for conservation efforts has occurred at the Tarthung monastery, where monks are involved in multiple conservation projects, including species monitoring and community education (Li et al., 2016). Conservation, community engagement, and religious practice are all integrated in this approach.

In protecting religious sites and sacred species, followers of and leaders within Buddhism help to maintain biodiversity and directly aid in conservation efforts. Additionally, indirect contributions to biodiversity are made through the practice of positive views and behaviors towards nature that are inherent to Buddhist philosophy (Li et al., 2016). Snow leopards are embedded in Buddhist scripture, giving their species a sacred status that increases awareness of and willingness to protect the animals among local believers. Often, these beliefs translate directly into normative behaviors conducive to the conservation of wildlife, including snow leopards. For example, Li et al. found in their study centered on China's Qinghai Province on the Tibetan Plateau that "42% of local herders said that they did not kill wildlife because it was a sin in Buddhism" (Li et al., 2016, 203). Given that the diet of modern snow leopards relies heavily on livestock, it is understandable that many people who raise animals as a livelihood in snow leopard habitat would have a certain level of animosity towards the creatures. However, it seems these negative views are lessened given the value placed on snow leopards in Tibetan Buddhism (Liu et al., 2016).

The snow leopard is endangered for a variety of reasons, chief among them poaching, decreasing amounts of prey, and an increasingly degraded habitat (Chundaway and Habib, 2008). Conservation strategies such as nature reserves, government incentive programs, and NGOs are limited in their scope and effectiveness, especially in the remote areas of the Himalayas and the Tibetan Plateau (Li et al., 2014). For example, the Chinese Sanjiangyuan Nature Reserve on the Tibetan Plateau covers only a small portion of the almost 90,000 km^2 of snow leopard habitat that spans the region. In their study of monasteries' role in snow leopard conservation in the Sanjiangyuan region, Li et al. found that "the 336 monasteries in the Sanjianyuan region could protect more snow leopard habitat (8,342 km^2) through social norms and active patrols than the nature reserve's core zones," especially given that 90% of the monasteries are located within at least five kilometers of snow leopard habitat (Li et al., 2014). This evidence suggests that the pre-existing network of monasteries in Tibet has the potential to serve conservation goals on a wider scale than that of designated nature reserves. In both their spiritual tenets conducive to wildlife protection and their physical proximity to snow leopard populations, Buddhist monks provide a key resource for aiding in conservation efforts in the Tibetan Plateau region.

INTEGRATING INDIGENOUS BELIEFS

Buddhism is not the only local cultural element that is relevant to ongoing efforts to conserve snow leopard habitat and populations. The shamanism of indigenous groups in the Tibetan Plateau region is crucially connected to an understanding of and appreciation for the natural world that complements conservation efforts (Colorado & Ryskulova, 2016). Shamans, or

Indigenous Cultural Practitioners (ICPs), are spiritual leaders in the indigenous communities of the region. Integration of their expertise into conservation planning is slowly becoming part of the conservation discourse, due in part to the United Nations Brundtland Report and Article 21 of the Rio Earth Summit, the latter of which stressed the need for acknowledgement and use of indigenous knowledge in research (Li et al, 2014). The development of *The Indigenous Cultural Practitioners Statement to the Global Snow Leopard Conservation Forum* in 2013 was representative of increased inclusion of indigenous perspectives to the international conservation sphere. Increasing inclusion in the international political sphere of diverse indigenous and religious viewpoints is putting pressure on the scientific community to consider these groups as potential partners in scientific and conservation endeavors.

The Kyrgyz people of Central Asia place high spiritual value on the snow leopard. (Li et al., 2014). They designate specific locations to be "sacred snow leopard sites," of which ICPs are designated Guardians (Li et al., 2014). These existing belief systems create a society structured towards reverence and protection of the snow leopard. One ICP described a petroglyph at Lake Issykul in Kyrgyzstan that depicts a line connecting a human to a snow leopard as representative of the Kyrgyz reverence for and unity with snow leopards (Li et al., 2014). Kyrgyz traditional beliefs align well with those of conservationists, and incorporation of indigenous thought and cultural elements into the discourse around protecting the snow leopard could strengthen conservation efforts.

Buddhism and indigenous spirituality are particularly effective vehicles for lending an emotional element to snow leopard conservation efforts. The movement to protect the species requires more creative motivators for action, given that complete extinction is not imminent (Liu et al., 2016). Existing examples of these efforts can be seen in the proliferation of snow leopard images on stamps, banknotes and flags of various nations in and near the snow leopard habitat. Irina Loginova (2016) of the Snow Leopard Fund writes that, "The symbolism of the snow leopard can play a significant role in shaping and strengthening its positive image as a living symbol of national pride and an object of the peoples of Central Asia, and therefore contribute to its conservation." Alongside governmental campaigns similar to those employed in giant panda conservation, such as designating the snow leopard as a flagship species, the snow leopard's central roots in the area's traditional cultures and religions should be recognized and capitalized on. Rodney Jackson and Wendy Lama (2016) illuminate this point in their discussion of conservation best practices, asserting:

> Beyond the goal of cultural conservation per se, protection of these mountain peoples' traditional values, religious beliefs, and sustainable livelihoods are part and parcel of snow leopard conservation…[because] without community participation, conservation efforts are incomplete.

Foreign groups would do well to call upon the expertise and opinions of local communities in snow leopard habitat in order to ensure long-term sustainability and cultural sensitivity of conservation projects.

The Bishkek Declaration is one of the first snow leopard conservation agreements to include indigenous perspective and knowledge (Colorado & Ryskulova, 2016). This organized plan was created in 2013 as "a global conservation strategy calling for a deep networking of sacred sites, shamans, and sacred species first within the cultural frame" that brings cultural consideration to conservation initiatives, which have primarily been science-based (Colorado & Ryskulova, 2016). This collaboration between scientific experts and indigenous leaders represents an understanding of indigenous knowledge as a kind of environmental ethic. Legitimizing and acknowledging the indigenous perspective can lead to a more successful approach to snow leopard conservation that is culturally sensitive, holistic, and inclusive in nature.

CONCLUSION

The issue of protecting snow leopards from extinction is a challenge facing conservationists worldwide. For the people who inhabit the same lands as these big cats, there is more at stake than the ecological implications of losing a species that plays a critical role in its ecosystem. Snow leopards occupy a part of the religious and cultural frameworks of the people in the Tibetan Plateau. The indigenous peoples that have lived in the Tibetan Plateau for countless generations have developed a spiritual connection to and reverence for the snow leopard, which is apparent in their rock art and oral legends. Similarly, Tibetan Buddhists practice compassion for all living beings, and their spiritual texts and practices include a unique appreciation of and respect for the snow leopard. Members of these respective cultures and belief systems can contribute a valuable emotional element to conservation initiatives, in addition to providing their own first-hand observations and understandings of snow leopard movement and behavior. It is essential that a multi-faceted approach to saving the snow leopard be created, one that encompasses scientific, indigenous, and spiritual knowledge and practices. Not only will such integration of methods give the snow leopards a better chance of survival, but it will also acknowledge and respect the people who live side-by-side with the elusive big cats.

ACKNOWLEDGMENTS

I would like to thank Professor Hopkins for her guidance and suggestions during the research and writing process, and for introducing me to various concepts relating to the geology and biology of the Tibet region. Thanks are also due to the anonymous peer editors that provided feedback on early drafts of this paper in my Honors College class.

REFERENCES

Colorado, A. and Ryskulova, N. *Shamanism in Central Asian Snow Leopard Cultures*. In: McCarthy, T. ed, *Snow Leopards: Biodiversity of the World: Conservation from Genes to Landscapes*. London; San Diego, CA: Academic Press p. 205-09.

DeCaro, D. and Stokes, M. 2008. Social-Psychological Principles of Community-Based Conservation and Conservancy Motivation: Attaining Goals within an Autonomy-Supportive Environment. *Conservation Biology*. 22 p. 1443–1451

Harris, R.B., 2008. *Wildlife conservation in China preserving the habitat of China's wild west*, Armonk, N.Y.: M.E. Sharpe.

Chundaway, R.S., and Habib, B. 2017. Panthera uncia Red List Assessment. *International Union for Conservation of Nature and Natural Resources*. http://www.iucnredlist.org/details/22732/0

Jackson, R.M. and Lama, W. B. 2016. *The Role of Mountain Communities in Snow Leopard Conservation*. In: McCarthy, T. ed. *Snow Leopards: Biodiversity of the World: Conservation from Genes to Landscapes*. London; San Diego, CA: Academic Press, p. 139-148

Kitchener, A. C., Driscoll, C. A., and Yamaguchi, N. 2016. *What is a Snow Leopard? Taxonomy, Morphology, and Phylogeny*. In: McCarthy, T. ed. *Snow Leopards: Biodiversity of the World: Conservation from Genes to Landscapes*. London; San Diego, CA: Academic Press, p. 3-11

Li J., Wang, D., Yin, H., Zhaxi, D., Jiagong, Z., Schaller, G. B., Mishra, C., McCarthy, T. M., Wang, H., Wu, L., Xiao, L., Basang, L., Zhang, Y., Zhou, Y., and Lu, Z. 2014. Role of Tibetan Buddhist Monasteries in Snow Leopard Conservation. *Conservation Biology,* 28, pp. 87-94.

Li, J., Xiao, L., and Lu, Z. 2016. Challenges of snow leopard conservation in China. *Science China*. 59(6), pp. 637–639

Liu, Y., Weckworth, B., Li, J., Xiao, L., Zhao, X., Lu, Z. 2016. *China: The Tibetan Plateau, Sanjiangyuan Region*. In: McCarthy, T. ed. *Snow Leopards: Biodiversity of the World: Conservation from Genes to Landscapes*. London; San Diego, CA: Academic Press, p. 514-520.

Loginova, Irina. 2016. *The Snow Leopard in Symbolism, Heraldry, and Numismatics: The Order "Barys" and Title "Snow Leopard*. In: McCarthy, T. ed, *Snow Leopards: Biodiversity of the World: Conservation from Genes to Landscapes*. London; San Diego, CA: Academic Press, p. 214-17

McCarthy, T., Mallon, David & Nyhus, Philip J., 2016. Snow leopards, London; San Diego, CA: Academic Press

Mock, John. 2016. *Snow Leopards in Art and Legend of the Pamir*. In: McCarthy, T. ed, *Snow Leopards: Biodiversity of the World: Conservation from Genes to Landscapes*. London; San Diego, CA: Academic Press p. 210-13.

Riordan, P., Cushman, S. A., Mallon, D., Shi, K. and Hughes, J. 2016. Predicting global population connectivity and targeting conservation action for snow leopard across its range. *Ecography*, 39(5). p. 419–426.

Snow Leopard Trust. 2013. *Buddhist Monks Are Champions of Snow Leopard Conservation* [Online]. Snow Leopard Trust. Available at: https://www.snowleopard.org/tibetan-buddhist-monks-are-champions-of-snow-leopard-conservation/

Wangmo, S. 2016. *The relationship between monastic and local communities: the example of Lhagang village in Kham Minyag* [Online] 47. Available at: http://emscat.revues.org/2805

12.1 (2018) ISSN: 2160-617X (online)
ourj.uoregon.edu

What Did You Say She Was Like? Features of Gossip Associated with Hearsay Accuracy and Consensus

Chenle Xu*, Psychology

ABSTRACT

When gossiping about a person, how does one's verbal responses affect the impression formed by the gossipers? A previous study on hearsay reputation find that when two gossipers gossiping about a target person, the hearsay accuracy about the target is low but the consensus between the two gossipers is high (Costello & Srivastava, 2017). As there has not been any research, to our knowledge, examining the factors that affect hearsay accuracy and consensus, this study intends to fill in the gap by exploring verbal responses as the potential factors. This study investigated the impacts of nine types of verbal responses on the accuracy and consensus. We coded 114 gossip conversations from the previous study (Costello & Srivastava, 2017) for nine specific responses and eight global features of the conversations. We explored the extent to which these specific and global features of gossip relate to consensus and accuracy in interpersonal impressions, operationalized as profile agreements. By using profile correlations with interpersonal ratings, the result suggests that certain types of responses may be associated with accuracy and consensus; for example, offering evaluation as a type of response seems to lead to a higher consensus between gossipers but cannot lead to an accurate impression of the target. Although few of the correlations were statistically significant, this project should still help to shed light on the conversational features associated with accuracy and consensus of impressions formed through gossip.

INTRODUCTION

Gossip is a very common activity in people's daily lives. Gossip may be associated with the intimacy or familiarity within groups or relationship (McDonald, Putallaz, Grimes, Kupersmidt, & Coie, 2007). Sharing information in gossip conversations is also important as it can help to stop the damages that may happen in social contexts. Dunbar (2004) explains that gossip may have evolved to help prevent people from exploiting the community by letting honest community members alert each other about any potential free rider. Moreover, through gossip, people can collect different kinds of information and form impressions about the target person (i.e. the one who gets discussed in the gossip episode). Forming an accurate impression of people is important for different occasions in life; for example, since an accurate personality

*Chenle Xu graduated from the University of Oregon in June of 2017. She majored in psychology and minored in theatre art. Chenle was a research assistant at the Personality and Social Dynamic lab led by Dr. Sanjay Srivastava while at the University of Oregon, where she also conducted her honors thesis. Chenle has also worked at Dr. Maureen Zalewski's The Science and Treatment of Affect Regulation Team lab as research assistant. Chenle is now pursuing a master's in psychology at Villanova University. Her plan after this master program is to apply for a PhD program in clinical psychology. Direct correspondence to: chenlex@uoregon.edu

judgment can help to predict the potential employee or student's future behaviors, a recommendation letter reader would need to gather accurate information from the letter to predict if the target person is worth hiring or admitting (Funder, 1995). The same issue may also exist in other social contexts, like in close relationships, where accurately perceiving personality can provide important information about a potential romantic partner (Buss, 2011). Therefore, gossip and the interpersonal judgments that accompany it are very important for people's daily lives.

COMPONENTS OF ACCURACY AND CONSENSUS

The importance of gossip or the interpersonal perception has intrigued researchers to ask what are the underline components behind this action? Among several different ways of conceptualizing agreement in interpersonal perception, one conceptualization stood out - *Profile Correlations*, which correlate ratings made across a set of items (Furr, 2009). In this conceptualization, Furr (2009) noted that the overall profile (i.e. raw personality profile) has two components: normativeness and distinctiveness. Normativeness is the average person's personality profile. Distinctiveness is what make each person different from the average person's personality profile. As different components reflect different valuable information, profile correlations would be the ideal way to look at interpersonal perception.

For example, say we have a dyad: the eleventh doctor and his companion Amy Pond, and we ask Amy to rate the doctor's personality on the Big Five Inventory. We would also ask the doctor to rate himself on the same questionnaire. Then we are left with two personality profiles for the doctor: one is the doctor's self-rating and the other is Amy's rating of the doctor. In order to know how accurate Amy (i.e. the informant) is at rating the doctor (i.e. the target), we can assess the overall profile accuracy by looking at the correlation between these two profiles. A high correlation between these two profiles would mean that Amy rated the doctor accurately. However, high overall profile accuracy does not tell us if Amy really knows the doctor well or if Amy just rated the doctor based on her impression of the average person. That is, we are not sure how much of the accuracy is driven by distinctiveness or normativeness.

As everyone is likely to be similar to average person (by definition), it is possible that a high level of profile accuracy in Amy's rating of the doctor could be due to using the impression of an average person. The correlation between Amy's rating about the doctor and the average person's personality profile is the normative accuracy. However, the doctor is somewhat different from the average person, and the differences between the doctor's personality characteristics and the average person's personality characteristics are the distinctive aspects of the doctor's personality. After meeting the doctor, Amy may be able to pick up some distinctive features in the doctor's personality, and reflect this information in her rating of the doctor. The correlation between the distinctive aspects of Amy's rating and the distinctive aspects of doctor's self-rating is the distinctive accuracy, which we can get at by subtracting the normative profile from Amy's and the doctor's ratings respectively.

Suppose then that Amy gossips about the doctor with another person, Rory Williams, giving Rory an impression of the doctor. Again, we ask the doctor to rate himself and Amy to rate the

doctor. Without meeting the doctor in person, Rory can also rate the doctor after hearing about him from Amy. We would then have three profiles about the doctor: one is doctor's self-rating, one is Amy's rating, and one is Rory's rating. In this case, Rory is the receiver as he only receives information about the target from the informant, Amy. The correlation between Rory's rating on the doctor and the doctor's self-rating in the triad is called the *Hearsay Profile Accuracy*. If more than one triad exists in a population pool, averaging all the potential target's self-ratings creates a new profile called the *normative profile*, the rating of the average person in this sample. Then when comparing Rory's rating on the doctor with the normative profile, the correlation between these two profile ratings is the *Hearsay Normative Accuracy*. However, the doctor's self-rating could be a little different from the normative profile, since everyone is a little different from the average person. This difference between the doctor's self-rating and the normative profile is the doctor's self-rated distinctive features, which is the doctor's *distinctive profile*. The difference between Rory's rating on the doctor and the averaged receivers' ratings on their targets is Rory's perception about the doctor's distinctive features. Thus, the correlation between the Rory's perception about the doctor's distinctive features and the doctor's distinctive profile is called the *Hearsay Distinctive Accuracy*.

Moreover, hearsay consensus between the gossipers (i.e. the informant and the receiver) in our example could be explained as follows: *Hearsay Profile Consensus* is the correlation between Amy's rating and Rory's rating. The distinctive features in doctor's personality could be captured in Amy's rating, so it is also likely that, after talking with Amy about the doctor, Rory can learn some distinctive features about the doctor's personality as well. As mentioned above, Rory's perception about the doctor's distinctive features is the difference between Rory's rating on the doctor and the average across all the receivers' ratings on their targets. Similarly, the differences between Amy's rating on the doctor and the averaged all informants' ratings on the target is Amy's perception about the doctor's distinctive features. Thus, the correlation between Amy's perception about the doctor's distinctive features and Rory's perception about the doctor's distinctive features is the *Hearsay Distinctive Consensus*. Additionally, *Hearsay Normative Consensus* is the correlation between Rory's rating and the average across all informants' ratings on their targets (see table below for all profile correlations' definitions). By separating out normative and distinctive accuracy, it allows for a more nuanced and interpretable analysis. This paper uses some terms interchangeably, such as overall profile accuracy and hearsay accuracy. These are summarized in the Table 1 below.

FACTORS THAT INFLUENCE ACCURACY AND POSSIBLE ACTS IN GOSSIP EPISODES

Normative and distinctive accuracy can be affected differently. Biesanz and Human (2010) investigated the effect of accuracy goals on interpersonal perception. Before having participants view a standard set of targets, they asked half of the participants to be as accurate as possible when rating the target's personality, and gave no specific instructions to the remaining participants. Biesanz and Human found that distinctive accuracy was higher for the participants they told to be more accurate, but normative accuracy was lower for those participants.

Table 1: Profile Correlations' Meaning/Definitions.

Profile Correlations	Meanings/Definitions
Hearsay Profile Consensus/ Overall Profile Consensus	The correlation between the informant's rating and the receiver's rating of the target
(Hearsay) Normative Consensus	The correlation between the receiver's rating and the average across all informants' ratings of the target
(Hearsay) Distinctive Consensus	The correlation between the informant's rating on target's distinctive features (i.e., the informant's rating compared with the average across all informants' rating) and the receiver's rating on target's distinctive features (i.e., the receiver's rating compared with the average across all receivers' ratings)
Hearsay Profile Accuracy/ Overall Profile Accuracy	The correlation between the receiver's rating and the target's self-rating
(Hearsay) Normative Accuracy	The correlation between the receiver's rating and the normative profile (i.e., average across all targets' self-ratings)
(Hearsay) Distinctive Accuracy	The correlation between the receiver's rating on target's distinctive features (i.e., the receiver's rating compared with the average across all receivers' ratings) and the distinctive profile (i.e., target's self-rating compared with the average across all targets' self-ratings)

Although this study provided some insight on what it may take to form an accurate distinctive accuracy, it did not dig deeper and capture what factors lead the participants to have more accurate judgment on the distinctive aspects of the target. The result may also be limited as it ignored triads and only studied interpersonal impression among the dyads (i.e. participants and the target from the video). Another study explored the structure of gossip in adolescents. Eder and Enke (1991) collected data from middle school students. They observed and recorded naturally occurring gossip conversation at one middle school. After collecting and analyzing all these audio and video files, Eder and Enke identified some basic structure of these gossip episodes. They found that after one middle school student identified a target at the beginning of a gossip episode, the others tended to respond with one of six possible "acts:"

- Request clarification of evaluation
- Explanation
- Support
- Expansion of evaluation
- Exaggerated affect
- Challenge

Each type of "act" could either restrain or support further discussion in the gossip conversation. As these responses had functions in gossip conversations and may elicit information that people use in their judgments, just like the objects in a person's room can serve as cues to help people forming an accurate impression of others (Gosling, Ko, Mannarelli, &

Morris, 2002), it is possible that certain types of verbal responses can be used as cues when forming accurate interpersonal impressions.

THE PRESENT STUDY

To our knowledge, there is no available research on factors in gossip episodes that affect the accuracy and consensus of gossipers' impressions. This study, as an exploratory project, looks for these factors using the data from a previous study on hearsay reputations (Costello & Srivastava, 2017). In their study, Costello and Srivastava had college undergraduate students come into the lab. One dyad was assigned to play the get-to-know-you game, where both people learned about each other. After the game, the researchers brought two new people to meet with one of original dyad member. The original dyad member (P1) told their partner (P2) about the person they played the game with (Target). All the participants then filled out the questionnaires to assess each other's personalities. The primary analysis focused on hearsay accuracy and consensus. Hearsay accuracy is the correlation between P2's personality rating on the target and the target's self-rating; hearsay consensus is the correlation between P1's personality rating on the target and the P2's rating on the target. They found that the hearsay accuracy is fairly low, but hearsay consensus is relatively high. However, as they did not look at the impression formation process or the potential reasons that lead to the high hearsay accuracy and low hearsay consensus, the current paper intends to use the possible structures of each gossip episode to find the potential cues that affect the hearsay accuracy and hearsay consensus. The specific exploratory question here is to see if the nine types of verbal responses, which were modified from Eder and Enker's study (1991) about the structures of gossip, have any impact on the hearsay accuracy and hearsay consensus of the target impression. The nine types of verbal response are:

- Offer explanation
- Request clarification
- Request evaluation
- Summarize
- Request expansion
- Offer evaluation
- Ask new questions
- Validation
- Inferences

METHOD

PARTICIPANTS

In Costello and Srivastava's original study (2017), there were 288 college undergraduate students who participated. In this study, pre-registration exclusion criteria led to the final 264 people remaining in the study. Participants' age range is from 18 to 30 years old (M= 19.59, SD=1.82). Most of the participants were female (57.7% female, 27.7% male, 14.6% no report).

The majority identified themselves as white (3.5% Black/African American, 17.7% Asian, 8.8% Hispanic, 0.4% Native American, 60.4% White, 3.8% other, 14.6% did not report race). Participants could choose more than one ethnicity. All students were from the same university that is located on the west coast of United States.

The current project had three coders to code the audiotapes. Two of coders were white female and one was Asian female. All coders were aged from 21 to 22 and were from the same university as all the participants who participated in the previous study.

MATERIALS/STIMULI

The previous study (Costello & Srivastava, 2017) produced audio data by recording the gossip conversation between P1 (i.e., the informant) and P2 (i.e., the receiver), and the only eligibility criterion for the recording was the subjects not knowing each other. The present study codes audio recordings.

There was a total of 134 audio recordings from this previous study. Of these, we excluded 20 recordings that had eligibility issues from being coded. There were two coders for each conversation recording, except for one that was coded by all three coders by mistake.

We randomized the orders of the total 114 audio recordings, and embedded them in a Qualtrics survey (see Appendix A). Coders used the survey to code the frequencies (scale range from zero to positive infinity) of each type of verbal response (i.e. the verbal response of P2).

MEASURES

BIG FIVE INVENTORY AND THE QUESTIONNAIRE BIG SIX

Costello and Srivastava's study (2017) used the modified Big Five Inventory-2 (BFI-2; Soto & John, 2016) and the Questionnaire Big Six (QB6) as the instruments to measure personality impressions. After the gossip conversation, participants filled out the questionnaires that contains questions from BFI-2 and QB6 to assess each other's personality on the six personality traits (openness, conscientiousness, extraversion, agreeableness, neuroticism, honesty and propriety). Among the six personality traits, honesty and propriety were measured with eight items (five of which appear in the QB6, three of which do not; Thalmayer et al., 2011). All the personality questions had a score range from one (disagree strongly) to five (agree strongly) with a neutral point of three (neutral; no opinion).

In the personality questionnaires, there were three types of ratings: the self-rating is when the target rates their own personality traits; the informant-rating is when P1 rates the target's personality; and the receiver-rating is when P2 rates the target's personality.

CODING

This study used nine types of verbal responses to code the frequency of P2 (i.e., the receiver)'s verbal response (M = 1.27, SD = 0.95) in their gossip conversation with P1 (i.e., the informant). The nine types of codes included: *offer explanation*, *request expansion*, *ask new questions*, *inferences*, *validation*, *request clarification*, *request evaluation*, *offer evaluation*, and *summarize*. Table 2 provides definitions and examples for each coding categories.

Table 2: Coding Categories.

Coding Category	a priori Definition	Example
Offer Explanation	P2 offers an explanation of something the target did or said that P1 mentions.	P2: "maybe [target] did it for..."
Request clarification	P2 directly asks P1 to clarify something about the target.	P2: "So you said [target] was unhappy about that? / So when you mentioned that [target] is... do you mean it is...?"
Request Expansion	P2 directly asks P1 to expand upon something said about target.	P2: "Can you say a little more about what [target] said about X?"
Ask New Questions	P2 asks a new question about the target	P2:" Do you know if [Target]...? / Did you guys talk about...?"
Inferences	P2 responds to P1 with an inference about what the target is like.	P2: "it sounds like [Target] is shy and happy"
Validation	P2 responds with other related comments (even side stories) to P1 showing that P2 had understood/heard what P1 said.	P2: "right, I understand that. I would totally do the same thing."
Request Evaluation	P2 asks P1 to offer an evaluation of the target (evaluative, in this sense, means valenced, or a positive or negative statement)	P2: "Is [Target] a nice person?" / "Is [Target] easy to talk to?"
Offer Evaluation	P2 offers an evaluation of the target (evaluation = valenced)	P2: "What the [Target] did is bad"
Summarize	P2 summarized what P1 has said about the target.	P2: " So you said [Target] is like..."

There were also eight questions about the global features of the conversation. These general questions were coded based on the coders' general impression of each gossip conversation. For example, the first question asked what percentage of the conversation was related to the target (range from 0 to 100), and General Question 1 asks if both people were interested and engaged in the conversation. All the general questions were rated on a Likert scale and ranged from one (strongly disagree) to five (strongly agree), with a neutral point of three (neither agree nor disagree). See all eight global features questions in Table 3.

Table 3: Global Features Questions.

Global Features Question	Question Content
First Question/ Percentage On-Topic	What percentage of the conversation was 'on topic' (i.e., about the target)?
General Question 1	Both people were interested and engaged in the conversation.
General Question 2	There was rapport between the two people in the conversation.
General Question 3	The content of the conversation about the target was mostly positive.
General Question 4	The content of the conversation about the target was mostly negative.
General Question 5	The conversation was detail-oriented, contained a lot of specific details about the target.
General Question 6	The conversation was abstract, contained a lot of generalities about the target.
General Question 7	The two people seemed to agree a great deal about the personality of the target.

The ICC score range from zero to one with one indicating a perfect agreement between coders and zero indicating no agreement between coders. In this study, the nine verbal behavior coding categories, the score ranges from 0.36 to 0.77; for the global featured questions, the ICC score ranges from 0.02 to 0.44. ICC and descriptive statistics is provided in Table 4.

PROCEDURE

Two of the coders were recruited by the lab as research assistants, and the third coder was the author of this paper. During the coders' training, all the coders received the coding orders for their specific coding team and the *Instructions for the Response Coding* (these materials can be obtained upon request from the author) to familiarize themselves with the coding categories. Due to the large amount of coding work, coders were divided into two coding team (Team A and Team B), and each team coded half of the audio recordings. Thus, each coding team had coded 57 recordings in 10 weeks. On average, each team coded five or six audio recordings every week.

Table 4: Interclass Correlation Coefficients and Descriptive Statistics

Code	Mean	SD	ICC
Offer Explanation	0.19	0.52	0.44
Request clarification	0.94	1.49	0.51
Request Evaluation	0.66	1.08	0.36
Summarize	0.98	1.65	0.54
Request Expansion	1.13	1.87	0.59
Offer Evaluation	0.57	0.98	0.40
Ask New Questions	2.98	3.47	0.77
Validation	2.88	3.74	0.54
Inferences	1.07	1.58	0.65
Mean of the Codes	1.27	0.95	

General Questions	Mean	SD	ICC
Percentage on Topic	70.58	27.115	0.77
General Question 1	3.64	0.99	0.26
General Question 2	3.68	1.07	0.24
General Question 3	3.87	0.81	0.44
General Question 4	1.79	0.78	0.22
General Question 5	2.8	1.01	0.22
General Question 6	3.07	0.80	0.02
General Question 7	3.71	0.68	0.35

RESULTS

AVERAGE PROFILE CORRELATION

The profile accuracy for each dyad is the correlation between the target's self-ratings with the receiver's ratings on the target's personality. Across groups, the average profile accuracy was r=.31. Profile consensus is the correlation between the informant's rating on the target with the receiver's rating on the target in each dyad. The average across all groups was r=.55.

Normative hearsay accuracy was obtained by correlating the receiver's rating with the mean of all the targets' self-ratings (across dyads). The average profile correlation for hearsay normative accuracy was r=.42. Normative consensus was obtained by correlating the receiver's rating with the mean of all informants' ratings. The average hearsay normative consensus was r=.47.

Hearsay distinctive accuracy is obtained by correlating the differences between the receiver's rating and the mean of all receivers' ratings with the differences between the target's self-rating and the mean of all targets' self-ratings. The average distinctive accuracy was r=.10. Distinctive consensus in each dyad is the correlation of the differences between the receiver's rating and the mean of all receivers' ratings with the differences between the informant's rating and the mean of all informants' ratings; the average hearsay distinctive consensus score was r=.31. Table 5 shows the average profile correlation scores.

Table 5: Average Profile Correlations.

Profile Correlation	Mean
Profile Consensus	0.55
Profile Accuracy	0.31
Normative Consensus	0.47
Normative Accuracy	0.42
Distinctive Consensus	0.31
Distinctive Accuracy	0.10

ANALYTIC APPROACH

As the current paper is an exploratory project, we wanted to see if the features of gossip episode (i.e. the verbal responses) have impacts on the hearsay accuracy and consensus by focusing on the effect size of the correlation rather than the test statistics and p values. Additionally, the data in this study have a nested structure (i.e. the triads are nested in groups), so the assumption of independence of observations does not apply and test statistics must take this into consideration.[1]

Thus, we focus on the effect sizes of these correlations. The two cutoff points we used here are the correlations with an absolute value above 0.1 as minimally of interest and correlations with an absolute value above 0.2 as worth considering for future confirmatory work.

PROFILE CORRELATION

To study the relations between these nine types of verbal responses and hearsay accuracy and consensus, we conducted a Pearson's correlation. The results are summarized in Table 6. For hearsay profile consensus, two codes are worth mentioning as they had a small to moderate positive correlation: General question 3 (positive gossip content), $r(101)= 0.20$, and General Question 4 (negative gossip content), $r(101)= -0.20$. Other codes like request evaluation, $r(101)= -0.13$, offer evaluation, $r(101)= 0.10$; General Question 2 (rapport between gossipers) $r(101)= 0.12$, and General Question 7 (seemly agreement between gossipers), $r(101)= 0.10$, all had small correlations with profile consensus.

For normative consensus, there were small correlations with request expansion, $r(104)= -0.18$, request clarification, $r(104)= -0.15$, request evaluation, $r(104)= -0.10$, the percentage on

topic, $r(104)= -0.11$, General Question 3 (positive gossip content), $r(104)= 0.19$, and General Question 4 (negative gossip content), $r(104)= -0.14$.

Distinctive consensus had some small correlations with several codes: offer explanation, $r(101)= 0.12$, request expansion, $r(101)= 0.16$, ask new questions, $r(101)= 0.18$, validation, $r(101)= 0.18$, the percentage on topic, $r(101)= 0.10$, General Question 3 (positive gossip content), $r(101)= 0.11$, General Question 4 (negative gossip content), $r(101)= -0.15$, and General Question 5 (detailed conversation), $r(101)= 0.17$. As an index of overall interactivity in the gossip conversation, we computed the average of all nine verbal response codes. This interactivity index (mean of the codes) had a small correlation with distinctive consensus, $r(101)= 0.18$.

Moreover, hearsay profile accuracy had small to moderate correlations with two of the nine codes: mean of codes, $r(100)= -0.20$, and General Question 6 (abstract gossip conversation), $r(100)= 0.25$. Codes that had small correlations with profile accuracy are: request clarification, $r(100)= -0.16$, request expansion, $r(100)= -0.15$, ask new questions, $r(100)= -0.18$, validation, $r(100)= -0.12$, inferences, $r(100)= -0.14$, the percentage of conversation is on topic, $r(100)= -0.15$, General Question 3 (positive gossip content), $r(100)= 0.11$, General Question 4 (negative gossip content), $r(100)= -0.10$, and the General Question 5 (detailed gossip conversation), $r(100)= -0.17$.

Normative accuracy also had a small to moderate correlation with request expansion, $r(104)= -0.26$. There were also small correlations with the following codes: offer explanation, $r(104)= -0.10$, request clarification, $r(104)= -0.17$, request evaluation, $r(104)= -0.12$, ask new questions, $r(104)= -0.15$, the mean of codes, $r(104)= -0.12$, the percentage of conversation on topic, $r(104)= -0.16$, General Question 2 (rapport between gossipers), $r(104)= 0.16$, General Question 3 (positive gossip content), $r(104)= 0.16$, General Question 4 (negative gossip content), $r(104)= -0.11$, and General Question 6 (abstract gossip conversation), $r(104)= 0.12$.

Finally, distinctive accuracy had small correlations with validation $r(100)= -0.13$, inferences, $r(100)= -0.13$, mean of the code, $r(100)= -0.10$, and General Question 6 (abstract gossip conversation), $r(100)= 0.14$.

Table 6: Profile Correlation Effect Size & P Values Matrix

Codes	Hearsay Profile Consensus	Hearsay Profile Accuracy	Hearsay Normative Consensus	Hearsay Normative Accuracy	Hearsay Distinctive Consensus	Hearsay Distinctive Accuracy
Offer Explanation	.04	-.04	-.06	**-.10**	**.12**	-.07
Request Clarification	-.02	**-.16**	**-.15**	**-.17**	.08	.03
Request Evaluation	**-.13**	-.08	**-.10**	**-.12**	.01	-.01
Summarize	-.05	-.03	-.02	.04	-.01	-.04
Request Expansion	.00	**-.15**	**-.18**	**-.26 ***	**.16**	-.02
Offer Evaluation	**.10**	-.04	.07	.04	-.07	-.00
Ask New Questions	.06	**-.18**	-.08	**-.15**	**.18**	-.04
Validation	.08	**-.12**	.02	.02	**.18**	**-.13**
Inferences	.05	**-.14**	.06	.05	-.03	**-.13**
Mean of Codes	.05	**-.20 ***	-.08	**-.12**	**.18**	**-.10**
Percentage on Topic	-.02	**-.15**	**-.11**	**-.16**	**.10**	.06
General Question 1	.01	-.06	-.01	.04	.02	.01
General Question 2	**.12**	.02	.09	**.16**	.04	-.03
General Question 3	**.20 ***	**.11**	**.19**	**.16**	**.11**	.03
General Question 4	**-.20 ***	**-.10**	**-.14**	**-.11**	**-.15**	-.04
General Question 5	.08	**-.17**	.03	-.03	**.17**	-.07
General Question 6	.02	**.25 ***	.08	**.12**	-.05	**.14**
General Question 7	**.10**	.07	.03	.05	.06	.09

DISCUSSION

This study explores the impact of the nine types of verbal responses on hearsay accuracy and the consensus between two gossipers. Focusing on the effect size of the correlation between different codes and the components of accuracy and consensus, there are some findings that indicate certain verbal responses may be potential factors that have impacts on accuracy and consensus. The types of verbal response that could be worthwhile to examine further for the hearsay accuracy and consensus are the ones that had a small to moderate effect size.

Taking the request expansion as an example, the negatively small to moderate correlation with normative accuracy suggest, in our example, the more Rory asks Amy to expand on what she said about the doctor, the less likely Rory would think the doctor is like the average person in the population. This may be due to Rory learning more about the doctor by asking Amy to expand more. He may then know more—or at least, thinks he knows more—unique information about the doctor, which would make him to be less likely to rate the doctor based on what an average person is like.

FACTORS ASSOCIATED WITH CONSENSUS

OVERALL PROFILE CONSENSUS

Both positive and negative gossip content seems to have impact on the hearsay profile consensus. The correlation between positive gossip content and the overall profile consensus suggests that the more the two people talk about the target positively the more they both agree with each other. This could be due to the positive impression that the informant formed for the target, as the face-to-face interaction can lead to more positive impressions through providing more interpersonal cues (Okdie, Guadagno, Bernieri, Geers, & Mclarney-Vesotski, 2011). If the target was discussed in a positive way, then both the receiver and informant would be more likely to agree with each other as they know the informant had met the target for the first time. A negative correlation between the negative gossip content and the profile consensus would then not be surprising. It indicates that the receiver has lower agreement with the informant on the ratings of the target when they talk about the target negatively. This may be because that the disconfirmation of the receiver's expectation leads them to disagree with the informant on the impression of the target. People usually form expectation from their past experiences before the social interaction with someone (Snyder & Stukas, 1999). The receiver, in this case, may expect that the informant to have a positive impression of the target, since people tend to use positive terms rather than negative ones to describe others (Zimmermann et al. 2017). However, when the informant starts to discuss the target in a negative manner, which contradict with the receiver's expectation, the receiver is more likely to still retain their expectation (Snyder & Stukas, 1999) and keep the positive impression of the target. It would then lead to a discrepancy between the receiver and the informant's impressions of the target when doing the rating.

What's more, some of the other conversation features also seem to affect the agreement between two gossipers. Request evaluation negatively affects profile consensus, which suggests

that the more the receiver asks about the informant to give evaluative information about the target, the less likely that the informant and the receiver agree with each other. It could be that when the informant does not seem to be comfortable enough to give out more evaluative information spontaneously, and the receiver must constantly ask the informant to evaluate the target, the receiver would start to question how well the informant knows the target. This could then result in a difference in rating. However, offering evaluation seems to promote the consensus between the two gossipers. We found that it is common for some informants to notify the receiver that they did not get enough information about the target. Perhaps when the informant has limited information about the target, they would be easily influenced by other sources of information, even if these were merely new ideas from the receiver. Thus, the more evaluation that the receiver gives about the target, the more likely the informant would follow the receiver's thoughts and agree with the receiver's interpretation about the target. Moreover, having rapport and agreement also help to increase the agreement between the two gossipers. This could be because the more rapport has been established between two people, the more likely they agree with each other. Assuming rapport is associated with interpersonal coordination (Miles, Nind, & Macrae, 2009), the informant and receiver could have been acting as if they were in a coordinative situation where they had to work together in forming their impressions of the target. Also, when the two people appear to agree a lot about the target's personality, they would be more likely to have the similar opinions about the target when doing the personality ratings.

NORMATIVE CONSENSUS

There are several conversation features that show impacts on the normative consensus. The more the receiver asks the informant to make clarifications or expansions on what the informant had said about the target, the more likely the receiver tends to disagree with all the informants' perceptions about their targets. When the receiver asks for detailed information from their informant, the receiver would form an impression specifically about his/her own target. This impression could then be different from what all the informants think their targets are like on average. High percentage of the conversation about the target is another illustration of the high likelihood for the receiver spend more time in asking for more information about the target, and this eventually result in seeing their specific target to be less like the average of all the informants think their targets are like. The same idea may apply when two gossipers talk more about the target in their conversation through expanding information about the target. The receiver may know their specific target too well to perfectly match their rating on the target with all informants' impression of their targets.

Additionally, General Question 4 suggests that when the two gossipers talk about the target in a negative way, the receiver is less likely to agree with the impression that all informants had for their targets. Just as the rationale discussed above, the receiver may expect the informant to describe the target positively (Zimmermann et al., 2017). But, when the informant talks negatively about the target, which conflicts with the receiver's expectation, the receiver may then decide to ignore the informant's judgment and believe their own conceptualization of the target

(Snyder & Stukas, 1999). This could make the receiver's impression of the target to diverge from all informants' impression of their targets. However, the correlation between General Question 3 and the normative consensus also indicates that, when talking about the target positively, the receiver would be more likely to agree with what all informants think their targets are like. This may also make sense in that, as the average person usually has some socially desirable traits, talking positively about their specific target may lead both the informant and the receiver to think that the target is very similar to the average person. By agreeing with their own informant's impression of the target and thinking the target is like the average person, the receiver's idea of what the target is like could be similar to all informants' idea about what their targets are like. Thus, the receiver's rating is more likely to match with all informants' impression of their targets.

DISTINCTIVE CONSENSUS

Two gossipers seem to agree more on the distinctive characteristics of the target with the influences of certain conversation features. When the receivers offer more explanation about the target, request more expansion on the target's behavior, validate what the informant says about the target, ask more questions about the target, or simply spend more time in discussing the target, both the informant and the receiver seem to agree more with each other on their specific impression of the target. By making sense about what the informant says about the target, learning specific details about the target, validating on the informant's explanation about the target, or spend more time talking about the target, the receiver can also form a more precise impression of the target after motivating the informants to provide more detail information about the target. This way, both the receiver and the informant would share the same precise impression of the target, which may lead them to have similar opinion in rating target. Also, asking new questions, especially follow-up questions, may help people to be more likable by their conversation partners (Huang, Yeomans, Brooks, Minson & Gino, 2017). Hence, when the receiver asks any type of questions, the agreement between the two gossipers would increase as the informant may like the receiver better.

Moreover, the positive correlation between the mean of the nine responses and the distinctive consensus suggests that all nine verbal responses seem to be helpful for the receiver to agree more with the informant on the target's distinctive features. When the receiver utilizes the nine types of responses more often, the informant could have higher chance to tell the receivers more about the unique features of the target. This could then result in an increase in agreement between the receiver and the informant on rating the target's distinctive features. The results for General Question 3 and 5 also show that, when talking about the target positively or in great detail, the two gossipers are more likely to have consensus on their rating of the target's distinctive features. It is possible that talking about the target in a more positive way can lead the receiver to pay more attention on any distinctive features of the target. Since people tend to describe others in a positive manner (Zimmermann et al., 2017), the receiver may feel the need to remember any other distinctive features that make the target different since it would help him/her to recall the impression easier when doing rating. As the result of a smooth

discussion on the target's uniqueness, a higher agreement between the receiver and the informant on rating the target's unique features would then become possible.

Also, similar idea may apply when talking about the target in great detail. To the receiver, the distinctive characteristics of the target may "pop-out" more, as it can help him/her to remember the target better. After receiving the unique information about the target, the receiver would then have a higher chance to agree with the informant on rating the target's distinctive features. In contrast, General Question 4 suggests that when talking the target in a more negative way, the receiver is less likely to agree with the informant on the rating of the target's uniqueness. Similar idea that has discussed in normative consensus section may help to explain this relation. With the expectation that the informant would form a positive impression of the target and discuss the target positively, the receiver may choose to retain his/her own expectation even when the informant disconfirmed the expectation by discussing the target negatively (Snyder & Stukas, 1999). The receiver would be less likely to agree with the informant's impression of the target, let alone to agree with the informant on rating the target's unique characteristics.

FACTORS ASSOCIATED WITH ACCURACY

OVERALL PROFILE ACCURACY

The average of the nine verbal responses had a negative but small to moderate correlation with profile accuracy, which suggests that the more the receiver use all nine types of responses, the less accurate s/he is when rating the target's personality. Since half of the verbal codes can help the receiver learn more information about the target (e.g. request clarification, request expansion etc.) and more than half of the verbal responses happen when the receiver is trying to interpret the information that s/he learn from the informant (e.g. offer explanation, summarize etc.), it may actually hurt the receiver's understanding about the target when using all nine types of responses. The receiver could over-interpret the information about the target. Hence, this means that the receiver would be less accurate at rating the target. Another possible explanation for this correlation could be that, although utilizing all the responses may show the high motivation of the receiver, which could lead to a higher distinctive accuracy (Biesanz & Human, 2010), the overall profile accuracy is still not increased as it has more than just this one component (i.e., it also contains the normative component). Nonetheless, these verbal responses that had a small to moderate effect should provide some implication for future researchers in studying hearsay accuracy and consensus.

Some other conversation features can also have influence on the hearsay accuracy. General Question 6 has a positive correlation with all three components of accuracy, so it indicates that the more two gossipers talk about the target in an abstract way, the better the receiver is to form an accurate impression about the target. This can be easily understood, as knowing more generalities about the target may help the receiver to have a general impression of the target. With this general impression that provides more comprehensive information about the target, the receiver could achieve a higher overall profile accuracy. If there is any missing information

about the target on certain personality traits, the receiver may be more likely to make a judgment based on the average person's profile, which would then increase their normative accuracy. On the other hand, talking about the target in generalities do not mean that the informant fails to deliver any unique information about the target, as the target could be simply like the average person who has less special characteristics. Thus, receiver should still be able to score high on distinctive accuracy as the target only has few distinctive features and acts very much like the average person.

Furthermore, the more the receiver ask for clarification, expansion, new question, or spending more time in discussing the target, the less likely they would be accurate with their rating of the target. This may be due to the high likelihood of making assumptions when discussing the target. As more information or longer exposure to the information could lead to a more accurate judgement (Wall, Taylor, Dixon, Conchie, & Ellis, 2013), the informant may not have a fully accurate impression of the target after meeting the target for only 10 minutes. When the receiver utilizes verbal responses like ask for clarification, request expansion, or asks new question to acquire more information that is not known by the informant, there is a higher chance for both the informant and the receiver to start making assumptions. These assumptions are not facts about the target. Thus, it could result in the receiver forming a less factually accurate impression of the target. In addition, it seems that the more the receiver use validation or offer inference, the less accurate s/he is at rating the target. This may be because, as we found from the recordings, when the receiver is not fully interested in the discussion about the target, s/he tends to validate the informant by giving out simple verbal response, like "yes", "OK", or "that makes sense." If the interest in the conversation is low, then it is likely that the receiver would be less attentive to information about the target such that, any accurate information about the target would not be received by the receiver. But the interest about the conversation could also be high to the extent that the receiver is actively making inferences. The receiver then runs the risk of making inaccurate assumptions as the informant has supplied insufficient information, leading to a low accuracy in rating.

Likewise, the profile accuracy was lower when talking more about the target in the gossip conversation. Although having more information about the target can lead to more accurate judgment of the target (Letzring Wells & Funder, 2006), this study found that talking more about target with the receiver could produce a risk for the two gossipers to make distant assumptions when the informant only has limited information about the target. Thus, the receiver's rating would have a low accuracy. What's more, when talking about the target generally or positively, the receiver seems to be more accurate with their rating. Since talking about the target in generalities can help the receiver form a more general and comprehensive impression of the target, the receiver may be more likely to accurately rate the target. Receivers also have high accuracy on rating target after gossiping about the target positively since positive attitudes towards unacquainted others let people minimize cognitive effort and are largely correct when judging others' personalities (Zimmermann et al., 2017).

Contrastingly, we found that talking about the target negatively or in detail leads to a lower profile accuracy. This could be that talking negatively about the target contradict with the

receiver's expectation, so the receiver decides to retain his/her own expectation (i.e., a positive impression of the target; Snyder & Stukas, 1999). By neglecting some accurate information from the informant about the target and relying on the expectation, the receiver is less likely to rate the target correctly. Regarding the low accuracy when talking the target in detail, using limited information to discuss the target in detail may indicate a higher likelihood of guessing or assumption making, like in the reasoning above. The receiver would then have a low accuracy in rating the target.

NORMATIVE ACCURACY

Hearsay normative accuracy appears to be affected by some features of the gossip conversation. The more the receiver explain the target's characteristics, asks for clarification, evaluation, new questions, or spend more time in talking about the target, the less accurate the receiver's rating is when matching the personality profile of target with the average person. This may be because the target is somewhat different from the average person and the more the receiver knows about their specific target and tries to make sense of target's personality, the more likely the receiver's rating would match with this specific target's self-rating and be less accurate with the average person's profile. This could also help to explain why using all nine verbal responses and talking more about the target would lead the receiver to think the target is less like the average person. Utilizing the nine verbal responses and talking more about the target can bring more information about their specific target to the receiver, which leads the ratings to diverge from the average person's profile. Another explanation could be that using more of these verbal responses shows a higher accuracy motivation of the receiver, which would then lower the receiver's normative accuracy (Biesanz & Human, 2010).

General Question 4's result suggests that talking about the target negatively can lead the receiver to have lower normative accuracy. This may be because perceiving the target to have less socially desirable traits could make the receiver to believe the target is different from the average person, who tends to have socially desirable traits. A discrepancy between the receiver's rating and the profile of the average person would then emerge. Nevertheless, the results about General Question 2 and 3 indicate they each can help to boost the normative accuracy. Having a harmonious conversation (i.e., building rapport) with the receiver, the informant may feel more comfortable to admit or reveal any limitation in their impression of the target. By understanding these limitations, the receiver would then, rather than rely on the informant's information entirely, be more likely to rate the target based on what the average person is like. In addition, talking about the target in a positive manner may allow the receiver to see the similarity between the target and the average person, as they both would have socially desirable personality traits.

DISTINCTIVE ACCURACY

Validation, inferences and utilize all nine verbal responses seem to be related with the decrease in hearsay distinctive accuracy. This implies that when the receiver is validating what the informant says, making inference about the informant's opinions, or using all verbal responses, the receiver is less accurate at rating the target's distinctive features. These findings

should not be surprising, since the receivers, like what we have discussed in profile accuracy section, usually give out a simple validating response when the informants describe the common or ordinary features of the target. Those features may not trigger any special impression of the target. Because of this, the receiver may feel the need to utilize more verbal responses in hoping to gain more unique information. Thus, doing more validation or using all nine types of verbal responses could simply suggest the informant fails to provide any unique or interesting information about the target. The receiver, therefore, would not know much more special features of the target, let alone to reflect this information on the rating of the target. However, General Question 6 suggests that talking about the target abstractly is related to increase in distinctive accuracy. When the target is very much like the average person without much unique features, then talking generalities about him could still lead to a high distinctive accuracy. But if the target is truly different than the average person, a general conversation about him should still carry out his unique characteristics. Thus, the receiver would still be likely in accurately rating target's distinctive features. Also, just as people tend to better accept information that they feel connected with (Niemiec, & Ryan, 2009), making more inferences may help the receiver to better remember the assumptions that s/he comes up with. Only remembering these assumptions but not other distinctive information about the target may lead the receiver to have a lower accuracy on rating the target's distinctive features.

LIMITATIONS

The current study is an exploratory project without much empirical evidence, and some conclusions may need to be interpreted with caution as the effect size for each coding categories is small. But because so little is known about the relationship between the features of gossip and the hearsay accuracy and consensus, this study helps shed light on this topic. For example, teachers have linguistic patterns, like the utility of evaluative language and the communal "we", in their professorial talk (Neal, 2008). In the context of gossip, it's likely that people would have different type of verbal responses that may lead to various result in forming accurate impression of others. With profile correlations, a more systematic method in studying hearsay accuracy and consensus, the current study looked at this link and was able to provide some complementary implications to better understand the feature of gossip.

Another limitation of this project could be the lack of enough coders. Since there were only three coders in two coding teams (one coder working in both coding teams), it is likely that the data would be weighted more towards the way that one coder who worked in both teams was doing coding. The use of the ICC to measure the reliability between coders showed that the coders did reliable coding work in general with the ICC for verbal responses range from 0.36 to 0.77.

IMPLICATIONS

Since there are not many studies examining the power of response in gossip, our current project offers complementary information on studying gossip through the angle of gossip's features. Just as the study on the room with cues (Gosling et al., 2002), which suggests that

observers can use some valid cues to form an accurate impression of occupants, the current paper can help to offer a new way of thinking gossip accuracy and consensus by looking for certain verbal cues in the conversation. In daily life, although people do gossip quite often, they do not realize that there may be some patterns in their ways of reacting during these gossip conversations. This project could help people to understand how the way that they respond in gossip may lead them to have different results on forming accurate impressions of others. It may also be applied to the field of counseling psychology, especially in therapeutic contexts: when the clients talk about other people in their lives with the counselor, the counselor could utilize certain types of verbal responses to form a more accurate impression of that target person. This way, the counselor may be able to know if the client is being objective or subjective.

FUTURE DIRECTIONS

Future research could consider specific types of verbal response and their correlations with hearsay accuracy and consensus, as it would offer more precise insight into the mechanism on how different verbal responses affect gossip accuracy and consensus. Specifically, any correlations that is above .1 in the current study would be meaningful to explore further. For example, the correlation between *request expansion* and *normative accuracy* is deserving of further study. When people ask for more information about a person, it can lead to lower accuracy by creating the perception that target is less like the average person. Maybe knowing more about someone would make this someone more distinguishable (i.e., less like the average person), or maybe there is other third variable accounts for this correlation. Exploring this relationship further could raise more directions for further study.

Future studies could also investigate the correlation between the types of verbal responses in naturally-occurring gossip and the accuracy of interpersonal perception, as it would have more validity in terms of the effects of gossip features on impression accuracy. As it is possible that the current project missed some cues in gossip conversations, such as facial expressions or body gestures, future studies should use video recordings to detect more cues that are worth noticing in gossip episodes. This would help further understanding of the features of gossip better by including more detailed information on cues or other relevant factors.

ACKNOWLEDGEMENTS

I thank Cory Costello and Sanjay Srivastava for their support and assistance on conducting this study, analyzing the data and writing this paper.

REFERENCES

Biesanz, J. C., & Human, L. J. (2010). The Cost of Forming More Accurate Impressions: Accuracy-Motivated Perceivers See the Personality of Others More Distinctively but Less Normatively Than Perceivers Without an Explicit Goal. *Psychological Science*, 21(4), 589-594.

Buss, D. M. (2011). Personality and the Adaptive Landscape: The Role of Individual Differences in Creating and Solving Social Adaptive Problems. D.M. Buss & P.H. Hawley (Eds.), *The Evolution of Personality and Individual Differences* (29-57). New York: Oxford University Press.

Costello, C. K. & Sarivastava, S. (2017). *Perceiving through the Grapevine: Consensus and Accuracy of Hearsay Reputations*. Poster section presented at the 18th annual meeting of the Society for Personality and Social Psychology (San Antonio, TX).

Dunbar, R. I. (2004). Gossip in Evolutionary Perspective. *Review of General Psychology,* 8(2), 100-110. doi:10.1037/1089-2680.8.2.100

Eder, D., & Enke, J. L. (1991). The Structure of Gossip: Opportunities and Constraints on Collective Expression among Adolescents. *American Sociological Review*, 56(4), 494-508.

Furr, R. M. (2008). A Framework for Profile Similarity: Integrating Similarity, Normativeness, and Distinctiveness. *Journal of Personality*, 76(5), 1267-1316.

Funder, D. C. (1995). On the Accuracy of Personality Judgment: A Realistic Approach. *Psychological Review*, 102(4), 652-670.

Gosling, S. D., Ko, S. J., Mannarelli, T., & Morris, M. E. (2002). A Room with a Cue: Personality Judgments Based on Offices and Bedrooms. *Journal of Personality and Social Psychology*, *82*(3), 379-398.

Huang, K., Yeomans, M., Brooks, A. W., Minson, J., & Gino, F. (2017). It Doesn't Hurt to Ask: Question-Asking Increases Liking. *Journal of Personality and Social Psychology*, 113(3), 430-452.

Letzring, T. D., Wells, S. M., & Funder, D. C. (2006). Information Quantity and Quality Affect the Realistic Accuracy of Personality Judgment. *Journal of Personality and Social Psychology*, 91(1), 111-123.

McDonald, K. L., Putallaz, M., Grimes, C. L., Kupersmidt, J. B., & Coie, J. D. (2007). Girl Talk: Gossip, Friendship, and Sociometric Status. *Merrill-Palmer Quarterly*, 381-411.

Miles, L. K., Nind, L. K., & Macrae, C. N. (2009). The Rhythm of Rapport: Interpersonal Synchrony and Social Perception. *Journal of experimental social psychology*, *45*(3), 585-589.

Neal, M. (2008). Look Who's Talking: Discourse Analysis, Discussion, and Initiation-Response-Evaluation Patterns in the College Classroom. *Teaching English in the Two Year College*, 35(3), 272-281.

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, Competence, and Relatedness in the Classroom: Applying Self-Determination Theory to Educational Practice. *School Field*, 7(2), 133-144.

Okdie, B. M., Guadagno, R. E., Bernieri, F. J., Geers, A. L., & Mclarney-Vesotski, A. R. (2011). Getting to Know You: Face-to-Face versus Online Interactions. *Computers in Human Behavior*, 27(1), 153-159.

Snyder, M., & Stukas Jr, A. A. (1999). Interpersonal Processes: The Interplay of Cognitive, Motivational, and Behavioral Activities in Social Interaction. *Annual Review of Psychology*, 50(1), 273-303.

Thalmayer, A. G., Saucier, G., & Eigenhuis, A. (2011). Comparative Validity of Brief to Medium-Length Big Five and Big Six Personality Questionnaires. *Psychological assessment*, 23(4), 995-1009.

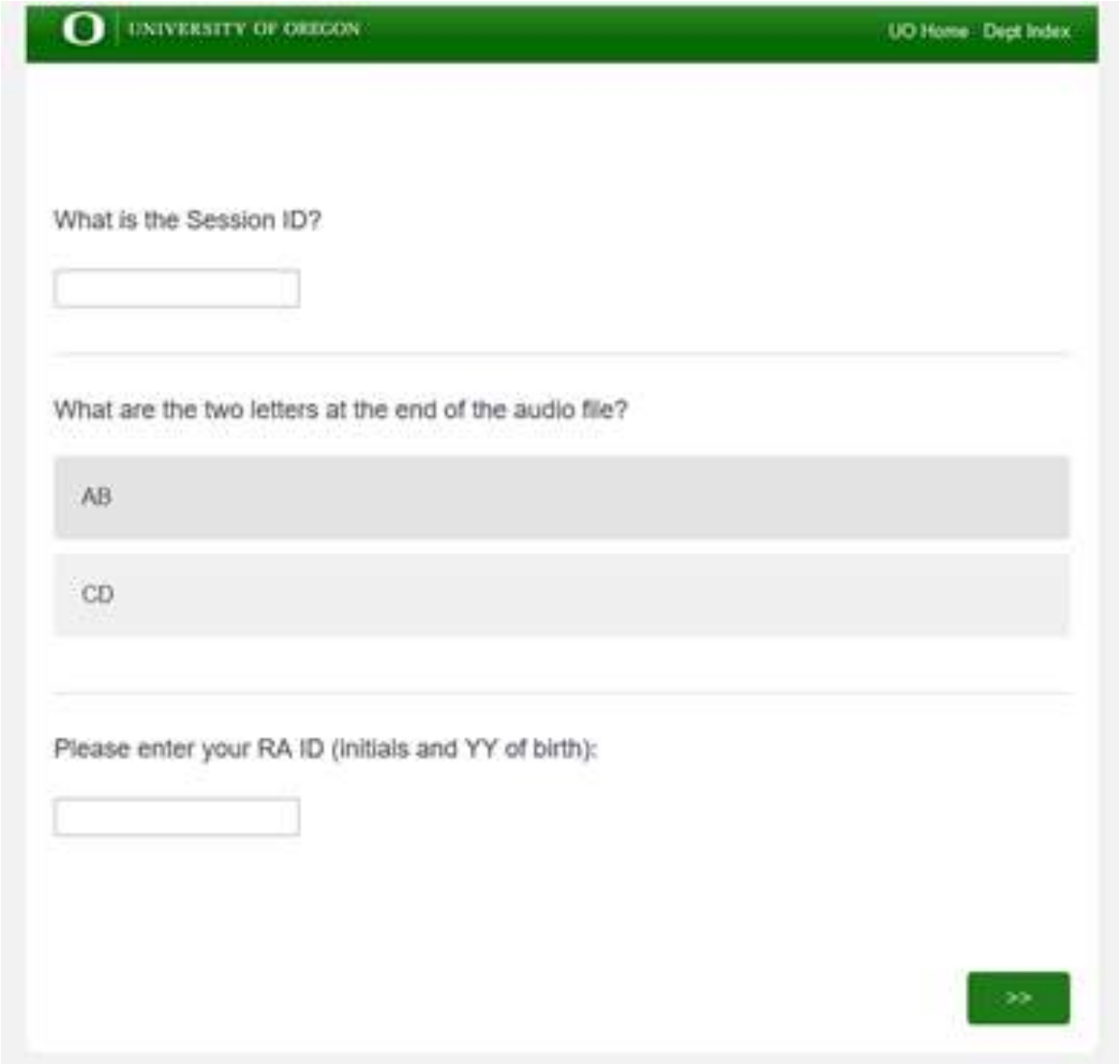
Wall, H. J., Taylor, P. J., Dixon, J., Conchie, S. M., & Ellis, D. A. (2013). Rich Contexts Do Not Always Enrich the Accuracy of Personality Judgments. *Journal of Experimental Social Psychology*, *49*(6), 1190-1195.

Zimmermann, J., Schindler, S., Klaus, G., & Leising, D. (2017). The Effect of Dislike on Accuracy and Bias in Person Perception. *Social Psychological and Personality Science*, 9(1), 80-88.

NOTES

[1] For results that accounts for the nested structure, please contact author to obtain the update. Current result is very similar to the updated result.

APPENDIX A


UNIVERSITY OF OREGON
UO Home Dept Index
What is the Session ID?
What are the two letters at the end of the audio file?
AB
CD
Please enter your RA ID (initials and YY of birth):
>>

Session ID: 06031601-AB

Based on the recording, how many times did P2 give out the following responses? (Indicate the number of times in the box.)

	Frequency
Offer Explaination	
Request Clarificaiton	
Request Evaluation	
Summarize	
Request Expansion	
Offer Evaluation	
Ask New Questions	
Validation	
Inferences	

What percentage of the conversation was 'on topic' (i.e., about the target)?

What percentage of the conversation was 'on topic' (i.e., about the target)?

0 10 20 30 40 50 60 70 80 90 100

Pick a number in percentage

Please indicate the extent to which you agree and disagree with the following statements.

Both people were interested and engaged in the conversation.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

There was rapport between the two people in the conversation.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

The content of the conversation about the target was mostly positive.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

The content of the conversation about the target was mostly negative.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

The conversation was detail-oriented, contained a lot of specific details about the target.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

The conversation was abstract, contained a lot of generalities about the target.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

The two people seemed to agree a great deal about the personality of the target.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree