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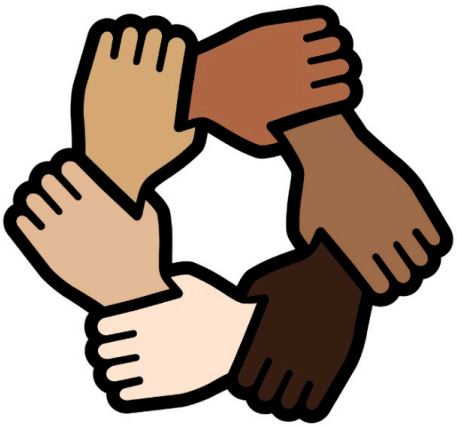
MCNAIR SCHOLARS PROGRAM

WICHITA STATE UNIVERSITY

STRONGER TOGETHER



McNair Scholars Program

Stronger Together: Creating a Network of Scholars

2023-2024 • Volume 29

Wichita State University

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From the Director

Welcome to the 29th volume of the Wichita State McNair Scholars Program Journal of Research Reports. This journal is a testament to the dedication, perseverance, and intellectual curiosity of our scholars, who have worked tirelessly to contribute to the body of academic knowledge. Under the guidance of their faculty mentors, these students have documented over 200 hours of rigorous research activities, prepared comprehensive research documents, and presented their findings at our Annual Closing Symposium.

The theme for this year's journal, "Stronger Together: Creating a Network of Scholars," underscores the collaborative spirit that is at the heart of the McNair Scholars Program. This volume features the research efforts of 13 outstanding students, showcasing three full manuscripts, seven research summaries, and three extended literature review summaries. Each piece reflects the scholars' commitment to excellence and their contributions to various fields of study.

We would like to extend our deepest gratitude to the faculty mentors who have dedicated their time, expertise, and unwavering support to guide these scholars. Their mentorship has been instrumental in shaping the academic and professional trajectories of our students.

Additionally, we recognize the invaluable contributions of the McNair Scholars Program staff: **Lauren Woodall**, research coordinator; **Rebekah Aeschliman**, writing tutor; **Sara Gallo**, assistant director/success coach; and **Jasmine Sosa**, administrative specialist. Their efforts have been crucial in ensuring the success of our scholars and the smooth operation of the program.

We also wish to express our heartfelt appreciation to the university leadership for their steadfast support. Special thanks to **Deltha Q. Colvin**, Associate Vice President for Special Programs, and **Dr. Shirley Lefever**, Executive Vice President and Provost, for their unwavering commitment to the McNair Scholars Program and its mission.

As you delve into this volume, we hope you are inspired by the remarkable research and the collaborative spirit that defines our community. Together, we are stronger, and together, we continue to create a vibrant network of scholars.

Ashley Cervantes
Program Director
Wichita State McNair Scholars Program

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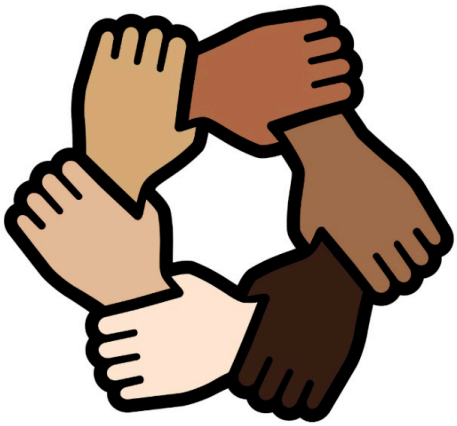

Stronger Together: Creating a Network of Scholars

Research Manuscripts

Racial Bias in the Reading the Mind in the Eyes Test

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C. Brendan Clark, PhD
Department of Psychology

Abstract

The Reading the Mind in the Eyes Test (RMET) is one of the most widely used tools to measure Theory of Mind or cognitive empathy in adults, and it is currently the National Institute of Mental Health (NIMH) recommended task for evaluation of social cognition. In people with dementias, autism spectrum disorder, schizophrenia, and personality disorders, Theory of Mind is often compromised or diminished, meaning it is crucial that an effective tool is created for its measurement. There is evidence that people perform better in social cognition tests when the items depict individuals of the same ethnicity. This raises suspicion about the quality of the RMET, as it depicts only white actors and actresses. This research delves into potential shortcomings of the RMET in relation to racial bias by evaluating the RMET scores of a diverse population. Scores were analyzed using both a one-way analysis of variance (ANOVA) and a regression controlling for the confounding effects of depression, age, sex, and psychopathy. In concurrence with the findings of previous studies, our results indicate that ethnicity played a significant role in determining participants' scores, with non-White individuals scoring lower than White participants. This form of test bias can lead the RMET to underpredict the actual Theory of Mind ability of non-White individuals. This underprediction can also perpetuate stereotypes about people of color. Future research tools designed to measure Theory of Mind should include a multitude of racial backgrounds or at the very least match the background of the individual taking the assessment.

Racial Bias in the Reading the Mind in the Eyes Test

Cognitive empathy, also known as Theory of Mind (ToM), is the ability of an individual to attribute emotions and motivations to others through social cues and shared world knowledge (Byom & Mutlu, 2013). This cognitive process is important for healthy social interactions. Difficulty with understanding the mental states of others is associated with a multitude of negative outcomes, such as social amotivation and isolation (Dodell-Feder et al., 2014a, 2014b, as cited in Dodell-Feder et al., 2020), friendlessness (Fink et al., 2015, as cited in Dodell-Feder et al., 2020), and risk for severe psychiatric illness, such as schizophrenia-spectrum disorders (Kim et al., 2011, as cited in Dodell-Feder et al., 2020). In people with dementias (Zegarra-Valdivia et al., 2023), autism spectrum disorder (ASD), schizophrenia (Baron-Cohen et al., 1997 as cited in Baron-Cohen et al., 2001; Green et al., 2005; Larøi et al., 2010 as cited in Vellante et al., 2013), and personality disorders (Cyrkot et al., 2021), ToM is often compromised or diminished. These disorders collectively affect a large portion of the population. According to the Alzheimer's Association (2023), an estimated 6.7 million older adults in the United States have Alzheimer's dementia. The current estimate for ASD prevalence in adults 18-84 years of age in the US is 1 in 45 (Dietz et al., 2020). The global prevalence of schizophrenia increased from 0.63% to 0.94% between 2011 and 2015 (Wu et al., 2018), and personality disorders have a global prevalence of 7.8% (Winsper et al., 2020). Based on these estimates and the known effects of these disorders on ToM, it can be inferred that a large portion of the global population may have diminished ToM.

The Reading the Mind in the Eyes Test

The Reading the Mind in the Eyes Test (RMET) is used to measure ToM in adults. It is comprised of 36 images, each depicting the eye-region of a person. Participants are presented with the image and four words that may describe the emotion depicted the image; one word is the target, and three others are foils with the same emotional valence (e.g., if the target word is "serious," the foil words may be "ashamed," "alarmed," and "bewildered"). They also have access to a glossary of the words included on the test and are encouraged to refer to it at any point during testing if they are unsure of a word's meaning.

In development of the RMET, the target word had to be agreed upon by five out of the eight judges, and no more than two could pick any of the foils. The final items were selected through group consensus of the normal control participants (N = 122) (Baron-Cohen et al., 2001). The original study of the RMET replicated findings that adults with ASD are significantly impaired on social intelligence tests (Baron-Cohen et al., 1997, as cited in Baron-Cohen, 2001), which lends validity to the RMET. Other studies have also evaluated the reliability and validity of the RMET. Vellante et al. (2013) found that the RMET had acceptable internal reliability (Cronbach's α = .61), good test-retest reliability using intraclass correlation coefficient (ICC = .83), and good repeatability using the Bland Altman method. Hallerbäck et al. (2009) also found that the child version of the test, which contains only 28 items and uses more simple language, had test-retest reliability using the Bland Altman method. However, despite this support, the lack of context and homogeneity of the items in the RMET may present an issue.

The RMET does not include any context for the images. Without knowledge of the "story" behind a facial expression, it can be difficult to accurately define the emotion a person might be feeling. Real-world interactions are not static and do not lack context (Baron-Cohen et al., 2001). Humans make inferences about the thoughts of others through various social cues, including gaze cues, facial expressions, and vocal cues (Byom & Mutlu, 2013). Isolating facial expressions from other social cues may lead to an underestimation of actual cognitive empathy. Furthermore, knowledge of what someone is doing and attending to helps the

observer to more accurately identify the thoughts behind a person's facial expression (Byom & Mutlu, 2013). Due to the images being taken from magazines, the actual emotions of the actors/actresses are unknown (Kim et al., 2023). This means the target responses are based on a consensus created by those who developed the test, as opposed to the reality of what the person in the image was trying to convey. Consensus scoring creates the possibility that participants must share the social norms and beliefs of those who created the test in order to be successful (Dodell-Feder et al., 2020).

The images on the RMET were taken from magazines, with all 36 items depicting white actors and actresses (Dodell-Feder et al., 2020). This is problematic, as previous studies have shown that people are better at reading the emotions in the eyes of those who are from their same culture. In a study conducted by Adams et al. (2009), an altered version of the RMET was administered using Asian eyes stimuli and White American eyes stimuli (as cited in Vellante et al., 2013). This study found that Asian participants performed better on Asian eyes stimuli, and White Americans performed better on white American stimuli. Another study using the original RMET was conducted in Ethiopia; it revealed that 237 medical students scored poorly when interpreting the white stimuli: the average score was below 22, whereas typical Western students score an average of 25-28 (Dehning et al., 2012, as cited in Vellante et al., 2013). The study conducted by Dodell-Feder et al. (2020) included the use of a multiracial emotion identification task, which revealed that some of the educational, racial, and ethnic bias can be alleviated through use of multicultural stimuli.

Purpose of the Present Study

In the present study, we evaluated the RMET scores of a racially diverse group of individuals at a mid-sized public university in Kansas, United States. We hypothesized that the Non-White students would perform worse than the White students and that race would have a significant effect on scores.

Method

Participants

Participants in this study were recruited using the SONA Experiment Management System, an online platform used to manage research in social sciences. These participants were students at Wichita State University (WSU), and they were compensated with course credit upon completion. There were 181 total participants, among which were 68 males and 112 females. There were 103 White participants and 77 non-White participants. They were each only eligible to participate once.

Materials

Participants completed seven questionnaires, which included the RMET, a demographics form, the Moral Foundations Questionnaire, the 10 Item Personality Inventory (TIPI), the Short Dark Triad (SD3), the Depression Anxiety Stress Scales (DASS), and the Morality section of the Gender-Role Attitudes, Beliefs, and Principles Questionnaire. These additional questionnaires were included to test for a variety of mental constructs, personality traits, and demographics that may confound results of the RMET. The Moral Foundations Questionnaire measures human moral intuitions across the five domains of Harm, Fairness, Loyalty, Authority, and Purity (Haidt, 2007; Haidt & Joseph, 2004, as cited in Wormley et al., 2023). The TIPI measures personality in the five broad domains of Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness (Costa & McCrae, 1992, as cited in Thørrisen & Sadeghi, 2023). The SD3 measures individuals' levels of Machiavellianism, narcissism, and psychopathy (Jones & Paulhus, 2014). The DASS measures the emotional states of depression, anxiety, and tension/stress (Lovibond & Lovibond, 1995). The Gender-Role Attitudes, Beliefs, and Principles Questionnaire measures policy attitudes toward gender equality and segregation, beliefs about differences in male and female capabilities in certain roles, and general moral beliefs

about gender equality and inequality (Prasad & Baron, 1996).

Analyses

Results were evaluated first using a one-way ANOVA with Race as the grouping variable and RMET score as the dependent variable. This was followed by a regression controlling for the effects of depression, age, sex, and psychopathy. Five participants who were included in the ANOVA were omitted from the regression due to missing data points.

Results

A one-way ANOVA evaluated the relationship between RMET scores and participant race. The means and standard deviations presented in Table 1 revealed a statistically significant difference in the RMET scores between White/Non-Hispanic (M = 25.62) and Non-White (M = 23.33) individuals ($F(1, 172) = 13.12$, $p < .001$). A linear regression examining the ability of race to predict RMET scores was found to be significant even when controlling for the effects of depression, age, sex, and psychopathy ($F(5, 167) = 4.28$, $p < .001$). The R2 was .11. Psychopathy was also significant, while depression, age, and sex were not. See Table 2 for the factor coefficients from the linear regression.

Table 1

Descriptive Statistics for RMET Scores

Race/Ethnicity	Mean	Std. Deviation
White/Non-Hispanic	25.62	3.74
Non-White	23.33	4.60

Note. The racial and ethnic categories of biracial, Hispanic/Latino, Asian/Pacific Islander, Native American, and African-American/Black were all condensed to the category of Non-White.

Table 2

Linear Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	*t*	Significance (*p*)
	B	Std. Error	Beta		
Constant	27.01	2.32		11.67	.001
Race/ Ethnicity	2.25	0.63	0.26	3.58	.001
Sex	0.33	0.68	0.04	0.49	.626
Age in Years	-0.10	0.06	-0.13	-1.71	.090
Psychopathy	-1.20	0.56	-0.17	-2.14	.034
Depression	0.64	0.67	0.07	0.96	.336

Discussion

The results of our analyses show a significant difference in the scores of White and Non-White individuals on the RMET, with Non-White individuals scoring lower. The regression results indicate that the known effects on social cognition caused by sex, age (Greenberg et al., 2023), psychopathy (Carroll et al., 2021), and depression (Weightman et al., 2014) are not responsible for the higher level of performance of the White participants. The data from our research supports the hypothesis that the test leads to scores biased against people of color. This form of test bias can lead the RMET to underpredict the actual Theory of Mind ability of non-White individuals. This underprediction can perpetuate harmful stereotypes about people of color. However, it is difficult to say what the exact cause of the bias is. Others have argued that the citizen-science consensus scoring method, which entails recruitment of predominantly White participants, may have contributed to a systematic scoring bias against people of color (Bjornsdottir & Rule, 2016). Though this is likely a contributing factor, we argue that the homogeneity of the items also has a significant contribution, based on the existing research surrounding racial ingroup advantage when inferring mental states of others (Adams et al., 2009; Dehning et al., 2012, as cited in Vellante et al., 2013; Dodell-Feder et al., 2020).

Limitations and Future Directions

Though we believe this study is strong overall, there are limitations to be considered. The population consisted solely of students at Wichita State University, meaning one should exercise caution when generalizing the findings. Furthermore, though there was a wide array of ethnic backgrounds represented by the Non-White group, it was not known where these individuals lived prior to attending WSU. Other studies have suggested that exposure to White individuals may have a significant impact on RMET performance (Bjornsdottir & Rule, 2016), indicating that students from areas with a non-White majority may score lower. Place of origin may have had a more significant impact than ethnicity.

Future research would benefit from focusing on a more diverse demographic that is not solely comprised of college students. This would increase the study's generalizability. We also recommend analyzing the impact of place of origin on scores, particularly when compared to the impact of ethnicity. For the RMET itself, future iterations of the test should feature racially diverse items to ensure fair scoring across a wide range of ethnicities.

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Test-Retest Reliability of a Neurocognitive Mobile Application In Healthy Adults

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Abstract

PURPOSE: This study tested the consistency and reliability of a neurocognitive mobile application to assess reaction time and cognitive function. Specifically, the test-retest reliability of the mobile application. **METHODS:** 49 healthy adults participated. Participation included 3 trials administered 7-10 days apart. Testing included 8 modules (i.e., Symptoms, Simple Reaction Time, Impulse Control, Inspection Time, CDC 4-Stage Balance, Memory, Reverse Number Counting, and Cued Stroop) using a smartphone (iPhone 12 or Samsung 13) with the Sway Medical App, Version 5.5.6. Analysis was conducted on 39 subjects, M= 23.38 + 1.36, 56% female. Ten subjects were removed before analysis (1- known neurocognitive condition, 9 - missing data). **RESULTS:** A Repeated Measures ANOVA using Greenhouse-Geisser found no significant difference in main effect Trials, F(1.698, 64.52)= 1.647, p= .204, np2=.042, observed Power .310, across the three assessments trial 1 (M= 170.351 + SE= 4.386), trial 2 (M= 166.291 + SE= 4.529), and trial 3 (M= 164.453 + SE= 4.242), respectively. No significant Trials x Modules Scores Interaction, F(2.578, 97.948)= 1.419, p= .245, np2=.036, observed Power .338 was found, however, the main effect for Sway module scores was significant F(1.376, 52.306)= 530.269, p= .000, np2=.933, observed Power 1.0. **CONCLUSION:** Despite a lack of statistical power, the Sway neurocognitive mobile app demonstrated test-retest reliability in this study. The gradual decline in mean scores across trials, although not significant, may indicate an apparent learning effect when using this tool requiring further investigation. The significant finding across Modules, however, was anticipated because Module is an individualized test intended to assess a specific cognitive or reaction time measure. In conclusion, the Sway Mobile App may serve as a viable cognitive assessment tool, however, reliability testing on each individual assessment module along with reliability testing on other age groups and populations is needed.

Introduction

Neurocognitive function is a set of specific cognitive skills the brain uses for daily activities like talking and walking. Cognitive function skills involve the ability to learn, simple reaction time, problem-solving, memory, and recall (Bailey, 2022; Templeton et al., 2020; Tucker-Drob, 2011). Cognitive skills can be trained and developed to enhance a particular set of skills necessary within a specific sport. Elite athletes often present enhanced working memory, eye-hand coordination, reaction time, and balance. These are skills needed to execute different movements and skills in the sport (Burhart et al., 2019; Lynall et al., 2021; Rahimi et al., 2022). Neurocognitive function is also important for the average person to complete daily tasks and maintain independence as a person ages. Working memory, attention level, processing rate, and recall speed are commonly shown to decline with increased age (Bailey, 2022; Templeton et al., 2020; Tucker-Drob, 2011). Some diseases, such as Alzheimer's or Parkinson's disease, as well as other mental health conditions, are also known to negatively affect neurocognition (Clark & VanRavenhorst-Bell, 2022; Gorus et al., 2008; Lepage et al., 2014; Templeton et al., 2020). Additionally, neurocognitive testing is used to evaluate neurocognitive changes an individual may experience due to a sports concussion or traumatic brain injury (TBI). TBI may cause neurocognitive changes and negatively affect balance, memory, processing, recall, and reaction time.

Any sign of a neurocognitive problem needs to be taken seriously, and a timely assessment is needed to determine its severity (Bailey, 2022; VanRavenhorst-Bell et al., 2021). For example, reaction time measures the time a person takes to respond to a stimulus. Reaction time is a factor for basic daily activities like driving, walking, or sports activities. More importantly, it can measure neurocognitive and functional health (Gorus et al., 2008; VanRavenhorst-Bell et al., 2021). Following an incident, comparing an individual's reaction time measurement to one's baseline is common practice. After a head trauma incident, a person's reaction time and other neurocognitive functions commonly decrease, but over time, they appear to improve. Therefore, repeated reaction time assessments before and after a neurocognitive injury assist in tracking one's progress to recovery (Burghart et al., 2018; Lynall et al., 2021).

Test-retest Reliability

Providing the same assessments to the same group of people at different times determines test-retest reliability (Devon et al., 2007). When it comes to the random varying scores, test-retest reliability is used to understand these changing scores and determine any differences between the sample scores and the true scores (Bannigan & Watson, 2009; Polit, 2014). The ability to compare scores with previous results or other users assists in diagnosing and predicting potential trends. More specifically, establishing reliability within a neurocognitive test is essential for tracking an individual's cognition and developing a treatment plan for a patient. Within sport-related concussions or TBI, the reliability of the neurocognitive test is important for determining whether an athlete is ready to return to play (Burghart et al., 2019; Kampen et al., 2006; VanRavenhorst-Bell et al., 2021). A reliable assessment that provides objective test-retest data and can track a person's neurocognitive ability and progression would complement established subjective questionnaires to further determine the next course of action.

Mobile Devices

The use and usability of mobile devices by healthcare professionals has increased, with the introduction of new fitness apps that can be used in various settings. Handheld smart devices allow the convenience of communication, internet access, quality screens, cameras, microphones, advanced operating systems, and internal sensors (Ventola, 2014). Mobile applications can use these smart device features to sense and record motions that can be translated into cognitive-related measures such as balance and reaction. In sports, the

use of a mobile assessment is to immediately identify a mild concussion and evaluate the individual's ability to continue to play. This requires comparing an individual's immediate, real-time neurocognitive measures to one's previously assessed baseline measures. The convenience and accessibility of an accurate and reliable mobile device-driven neurocognitive app addresses this need. Mobile applications offer readily available convenience for administering a health-related assessment and provide personalized, user-friendly results immediately following an assessment. Additionally, a neurocognitive app can assist with the continued evaluation of the severity of the injury and track improvement to determine when the athlete can return to play (Burghart et al., 2019; VanRavenhorst-Bell et al., 2021).

Sway

The Sway app is becoming a common tool used to assess and monitor concussions and mild TBIs within the health and sports industries. The Sway Medical Application is a versatile mobile assessment tool that offers a series of modules used to assess an individual's balance (e.g., CDC-4 balance) and neurocognitive performance (i.e., reaction time, executive function, working memory, memory recall) and offers the capability to compare one's current measures to prior baseline measures (Burghart et al., 2019; Templeton et al., 2020; VanRavenhorst-Bell et al., 2021). The Sway app uses motion-based triaxial accelerometer sensors built-in to the mobile device to assess movement of the device and register touchscreen responses to assess one's balance and neurocognitive measures (Burghart et al., 2019; Clark & VanRavenhorst-Bell, 2022; VanRavenhorst-Bell et al., 2021; Van Patten et al., 2021). The placement of these sensors with the smart device allows the application to register any movement or vibrations from the device with greater accuracy down to the millisecond compared to touch-based only assessments (Clark & VanRavenhorst-Bell, 2022; VanRavenhorst-Bell et al., 2021; Wilkins, 2020). This improves how the application reports neurocognitive measures such as simple reaction time, impulse control, and inspection time providing more accurate cognitive results. Sway also provides compatibility across multiple operating systems (iOS or Android) and mobile devices (e.g., smartphones and tablets). The Sway balance module has FDA clearance (Amick et al., 2015; Burghart, 2019) and is a common tool on the sidelines of many sporting events. The Sway neurocognitive modules have established concrete, construct, and criterion validation (Clark & VanRavenhorst-Bell, 2022; VanRavenhorst-Bell et al., 2021), reported test-retest reliability in a remote setting (Van Patten et al., 2021), and are in the process of securing FDA clearance. The verification of test-retest reliability of the Sway neurocognitive modules would significantly improve the immediate and follow-up care of a sport-related head injury by offering a tool with greater sensitivity while maintaining the portability, mobility, time-sensitivity of testing (e.g., performing sideline assessments), and the ability to compare real-time measures to baseline measures. In addition, the Sway app may serve the clinical setting as a complementary cognitive tool capable of evaluating a patient's cognition in person or in a remote telemedicine setting.

As previously stated, the Sway medical app neurocognitive modules have established validity and test-retest reliability in a remote setting; however, reliability administered in person has not been established. The purpose of this study was to establish the test-retest reliability of the Sway application in its ability to assess neurocognitive measures in an in-person setting. Such findings are crucial for evaluating concussions because a quick, accurate, and reliable test is needed to evaluate the injury so proper precautions can be taken.

Methods

Participants

Forty-nine healthy adults aged 18 years or older were recruited for this study. Recruitment included

flyers, online communications, and word of mouth. Participants completed a self-reported health-intake questionnaire and were excluded from continuing in the study based on the following the criteria: 1) having a known neurocognitive condition that may be aggravated or invite the onset of a seizure from rapidly changing visual cues on an electronic device, 2) having experienced a seizure in the past 6-months or more than two seizures in the last 12 months, 3) having a concussion or traumatic brain injury in the past 12-months, 4) known diagnoses of Attention-deficit/ Hyperactivity Disorder (ADHD), 5) uncorrected vision or hearing impairments, 6) under the influence of drugs or alcohol, 7) a known muscular, orthopedic or other condition that may prevent standing for a short period of time or extending upper extremities to interact with an electronic device. Of the 49 participants, ten were removed from the analysis (one met exclusion criteria, and nine were missing data) with a final sample size of 39 participants, age (yrs) (M= 23.38 + SD= 1.36), 56% female.

Procedure and Measurements

Data was collected in the Human Performance Laboratory in the Heskett Center at Wichita State University. After completing the health intake questionnaire, the participant's demographics and biometrical data were recorded. Participants then completed three Sway assessments; each trial was 7-10 days apart. All trials were completed in person and in the same quiet environment. The Sway cognitive assessment was administered on a smart device (iOS version 9.3 or Android version 7.0) with the Sway Medical app (Version 5.5.6) provided by the administrator. The Sway cognitive assessment consisted of eight modules (symptoms, simple reaction time, impulse control, inspection time, CDC 4-stage balance, memory, reverse number counting, and cued stroop). For all trials, the modules were completed consecutively and administered in the same order while the participant remained standing. All modules, except the symptoms test, provided visual instructions and included a familiarization followed by three assessments. A research assistant supervised each trial to ensure the completion of the trial and provided verbal instructions. Additionally, rest breaks were provided between modules, if needed.

The Sway assessment begins with a self-assessed symptoms questionnaire module. These symptoms are assessed to screen for concussion or neurocognitive symptoms. The severity of each symptom is scored on a 6-point Likert scale (ranging from mild to severe symptoms).

Next, the simple reaction time module assesses attention, visual or sensory processing, and neuromotor response speed. The participant holds the mobile device horizontally with both hands, and when the screen changes colors from white to orange, the participant must move the device quickly in any direction (Van Patten et al. 2021). For reaction time, the score comes from the time it took to complete the test, given in milliseconds. The smaller the number, the better the score.

The impulse control module assesses attention, inhibitory control, and basic executive function. The participant is given a cue on the screen to move the device quickly or keep it still. A green circle with a white check mark is displayed, and the participant must move the device in any direction as quickly as possible; when a red circle with a white "X" appears, the device must be kept completely still. This module recorded the number of errors made and the time required to complete the test in milliseconds (ms). The time it takes to complete the assessment is used as their score.

The inspection time module is used to measure attention and visual processing speed. Two T-shaped lines are displayed side by side on the device screen. One T-shaped line is longer than the other. The lines for both Ts are shown quickly, and then the long end

of both "T's" are quickly covered. The participant must touch the screen and select the "T" with the longer end. The time it takes to cover or show the "T's" is reduced by one screen refresh (~17ms) every time the correct "T" is picked (Van Patten et al., 2021). The time is increased every time the incorrect "T" is chosen until the correct choice is made. The score for Inspection Time was the rate of the screen refreshes.

Next is the CDC 4-stage balance module, which includes four stances measuring posture stability and balance. The stances are feet together, semi-tandem, tandem, and single leg, performed in this order three times. The participant holds the device vertically pressing the screen against one's chest and eyes kept open. The participant is instructed to maintain balance for 10 seconds in each stance before moving on to the next; the device will chime after each stance's completion, cueing the next stance. This assessment scores the balance for each stance on a scale of 0 (poor balance) to 100 (excellent balance) and then gives a composite score, which is the average score of all the stances performed for that trial.

The memory module assesses working memory and delayed recall. The screen presents three letters for 15 seconds. Then a prompt appears on the screen with instructions to complete a memory task by tracking squares (2x4 grid) lighting up in a random sequence and repeating that pattern. If an error is made, the participant will be asked to recall the three letters introduced at the beginning of the test (Van Patten et al., 2021). Both working memory and delayed recall are given individual scores used to give the participant a percentile score ranging from 0 (poor performance) to 100 (high performance). The score accounts for errors made during the trial and the time it took to complete.

The reverse number counting module measures the participants' attention, visual processing, and executive functioning. The screen shows squares numbered from 1 to 20 in a random sequence on a 4x5 grid. The participant must pick the squares backward from 20 to 1 as quickly as possible until all the numbers have been selected. Reverse number counting assesses and records the errors made and the time it takes to complete each trial in seconds. The score comes from the individual's time to complete the test.

The last module is the cued stroop. This module assesses components of executive function such as attention, response inhibition, and reaction time. The mobile screen displays four colored squares and either a word-naming or color-naming cue at the top, for a total of 30 cues. When the word or color is displayed, the person will touch the square that matches the color of the word or the color the word says. Cued stroop assesses several factors, but this study recorded score, errors, total time (in seconds), and average reaction time (in milliseconds). The score is based on a scale of 0 to 100, with 100 being the best.

A Sway score was provided for each of the modules. For each of the three trials (wk1, wk2, wk3), an overall average score was calculated from the average scores of the eight modules. This overall average module score from each trial was used for analysis.

Analysis

A statistical analysis was conducted using the Statistical Packages for the Social Science (SPSS) version 29.0. All test variables were evaluated for normality of distribution. A Repeated Measures Analysis of Variance (ANOVA) using Greenhouse-Geiser was conducted to evaluate Trial x (trial 1, trial 2, trial 3) Sway module score.

Results

A Repeated Measures ANOVA using Greenhouse-Geisser found no significant difference in Sway module scores, $F(1.698, 64.52) = 1.647$, $p = .204$, $np2 = .042$, observed Power .310, across the three assessments trial 1 ($M = 170.351 + SE = 4.386$), trial 2 ($M = 166.291 + SE = 4.529$), and trial 3 ($M = 164.453 + SE = 4.242$),

respectively, as shown in Figure 1. No significant Trials x Scores Interaction, F(2.578, 97.948)= 1.419, p= .245, np2=.036, observed Power .338 was found, however, main effect for Sway module scores was significant F(1.376, 52.306)= 530.269, p= .000, np2=.933, observed Power 1.0.

Discussion

The purpose of this study was to determine the reliability of the Sway mobile application when administered in person. The expected outcome was that there would be no significant difference in the scores between each trial. The overall findings, as shown in Figure 1, confirmed our hypothesis of the test-retest reliability of the Sway mobile application. The mean composite scores across the trials did not significantly differ and displayed consistency similar to findings discussed in the remote test-retest reliability study by Van Patten and colleagues (2021). To further support our findings, Ryan Amick and colleagues' study for the test-retest reliability of the sway balance (2015) also had comparable results for the balance module. Despite our small sample and low statistical power, the Sway app displayed neurocognitive and balance test-retest reliability. The data shows that the Sway medical app may be a useful tool for assessing and tracking neurocognition. This application offers insight into the individual's overall cognition and further provides comparable, objective data to assist clinical decisions when diagnosing and treating neurocognitive injuries. The reliability of the Sway Medical app could improve how sports injuries are evaluated by reducing the delay in testing and providing the ability to compare results to an athlete's initial baseline. It would also advance its use outside sports by providing clinics with another tool for assessing neurocognition in any setting, whether remote or in person.

In addition, although not significant, there was a decline in the mean score from one trial to the next. This indicates the participants did better with each trial, so the slight decline in mean scores across the three trials could indicate a learning curve. Like the test-retest reliability of the Sway balance study by Ryan Amick and colleagues (2015), we found that the participant's performance increased with each trial. Sway assessment includes a familiarization trial within each module; however, an introduction trial may help reduce the effect of a learning curve. To better understand this change, evaluating the reliability of the data for each module individually is warranted. Lastly, there was a significant difference in mean scores between each module. This difference was expected due to each module's individuality in assessing different neurocognitive and balance constructs. Ideally, a neurocognitive assessment should possess this trait to evaluate an individual's neurocognition confidently and accurately across all cognitive constructs (i.e., executive function, simple reaction time, delayed memory and recall).

Limitations

The research design of this study does present some limitations. First, the participants were relatively young, with most in their early twenties. As age increases, neurocognition has been shown to decline (Bailey, 2022; Templeton et al., 2020; Tucker-Drob, 2011). This limits the generalization of findings across ages. Further testing in older age groups is needed. Secondly, the sample size was relatively small (N=39), which can limit the significance of the findings. Testing reliability on a larger group would provide stronger confidence and the ability to establish change estimates' reliability.

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Heatwaves in the Heartland

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Abstract

As extreme heat events become more frequent and severe, the urgency to address their impact on labor productivity in Kansas intensifies. This research studies the relationship between extreme heat, workforce efficiency, public health, and economic stability. By examining existing literature, it identifies the pressing need for tailored interventions that recognize the localized nature of heat-related challenges. The proposed policy framework outlines decisive measures, including the establishment of a dedicated Heat Resilience Program or officers, region-specific Heat Action Plans, investments in public health and safety, climate-resilient infrastructure, educational initiatives, and robust research frameworks. Through proactive implementation of these initiatives, Kansas can effectively mitigate the adverse effects of extreme heat, safeguard its workforce, and ensure a resilient future for its residents.

Introduction

Climate change is a pressing issue affecting our daily lives and livelihoods. Extreme weather events, caused by climate change, impact food systems, prices, death rates, and the spreading of illnesses. One prevalent issue is the increase in heat. As global temperatures rise, understanding the economic impacts of heat is crucial for policy-making and adaptation strategies. Prior research has explored the influence of climate change on various aspects like agriculture, human health, and capital accumulation (Dell et al., 2012; Deschênes & Moretti, 2009; Fankhauser & S.J. Tol, 2005). This research also centers on climate change but focuses on the impact of extreme heat on labor productivity in Kansas. As rising temperatures become more frequent, widespread, and intensified, it is essential to develop policy recommendations for Kansas to address the losses in productivity. Kansas, located in the U.S. heartland, is part of an emerging "Extreme Heat Belt" and is home to labor-intensive industries vulnerable to rising temperatures. The "Extreme Heat Belt" extends from Texas to Illinois, characterized by temperatures capable of generating heat at least 125°F (52°C) once a year by 2053 (First Street Foundation, 2022). High temperatures can lead to health issues, reducing worker productivity and impacting the state's economy. Therefore, it's essential to develop policies that protect labor productivity and public health while ensuring economic stability.

Kansas Political Classification

The political landscape of Kansas, characterized by a moralistic culture that views government as a tool for societal improvement, is key to crafting effective climate change policies (Elazar, n.d.). This aligns with the urgency of addressing climate change, as reflected in the public opinion data from the Fort Hays State University survey conducted in Fall 2023 (Sun et al., 2023). According to the survey, a significant portion of Kansans, 56.9%, perceive climate change as a crisis or a major problem in the state. Furthermore, 57.3% believe it poses a crisis or major problem for farming in Kansas. These figures suggest a recognition of the severity of climate change and its potential impacts on crucial sectors of the state's economy. Notably, 57.8% of respondents agree that "addressing climate change should be given priority even at the risk of slowing economic growth" (Sun et al., 2023). This aligns with the moralistic political culture's emphasis on the government's role in promoting the general welfare, indicating a potential openness to policies prioritizing climate change mitigation. Understanding Kansas' political culture and public sentiment provides a foundation for creating climate change policies that resonate with the state's values. By addressing the threats of extreme heat to labor productivity, public health, and economic stability, we can foster a climate-resilient future for Kansas that prioritizes economic prosperity and its citizens' welfare.

Literature Review

Human Health

Extreme heat shattered 6,500 daily heat records in the U.S. in 2022 (National Centers for Environmental Information, 2022). Furthermore, incidents, such as the devastating heatwaves in St. Louis (1954), Kansas City (1980), Milwaukee (1999), and Chicago (1995), serve as stark reminders of the dangers associated with extreme heat. Such occurrences could become increasingly frequent and severe as climate patterns shift (Wuebbles & Hayhoe, 2004), potentially leading to events akin to the catastrophic 2003 European heat wave, which claimed the lives of 70,000 people (Robine et al., 2008).

Heat stress affects a broad range of people, especially outdoor workers (Flouris et al., 2018). Quantifying heat stress typically involves the use of empirical heat indices such as the "wet bulb globe temperature" (WBGT). However, the extent to which individuals can tolerate a given WBGT value varies significantly depending on factors such as clothing, physical activity, and acclimatization (Sherwood & Huber, 2010). Factors like wearing suitable attire, engaging in less strenuous

activities, or having previous acclimatization to high-temperature working conditions can significantly impact an individual's resilience to heat stress. Further, these high temperatures have complex effects on the human body, triggering increased blood flow and heart rate (Deschênes & Moretti, 2009). When heat stress exceeds 95°F or 35°c, the body's ability to dissipate metabolic heat becomes impaired (Sherwood & Huber, 2010). Additionally, prolonged work durations in this type of heat can significantly reduce physical work capacity (Smallcombe et al., 2022).

The implications of short-term exposure to high temperatures extend to the performance of tasks involving strength, speed, and dexterity. Long-term exposure to heat can worsen existing conditions and increase the likelihood of workplace injuries (D'Amato et al., 2014). Data from the Kansas Syndromic Surveillance System (KSSS) in 2023 revealed a surge in hospital visits due to excessive heat exposure (Kansas Syndromic Surveillance Program, n.d.). Furthermore, there is an increased likelihood of injury on the job when there are hotter temperatures. Park and others found that "a day with high temperatures between 85 and 90°F leads to a 5 to 7 percent increase in same-day injury risk and a day above 100°F leads to a 10 to 15 percent increase" (Park et al., 2021). This highlights the importance of proactive measures in anticipation of extreme heat as it increases workplace accidents.

Heat can also affect cognitive functions and mental health, leading to changes in brain activity, altered cognitive processes, and the escalation of stress and anxiety (Hocking et al., 2001; Noelke et al., 2016; Rony & Alamgir, 2023). Severe heat stroke can induce neuropsychiatric symptoms (Cianconi et al., 2020). Therefore, strategies to manage heat stress are crucial for promoting overall mental wellness in the face of climate change. Understanding these interconnected effects is essential for assessing the full implications of extreme heat on labor productivity and individual well-being in the context of climate change.

Labor Productivity

Extreme heat significantly impacts labor productivity, with outcomes ranging from increased fatalities to substantial productivity declines. By 2030, over 2% of total working hours worldwide could be lost annually due to extreme heat (International Labour Organization, 2019), and nearly 70 million work life-years could be lost due to reduced productivity (Flouris et al., 2018). Extreme heat also influences economic outputs, from national economies to individual industries. A 1°C increase in surface temperature can result in a 2.5% decrease in national output (Hsiang, 2010). Notably, in these studies, nonagricultural sectors bear the brunt of these effects, highlighting the critical role of labor-intensive non-farming sectors in national output. Higher temperatures tend to hamper economic growth, affecting both poor and wealthy countries (Dell et al., 2012; Deryugina & Hsiang, 2014). The impact of extreme heat on labor productivity and economic output is a pressing concern in our rapidly warming world. From individual workers to national economies, the effects are far-reaching and multifaceted. As temperatures rise, so do the challenges for labor-intensive sectors, with significant implications for both developed and developing economies. The research underscores the urgent need for comprehensive strategies to mitigate these effects.

Distributional Effects

Effective policies addressing heat impacts must consider various dimensions, including socioeconomic disparities, gender-specific vulnerabilities, racial disparities, and industry-related factors. Lower-income individuals may suffer increased damages due to temperature, necessitating targeted interventions (Hsiang & Narita, 2012; Park et al., 2021). Gender differences in the face of extreme heat are also crucial, with some studies suggesting larger reductions in labor supply in females (Garg, 2019; Park et al., 2021). However, some studies find no gender differences in productivity losses (Qiu & Zhao 2022; Cai et al., 2018). Industry-specific interventions may be necessary to

maintain labor productivity during heat waves (Graff Zivin & Neidell, 2014). For instance, Kansas farmers and the agriculture industry in Kansas is one industry that will face disproportional challenges due to rising extreme heat, impacting their income and livelihood (Sajid et al., 2023). Lastly, race-based disparities in the impact of extreme heat must be considered. American Indians/ Native Alaskans and Black populations experience higher mortality rate due to excessive heat, followed by Hispanics, Whites, and Asian/Pacific Islanders (Adams et al., 2021). Hispanics, often overrepresented in high-risk industries, bear a disproportionate burden of heat-related illnesses and death (Berberian et al., 2022). These disparities extend to mental health conditions, with Black people and Hispanics experiencing greater adverse mental health-related outcomes associated with temperature fluctuations (Basu et al., 2018; Yoo et al., 2021). Crafting effective policies demands a nuanced and intersectional approach, recognizing the interplay of socioeconomic, gender, and racial factors. By addressing these distributional effects comprehensively, policymakers can foster resilience, equity, and well-being in the face of challenges posed by extreme heat.

Policy Proposal

As extreme heat events intensify and become more frequent, they pose a significant threat to Kansas residents. This policy proposal aims to establish a comprehensive approach to combat heat-related issues across the state. The challenge of extreme heat is multifaceted and localized, demanding policies that reflect the unique characteristics of each region. These characteristics include urban heat island effects, air conditioning availability, energy security, climate zones, development patterns, health issues, and socioeconomic factors (Abbinett et al., 2020). Therefore, it's crucial for policymakers to adopt strategies that are tailored to the specific needs of each locality, such as Phoenix's "Cool Pavement Program" (Hondula, 2023).

Effective governance and strategic long-term planning are vital at all levels to address the challenges posed by extreme heat. The inability to trigger federal emergency declarations under the Stafford Act and the lack of dedicated staff for heat resilience (Federal Emergency Management Agency, 2023) underscore the need for strategic planning. This planning is necessary to equip agencies with the tools required for effective heat resilience implementation. At local and state levels, there is an urgent need for specific roles or agencies to address heat-related issues. Some jurisdictions, like Miami-Dade, Florida, have begun experimenting with roles such as Chief Heat Officer (Miami-Dade County, 2021). However, the lack of federal incentives for creating effective heat response personnel at the local level exacerbates this challenge. Hondula (2023) suggests a shift to a traditional public health governance structure to address extreme heat vulnerability. Heat Action Plans (HAPs) can provide a framework for addressing extreme heat's public health impact (Randazza et al., 2023). However, there's a need for tailored strategies to protect vulnerable communities (Randazza et al., 2023). Coordination between HAPs and municipal or regional climate action plans can create comprehensive strategies. The key initiatives of this proposal include a Heat Resilience Program, Heat Action Plans, Public Health and Safety, Climate-Resilient Infrastructure, Education and Awareness, and Research and Monitoring.

Launching a Statewide Heat Response and Mitigation Program

To proactively tackle heat-related challenges, Kansas must establish a dedicated Heat Resilience Program under the Kansas Department of Health and Environment (KDHE). This program will focus on educating, monitoring, researching, building climate-resilient infrastructure, and crafting Heat Action Plans (HAPs) to protect workers and the general population from heat stress. The Heat Resilience Program will provide resources and training to schools, communities, and workplaces, enabling them to

better understand and address heat-related issues. The program will allocate resources for research on the health, economic, and environmental impacts of extreme heat, fostering innovation in heat-resilient technologies and infrastructure.

Public Health and Safety

To address the unique challenges and vulnerabilities in different regions of Kansas, region-specific HAPs are recommended. These plans should be tailored to each area's needs, include a strong focus on low-income communities and the elderly, and target specific industries that are most at risk. In industries most vulnerable to heat, the program must encourage businesses to adopt heat-resilient practices by offering financial incentives for the use of cooling equipment, modification of work schedules, and provision of heat-resistant clothing to employees. For example, in Dodge City, Kansas, where temperatures surpass 100 degrees Fahrenheit, the National Beef slaughterhouse relies on fans rather than air-conditioning to cool the facility. Workers endure intense heat while wearing heavy protective gear, leading to concerns about food contamination due to impaired vision and exhaustion. According to Martin Rosas, a union representative, almost 200 employees have quit since May, emphasizing the urgency for region-specific Heat Action Plans (HAPs) that target vulnerable industries and prioritize worker well-being (Davenport, 2023). This will not only protect workers but also improve workplace productivity.

Heat-Related Illness Surveillance

To fortify commitment to worker safety in the face of rising temperatures, there must be advocates for the utilization of innovative approaches in heat-related illness surveillance. President Biden's call for the Department of Labor (DOL) to issue the inaugural Hazard Alert for heat signals a pivotal moment in federal engagement, with a focus on ramping up enforcement to shield workers from extreme heat, recognizing it as the primary cause of weather-related deaths in America (House, 2023). Concurrently, the Kansas Syndromic Surveillance Program (KSSP) offers a valuable tool at the state level, collecting de-identified information from various healthcare facilities (Kansas Syndromic Surveillance Program, n.d.). Harnessing this data will pinpoint high-risk regions and populations, enabling targeted interventions and more effective healthcare resource allocation during heat waves. Moreover, the proposal recommends the development and implementation of early warning systems, leveraging KSSP insights to alert communities to impending heat waves, empowering them to take proactive measures for the well-being of both workers and residents.

Climate-Resilient Infrastructure

Kansas must invest in climate-resilient infrastructure to combat extreme heat. This includes creating cooling centers, shaded public spaces, and heat-resilient urban planning. To achieve this, there must be research into federal grants, new infrastructure technology, and engagement with communities to understand their specific needs. Subsidies or grants can then be allocated to support the development of climate-resilient infrastructure. This approach draws inspiration from successful models like climate-smart agriculture, emphasizing collaboration with Tribes and proactive community engagement. For instance, the Great Lakes region is experimenting with port management that assumes a dual role of ecological restoration, improving both environmental and social health (U.S. Global Change Research Program, 2023). Cities like Milwaukee showcase the efficacy of public–private partnerships in developing green stormwater infrastructure.

Education and Awareness

To enhance public awareness and protect the workforce from the dangers of extreme heat, dynamic educational initiatives are proposed in Kansas. Launching targeted public awareness campaigns, in collaboration with schools, local organizations, and media outlets, will disseminate crucial information about heat safety. This

effort aims to encourage the adoption of heat-resilient practices by individuals and businesses alike.

A key aspect of this strategy involves working closely with the state's education system to integrate comprehensive heat stress management and prevention modules into school curricula. By aligning with established educational frameworks such as the Next Generation of Science Standards (NGSS) and leveraging the rich climate education resources available in the Midwest, it can ensure that the younger generation is well-equipped with the knowledge and skills to navigate and mitigate the impact of extreme heat (U.S. Global Change Research Program, 2023). Through these collaborative efforts, Kansas can establish a foundation for a climate-informed and responsive society, fostering resilience and preparedness across communities.

Research, Monitoring, Evaluation, & Adaptation

A comprehensive strategy is needed to understand and address the impacts of extreme heat on labor productivity in Kansas, encompassing research, monitoring, evaluation, and adaptation. This involves significant funding for research initiatives that examine industry-specific effects and localized vulnerabilities, with an emphasis on interdisciplinary collaboration for a holistic understanding of climate change, labor productivity, and public health. Grants should be provided to local institutions to foster impactful research projects on heat resilience. A dynamic policy review framework that incorporates the latest advancements in climate science, health data, and labor productivity trends is also essential. This flexible and responsive approach enables Kansas to proactively address evolving conditions associated with extreme heat. Public engagement in the policy evaluation process is central to this strategy, creating avenues for input and feedback on heat resilience initiatives. This inclusive approach transforms policy development into a collaborative effort, benefiting from diverse perspectives and insights of those directly impacted by extreme heat in Kansas.

Conclusion

As extreme heat events become more frequent and severe, the implications for labor productivity and public health demand immediate attention. This policy proposal serves as a blueprint for Kansas to not only weather the challenges of rising temperatures but also emerge as a leader in climate resilience, setting an example for other regions facing similar threats. The time for decisive action is now, and the proposed policy offers a comprehensive roadmap for Kansas to secure a sustainable and resilient future for its residents.

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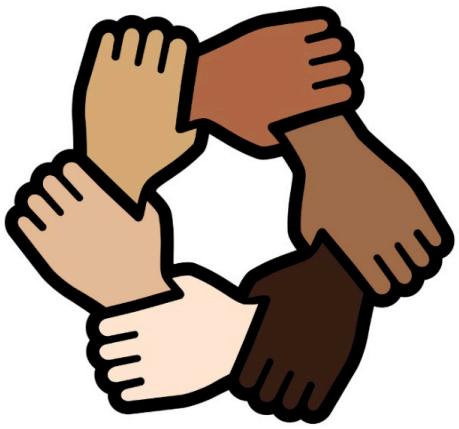

Stronger Together: Creating a Network of Scholars

Research Summaries

Safety Of Proximity to Nuclear Reactors in Eastern Kansas and Nebraska

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Introduction

The safety of nuclear power has been debated for decades. Elevated rates of childhood cancer incidence have been linked to the vicinity of a nuclear power plant in France, Germany, Japan, the UK, and the US (Canadian Nuclear Safety Commission, 2014; Hoffmann et al., 2007; McNally & Eden, 2004). These studies reveal a proximal correlation, but no definitive causation—at least not from a nuclear power plant (NPP) during normal operations. Even in well-documented cases in a site with a history of safety breaches and unplanned discharges, a causal link has not been established (Black, 1984; Forman, et al., 1987; Gardner, 1993; Schmitz-Feuerhake et al., 1997). Most studies focus on childhood leukemia, mainly acute lymphocytic leukemia (ALL), but also acute myeloid leukemia (AML) and certain lymphomas. Ionizing radiation is the foremost cause of childhood leukemia (Boice et al., 2022). No other major causes are known (Kendall et al., 2021). Ionizing radiation was proven to cause leukemia as early as the 1950s (Stewart et al., 1958).

In 1983, a British journalist, hoping to report on the "nuclear laundry" stored at Windscale nuclear site near Seascale, Cumbria, England, discovered several cases of childhood leukemia in the area within a small timeframe. His report became one of the first studies on the link between childhood cancer and proximity to a nuclear power plant (Urquhart et al., 1984). The Sir Douglas Black committee was established in 1983 to investigate the matter. The Black Report found a higher incidence of leukemia in the area and unusually high radioactive discharges from the site; however, Black claimed that no link between the two was found and more data was needed. Black recommended further research into improved safety at nuclear sites (Black, 1984). Martin Gardner later wrote that the Windscale site contained, "...vastly more radioactive waste... than any other nuclear site in the UK." Gardner also highlighted a "known record of accidental releases," the documented Windscale fire in 1957, and other safety concerns regarding building materials, maintenance, and operations (Gardner, 1993). No association was

declared between the site and the excess incidence of childhood leukemia in the nearby area (Black, 1984). Several studies followed, with varying results (Black, 1984; Gardner, 1993; Kinlen, 1988).

Despite the rarity of childhood cancer (American Cancer Society, 2023), some studies claim these are chance occurrences or have another cause besides childhood or prenatal exposure from environmental contamination from a nuclear site. Children diagnosed before their fifth birthday who lived within 5 km of an NPP all showed significant excess of leukemias and non-Hodgkin's lymphomas (Cook-Mozaffari et al., 1989; Forman et al., 1987; Kinlen, 1988; Michaelis et al., 1992; Roman et al., 1987). Gardner et al. (1987) proposed 'paternal preconceptual irradiation' (PPI) as a likely cause. Another more widely accepted theory is that population mixing brings some infectious agent to an isolated town with a high population density (Kinlen, 1988). Neither Kinlen nor other papers have found or named such an infection or confounding factor (Government of Canada, 2014; McNally & Eden, 2004).

In cases of high-dose exposure from an event easily discerned by the public, such as Chernobyl 1986 or Fukushima in 2011, higher cancer rates are expected and more easily explained. The focus of this research, however, is on the prolonged exposure to low dose ionizing radiation, which has been more difficult to study effectively.

Many nuclear sites store nuclear waste, and most release small amounts of waste/biproducts from the nuclear process into the surrounding environment (United States Nuclear Regulatory Commission (NRC), 2021). The fission process in a reactor creates strontium isotopes and radioactive water called tritium. While nuclear fuel, made mostly of uranium, is naturally occurring and produces radionuclides (World Nuclear Association, 2024), radioactive strontium is not naturally present on Earth; it is only produced through this induced fission process (Environmental Protection Agency (EPA), 2024). Tritium and many radionuclides such as strontium-90 are regularly released as part of typical operation. Some releases are accidental (NRC, 2021), and it is possible that not all releases are reported (Schmitz-Feuerhake et al., 2005).

Mass release events are known to cause acute radiation poisoning and other cellular damage that results in further disease over time (National Institute of Health, 2022). The small, regular releases of nuclear waste are permitted because they are less radioactive than the natural background radiation (American Nuclear Society, 2023). Cellular damage can be caused by repeated, low-dose exposure. Strontium isotopes, tritium, and other known biproducts of uranium's nuclear fission process release alpha and beta particles, which cause molecular damage when inhaled, absorbed, or ingested (EPA, 2023). This interrupts normal DNA replication and can result in tumorous growths such as in lymphoma, or a blood cancer such as leukemia when blood cell production is affected (Cleveland Clinic, 2022). Although numerous studies claim that the detected radioactive discharges from the nuclear sites are too low to cause the observed cancer clusters, their conclusions are based on data from large-scale releases and mostly the effects on adults (Gardner, 1989). Exposure dose is much greater in utero and early childhood (Stather et al., 2002). The aim of this study was to ascertain if the levels of radiation surrounding several NPPs in Eastern Kansas and Nebraska are significantly higher than the natural background radiation.

Methods

Nuclear reactors within a six-hour drive of Wichita, KS were identified. Three sites were chosen: Wolf Creek generating station near Burlington, KS; Kansas State University's (K-State) TRIGA Mark II research reactor in Manhattan, KS; Fort Calhoun Nuclear Generating Station near Blair, NE. Wolf Creek is an active commercial light-water reactor, K-State is a

pool-type research reactor, and Fort Calhoun is a decommissioned nuclear reactor. Water samples were collected from areas surrounding the nuclear reactors and tested at Wichita State University. The collected water was stored in glass vials labeled with the location where the sample was sourced. The water was transferred to petri dishes to allow the liquid to evaporate. All samples were tested using a Geiger counter wand connected to a PASCO interface and a laptop and processed using the Radiation program from CAPSTONE software.

Results and Discussion

Calculations were based on a Poisson distribution with mean averages and statistical deviations. When applying z- and p-values, none of the samples showed a statistical difference with a 95% confidence interval. Medical data and statistics for cancer in Kansas are not publicly available, but recent statistics for Nebraska are. The average cancer incidence per 100,000 in Nebraska from 2016-2020 was 459.1 (NIH, 2022), and the national average was 442.3 (National Program of Cancer Registries and Surveillance, Epidemiology, and End Results, 2022). Elevated cancer rates are documented in areas south of the Fort Calhoun nuclear power plant and Cooper nuclear generating station (no water samples from this site), along the Missouri river that flows past the plants and southward. The aforementioned counties with incidence per 100,000 are Washington (465.1), Douglas (484.5), Sarpy (473.2), Cass (490.4), Otoe (471.1), and Richardson (488.2) (National Program of Cancer Registries, 2022). It must be noted, however, these tend to be high population areas with other potential risk factors for cancer such as industrial and personal products containing benzene and other known carcinogens.

The results for the K-State TRIGA reactor were not surprising. As a research reactor, it is not on the same scale as the other sites; it operates on a closed system. Testing did not show any readings higher than the natural background radiation. The Fort Calhoun site is being decommissioned because updating the site to meet current safety standards is not fiscally feasible. This site has a history of safety citations, so higher readings were expected (United States Nuclear Regulatory Commission, 2022). The Wolf Creek site is active and sits on a lake that is publicly accessed in some parts. The samples for Wolf Creek and Fort Calhoun appeared to show elevated readings during several test intervals. Further testing found that the results were not statistically significant.

Conclusion

Radiation readings at the sites tested were not statistically significant. No distinguishable differences were found between the samples and the measured ambient radiation. The ionizing radiation surrounding the chosen nuclear sites in Eastern Kansas and Nebraska was not found to be higher than the natural background radiation.

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Examining the Structure and Stability of Palladin's Ig3-4 Linker Region

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Introduction

Actin is the most abundant protein in most eukaryotic cells. It is an integral part of cellular division, which is necessary for growth and healing, and is also crucial for cell motility and maintaining cell shape. It also participates as a primary filament in muscle contractions. Due to its vital role in basic human functions, responsive regulation is imperative. Research indicates over one-hundred and fifty actin-binding proteins participate in actin regulation, polymerization, cross-linking, bundling, and localization of actin (Beck, 2021).

Palladin has surfaced as a key player in the actin-binding protein family, located in all eukaryotic cells, and noted for its involvement in embryonic development and cancer metastasis. A simple example of its significance can be demonstrated by its role in the mitotic spindle orientation of dividing cells. Depletion of palladin was seen to induce spindle misorientation. Spindle orientation is crucial for defining the axis in which chromosomes align and therefore divide into daughter cells. Chromosome instability caused by improper mitotic progression can therefore be linked to tumorigenesis (Zhang et al., 2017). Palladin has also been linked to active roles in cell motility and actin filament organization. For example, a study published by Dhanda et al. (2018) determined that palladin could compensate for diminished levels of the Actin-Regulating Proteins 2-3 (Arp 2/3) complex. The Arp2/3 complex, along with its large family of nucleation-promoting factors, promotes nucleation of actin and affects the time and location of polymerization, which promotes the organization of actin filaments into a branched network (Dominguez & Holmes, 2011). When palladin was overexpressed and Arp2/3 was inhibited, it was seen that bacterial motility could be initiated and maintained, therefore indicating the idea that palladin plays a significant role in the organization of actin filaments (Dhanda et al., 2018). Similarly, when palladin was knocked down in primary neurons and neuroblastoma, neurite extensions failed to extend (Boukhelifa et al., 2001).

In addition to functioning as a cytoskeletal regulator, palladin functions as a molecular scaffold for other actin-associated proteins (profilin, α-actinin, VASP, etc.), making it an interesting and crucial area of study (Mayer et al., 2022; Tay et al., 2010). Palladin has also been linked to the progression of breast, pancreatic, ovarian, colorectal, and renal cancers (Mayer et al., 2022). In breast cancer tumors, palladin was found to be expressed at higher levels when compared to benign breast tissue. In a palladin knockdown model, the formation of podosomes, actin-rich structures used in adhesion and matrix degradation in invasive cells, were seen to decrease, and consequently, a significant reduction in transwell migration and invasive motility was observed within breast cancer cells (Goicoechea et al., 2009). Alternatively, in a human colon cancer cell line characterized as having poor metastasis (HCT116), a knockdown study of palladin was conducted where cell line E1 was found to exhibit reminiscent epithelial-mesenchymal transition (EMT), a physiological process where cells acquire motility and invasive behavior via alterations in epithelial structure leading to the dissolution of adherens junctions and reorganization of actin cytoskeletons. Therefore, with the decrease in palladin, an increase of invasiveness was observed. The study identified that palladin's ability to regulate actin-crosslinking and its interactions as a scaffold protein make it a novel regulator for EMT-like phenotypes in metastatic colon cancer (Tay et al., 2010). Additionally, palladin's role was assessed in adult gliomas using publicly available data along with human and mice samples. Gliomas are described as being a brain tumor that originates in the brain's glial cells surrounding neurons and compose about 23-25% of all brain tumors (Mayer et al., 2022). Within the study, it was determined that the wild-type 90 kDa palladin isoform was overexpressed in adult gliomas and correlated with a decrease in survival. While the role of palladin within gliomas is still unknown, the results of the study open the possibility of palladin being used as a diagnostic and prognostic marker (Mayer et al., 2022). Despite significant research supporting the role of palladin in cell motility, actin filament organization, and cancer progression, there is very little evidence to determine the molecular mechanism through which palladin binds to F-actin and contributes to the invasiveness of such diseases.

Structurally, palladin consists of five immunoglobulin-like (Ig) domains. Palladin's Ig3 domain is the minimal requirement for actin-binding; however, addition of the Ig4 domain enhances both binding and bundling of actin filaments. The mechanism for increased binding and bundling by the tandem domain is still unknown (Dixon et al., 2008). In the Beck lab, a previous study was conducted to understand the significance of the Ig3-4 linker region's unique properties, such as amino acid length (41 compared to typical 5-7), charge (high concentration of arginines), and preponderance of protein modification sites (i.e. serines). The study consisted of various mutations to the linker region to see the overall impact of actin-binding. In one specific mutant, RLinkerA, ten arginines were replaced with ten alanines to create an overall neutral linker region. Results indicated complete abolishment in actin-binding ability and therefore no bundling activity even though the Ig3 domain was intact (unpublished data). To determine the validity of these results, this study was conducted to determine if the mutation impacted the structure and overall stability of the protein containing this mutated linker region.

Methodology

The wild-type and mutant palladin Ig3-4 proteins proceed through three different purification columns: nickel affinity, amylose affinity, and cation exchange, followed by Circular Dichroism (CD) to determine the secondary structure and thermal stability of our mutant and wild-type proteins. A comparative analysis was then performed using the well-established and highly used CD data analysis website, DichroWeb, to determine the difference in secondary structure and its potential effects on the relative stability of the protein and binding to F-actin.

Results

Protein Purification: Nickel and Amylose Affinity

The nickel column was used as our primary source of purification for both wild-type (WT) and mutant (RlinkerA) palladin Ig3-4. We monitored the purification process using SDS-PAGE gels containing the different fractions. A protein ladder located in the first lane of each gel was then used to confirm the location of our desired protein in all the elution samples. The final cut Ig3-4 protein can be seen in lane nine at ~26 kDa along with the TEV protease (~28 kDa) and His6-MBP tags (~ 57 kDa). After confirmation from the SDS-PAGE nickel column gel, the vials containing the Ig3-4 protein (E1+TEV) were briskly centrifuged at 4,000 rpm for 10 minutes to remove any precipitation and then run through the amylose column. Within these gels, Ig3-4 can be collectively seen in flow-throughs 1 and 2 (FT1 and FT2) which will later be dialyzed in Buffer A and run though cation exchange purification (SP Sepharose) for further purification. The His6-MBP tag cleaved from Ig3-4 as well as the MBP-tagged TEV protease are both retained on the amylose column until elution buffer containing maltose is added.

Cation Exchange (SP Sepharose)

Flow-throughs from the amylose column for both WT and mutant Ig3-4 proteins were dialyzed and run through a cation exchange SP Sepharose column at 1-3 ml/min and collected as purified fractions. Smaller impurities are illustrated by a smaller peak at the beginning of the chromatograph, followed by the Ig3-4 protein located at fractions #30-40 indicated by the 2 small and larger peaks located in the center of the chromatograph. Fractions were collected, run through an SDS-PAGE gel to confirm protein presence and purification, and later dialyzed using CD buffer.

Circular Dichroism

Circular dichroism was performed to detect any differences in secondary structure between WT and RlinkerA mutant Ig3-4. Results from the CD wavelength scan and thermal denaturation allow us to visualize the secondary structure and unfolding of our wild-type and mutant proteins. Results illustrate a similar absorption pattern and a melting temperature of similar values for both WT and mutant Ig3-4. At 15 mM protein concentration, the melting temperature, or temperature where 50% of the protein became unfolded, was recorded at 56.31 °C and 55.63 °C for the wild-type and mutant protein respectively. Slightly more variation can be seen in the 30 mM concentration of both variants where the wild-type was seen at 50% denaturization at 61.15 °C and 54.33°C for the 30 mM mutant. Despite the slight decrease in average melting temperature in wild-type versus mutant protein at 30 mM, the melting temperatures remained relatively similar, suggesting insignificant change in stability.

CD Spectra were then imported into the well-established and highly used CD data analysis website, DichroWeb, for secondary structure analysis (Table 1). When compared to the Ig3-4 wild-type, there was a slight decrease in beta sheet formation, a slight increase in alpha helix, and no effect on random coil for the comparison of WT and mutant protein. Secondary structure analysis therefore confirms insignificant structural differences between the Ig3-4 wild-type and RlinkerA mutant protein.

DichroWeb- Secondary Structure Analysis

PALLD Ig3-4 WT	Alpha Helix	Beta Sheet	Random Coil
23μM	0.05	0.47	0.48
15μM	0.05	0.48	0.48
10μM	0.04	0.8	0.48
PALLD Ig3-4 RLinkerA			
30μM	0.05	0.47	0.48
15μM	0.07	0.45	0.48
10μM	0.09	0.44	0.48

Table 1: Results from CD Spectra analysis performed by DichroWeb. Only results with less than a 0.22 error were accepted and recorded.

Conclusion

The lack of significant differences found in this CD data between the mutant and wild-type proteins suggests that the RLinkerA mutant protein is stable and that the secondary structure has not been dramatically altered as to explain the lack of actin-binding to its structure. Determining why Ig3-4 RLinkerA mutant does not bind to F-actin is, therefore, still an active area of investigation. Answers to this question could propel future studies in gaining insight into how the wild-type palladin's Ig3-4 linker region functions in the binding of F-actin. Knowledge in this area could grant us more direction to study the method by which palladin contributes to actin polymerization and organization, which may inform our understanding of why or how palladin contributes to the metastasis of various forms of cancer. For future studies, we aim to determine if the flexibility or dynamics of the protein linker are altered using SAXS (small angle x-ray scattering) analysis to detect this difference.

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The Impact Of Participating in a Culture Based Summer Bridge Educational Intervention

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Introduction

Bridge programs are educational initiatives designed to help students successfully transition from high school to college. These programs are particularly beneficial for students who may be first-generation college students, come from underrepresented backgrounds, or face other barriers to a smooth transition into higher education. Bridge programs increase access to higher education by exposing students to the college environment prior to the academic term (Trevino & Mayes, 2006). This helps students make informed decisions about their academic and career paths, narrowing the opportunity gap. Specifically, cultural bridge programs provide equitable college preparation opportunities by integrating cultural elements into their curriculum. These programs enhance language skills, cultural pride, and self-identity while providing coping mechanisms and resilience strategies within a specific cultural context (Puente & Ramirez, 2021).

Cultural summer bridge programs are crucial for supporting Hispanic high school students' transition to higher education. By providing academic resources and fostering cultural pride, bridge programs enhance students' readiness for college and encourage their success both academically and socially. These elements help students overcome academic challenges and alleviate financial burdens, making it more likely for them to graduate (Sablan, 2014).

These bridge programs are guided by culturally relevant pedagogy. This framework emphasizes incorporating students' cultural backgrounds into the curriculum, validating their identities and experiences. This framework is crucial for culturally based bridge programs, which aim to create inclusive and supportive learning environments for underrepresented students.

This research delves into the experiences of high school juniors and seniors who took part in Herencia. This week-long initiative aims to enhance cultural identity and language skills, which are crucial for underrepresented students as they prepare for college.

Methods

The study involved a focus group of Herencia participants to evaluate the program's effectiveness. Seventeen students who completed the Herencia program were invited to participate, with nine agreeing to do so. All participants were Hispanic high school juniors. The focus group included five open-ended questions designed to explore key themes, participants' experiences, perceptions, and attitudes towards their experience participating in Herencia.

1. What was the highlight of participating in the summer bridge program Herencia?
2. How has your perception of your Spanish-speaking skills been influenced by participating in Herencia?
3. How has your understanding of your cultural identity been influenced?
4. Did participating in Herencia impact your journey to college readiness? If so, how?
5. What are the biggest lessons you learned from participating in Herencia?

Interviews were audio-recorded with the participants' consent and transcribed verbatim. Field notes were also taken during and after the interviews to capture non-verbal cues and the context of the conversations. To ensure accuracy and reliability, the transcripts were checked against the audio recordings for precision.

Results

Interview analysis revealed four major themes that encapsulate the participants' experiences and perspectives during Herencia.

Accessibility: Participants shared their experience of not being able to access education. They mentioned talking to faculty about their concerns and having valuable conversation about accessing education.

> "Before Herencia, I didn't want to go to college because it was a lot of money and my parents don't really have extra money."

Awareness of their cultural identity: Participants reported that they were not aware of or did not show interest in their cultural identity until they participated in Herencia. Some discovered new aspects of their culture and became more connected to it. Students felt divided between their different identities, but through Herencia they feel more united and confident in embracing both cultures.

> "I was influenced in a big way because I didn't really care about my culture or my identity at all at the beginning and I didn't know what it's like. There's so much to learn from our culture."

Linguistic Capital: Participants reflected on the value of learning Spanish, highlighting cultural understanding and pride. Students' perception of their Spanish speaking skills was influenced by participation in Herencia.

> "Herencia made me more proud to be able to speak Spanish because that's just another talent that one has."

Community: Participants appreciated the connections made through the program. They met people who could offer support and help them give back to the community.

> "I feel like it has helped me a lot and it's probably still continuing to help me. By giving me connections to people, who I know would be able to help me and help me understand things that I'm having trouble with."

Discussion

Summer bridge programs, like Herencia, play a crucial role in supporting Hispanic high school students as they transition to higher education. These programs are particularly important because they address several key challenges faced by Hispanic students, including educational accessibility, cultural identity,

linguistic capital, and community support. Herencia increases accessibility to college for these students by providing scholarship assistance, individual advising, presentations from university admissions, and open dialogue with faculty and current university students. Faculty and student representatives who come from similar backgrounds serve as role models. Seeing themselves represented helps students visualize themselves in these spaces. Additionally, Herencia promotes cultural awareness and pride, helping students to connect with and embrace their cultural identity, which can enhance their self-esteem and sense of belonging. Classes explore cultural identity and community leaders help students explore their own identity and connect to culture in the community.

The emphasis on linguistic capital further equips students with valuable bilingual skills, enhancing their cultural understanding and communication abilities. Moreover, the community-building aspect of bridge programs provides a supportive network of peers and mentors, which is essential for navigating the challenges of college life. This network not only offers emotional and practical support but also encourages students to engage with and give back to their communities. Overall, Herencia empowers participants to succeed academically, culturally, and socially as they prepare for and transition to higher education.

Conclusion

The Herencia program exemplifies how cultural bridge programs can effectively support underrepresented students in their journey toward higher education. By integrating cultural identity and language skill development, these programs not only improve academic outcomes but foster a sense of belonging and mental well-being among participants. This comprehensive approach is essential in promoting educational equity and ensuring all students succeed in higher education.

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The Use of Color by Reggaeton Artists on Social Media to Establish a Brand

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Introduction

Reggaeton, a genre that originated from Panamanian and Jamaican influences in the 1980s, has evolved into a global musical phenomenon that uniquely blends Latin American and Caribbean sounds (Rivera-Rideau, 2017). Characterized by its rhythmic beats, catchy melodies, and socially relevant lyrics, Reggaeton has become a powerful medium for cultural expression and artistic innovation. Understanding the historical roots and evolution of this genre is essential to appreciate its impact on contemporary society.

This research explores the intriguing intersection of color, branding, and social media within the Reggaeton genre. In recent years, the visual identity of Reggaeton artists has become increasingly important in shaping their public image and connecting with their audiences. This research aims to unravel the complexities and implications of the visual elements employed by Reggaeton artists, focusing particularly on the interplay between color, branding strategies, and their presence on social media platforms.

Color theory is a crucial aspect of visual communication, encompassing the principles and guidelines on the use of color in art and design to create harmonious and visually appealing compositions. It delves into how colors interact, the psychological effects they evoke, and their cultural significance. In marketing and branding, understanding color theory is essential as colors can significantly influence consumer perceptions, emotions, and behaviors. By leveraging color theory, brands can create strong visual identities, convey specific messages, and connect more deeply with their target audiences (Hornung, 2020).

Studying these relationships is crucial in the context of Reggaeton's global impact. The genre transcends geographical boundaries, reaching diverse audiences worldwide. As Reggaeton artists navigate the intricate landscape of the music industry, the visual elements associated with their brand become pivotal in establishing a unique identity and fostering a sense of connection with fans. This research aims to shed light

on how color and branding choices contribute to the artists' narrative and influence their music within the broader cultural context.

Methodology

The target participants for this study were young adults aged 18 to 25 who actively engage with Reggaeton music and follow Reggaeton artists on social media platforms. To be eligible to participate, individuals had to be at least 18 years of age and express an interest in the Reggaeton genre. Participants were recruited through targeted advertisements on Instagram, Facebook, and Twitter, focusing on spaces frequented by Reggaeton enthusiasts. Additionally, outreach was conducted through music-related forums and communities to identify individuals with a genuine interest in the genre. Due to lack of availability, the focus group included four participants.

Focus groups facilitate dynamic interactions among participants, allowing for the exploration of shared experiences and perspectives regarding the use of color by Reggaeton artists on social media. The focus group session was structured around open-ended questions, encouraging participants to share their thoughts, experiences, and opinions regarding the use of color by Reggaeton artists on social media. Participants were exposed to marketing materials from four Reggaeton artists' social media pages. They were asked questions surrounding how the color made them feel and what they could perceive about the artist based on the color scheme.

Results and Discussion

The findings from this study provide valuable insights into how color is utilized in the branding strategies of Latin music artists and the implications these visual choices have on audience perceptions and engagement. The focus group discussions revealed several key themes and interpretations regarding the association of specific colors with certain artists and the use of color in hair and clothing to enhance branding. One of the most prominent themes that emerged was the strong association of specific artists with certain colors. The study also revealed how artists use color in their hair and clothing to reinforce their branding. This strategic use of color in personal style and album aesthetics creates a cohesive and recognizable image that resonates with fans. The consistent use of neutral tones established a distinct visual identity, demonstrating that a well-executed color scheme can capture attention and create a strong brand identity, even for lesser-known artists.

The discussions suggest that the strategic use of color can significantly influence audience perceptions and engagement. Artists who consistently use specific colors in their branding can create a stronger and more recognizable brand identity. This consistency helps in establishing immediate visual associations, which can be particularly effective in a crowded and competitive music industry. Feid's consistent use of green was particularly effective, allowing for immediate recognition and association with his persona. In contrast, J Balvin's eclectic use of multiple colors, while reflecting his dynamic image, lacked the distinct branding power offered by a more focused color scheme.

The study's implications suggest that strategic use of color can significantly influence audience perceptions and engagement. Artists who consistently use specific colors in their branding can create a stronger and more recognizable brand identity, helping to establish immediate visual associations. The multifaceted approach to branding, incorporating color in hair and clothing, enhances overall image and helps artists connect more deeply with their audience.

Conclusion

This study aimed to explore the intersection of color, branding, and social media within the Reggaeton genre, focusing on how artists utilize color to establish their brand identity and engage with audiences.

The findings underscore the significance of color as a strategic tool in the visual branding of Reggaeton artists, revealing its impact on audience perceptions and brand recognition. This research provides valuable insights into the role of color in the branding strategies of Reggaeton artists, highlighting its importance in establishing brand identity and engaging with audiences. These findings can guide artists and marketers in enhancing their digital presence and contribute to academic discussions on digital marketing strategies in the music industry.

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Building Bridges to Older Adults: An Interdisciplinary Assessment of Students' Knowledge and Opinions on Older Adults

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Introduction

Ageism, discrimination or prejudice against individuals based on their age, is a prevalent issue in society, particularly within the realm of healthcare (Allen et al., 2022). Within this domain, ageism can manifest in subtle biases, stereotypes, and disparities in care, which ultimately affects the well-being of older adults. Research indicates that a deficiency in understanding old age corresponds with negative attitudes towards older adults and heightened levels of ageism among students in healthcare disciplines (Even-Zohar & Werner, 2020). By illuminating this relationship, the study aims to provide valuable insights into the factors shaping attitudes towards aging within the future healthcare workforce.

Examination of Allen et al.'s (2022) research on healthy aging revealed that 93.4% of American adults aged 50 to 80 encounter subtle forms of discrimination referred to as "everyday ageism." Everyday ageism may merit more investigation, emphasis as a subject for further research, and recognition as a preventable health risk as individuals grow older (Allen et al., 2022). The demographic transition, as projected by the World Health Organization (2018), foresees a significant increase in the population aged 60 years or older, from 900 million to 2 billion between 2015 and 2050, representing a shift from 12% to 22% of the total global population. This shift underscores the urgent demand for healthcare professionals who possess the requisite knowledge, skills, and attitudes essential for delivering comprehensive and empathetic care to older adults.

This study aims to investigate the relationship between knowledge of aging and ageism among undergraduate students at Wichita State University by incorporating intergenerational learning. Through the sharing of knowledge, engagement, and viewpoints between older adults and younger generations, intergenerational learning can provide unique opportunities to address ageism and social isolation

brought on by an aging population. Based on existing literature, it is hypothesized that students who possess greater knowledge of aging and older adults will demonstrate more positive attitudes towards adults and exhibit lower levels of ageism. This hypothesis is grounded in the understanding that increased knowledge about aging can lead to more accurate perceptions of older adults and greater empathy towards their needs and experiences.

Methods

This study centered on understanding the perceptions and knowledge of older adults, specifically aged 65 and above. Using a cross-sectional design, it aimed to explore how undergraduate students perceive this demographic. The data includes 263 undergraduate students' responses from an Introduction to Aging Studies course, taught at Wichita State University, over a three-year period. The curriculum explores opportunities and challenges within aging, with an emphasis on combating ageism across various populations and professions. Data was collected through distribution of online surveys on the Qualtrics platform. Participants were prompted to report both before starting the course and after its completion. They were asked to self-report their attitudes and understanding of older adults. Inquiries encompassed various dimensions including ageism and factual knowledge about aging. The surveys included the Fraboni Scale on Ageism, comprising 23 statements rated on a 4-point Likert scale, and the Palmore Facts on Aging Quiz, a multiple-choice questionnaire consisting of 25 items. Additionally, demographic information such as gender, age, study program, and year in the degree program was gathered. The Fraboni Scale yields scores ranging from 23 to 92, with higher scores indicating greater levels of ageism, while the Palmore Quiz generates a total score out of 25, with higher scores reflecting enhanced knowledge about aging. These assessment tools were selected based on their established validity and reliability in measuring attitudes and knowledge related to older adults.

Results

Two hundred sixty-three (N=263) students completed the survey. The sample was mostly women (80%), white/non-Hispanic (52%), and Junior undergraduates (39%). Participants in the study had a mean age of 20 years (SD= 1.08). Most students (89%) had not taken aging courses, while 10% reported having taken such courses. The caring fields, consisting of disciplines such as Health Science, Nursing, Psychology, Dental Hygiene, and Social Work accounted for most of the majors (75%), followed by Health Management, Business, and Engineering (21%); Arts (1%); and undecided students (3%). Paired samples t-tests revealed significant improvements in participants' knowledge of aging as assessed by the Palmore Facts on Aging quiz. Pre-intervention scores (M= 10.58, SD = 3.1) were notably lower than post-intervention scores (M= 14.90, SD=4.4). Moreover, significant reductions were observed in ageist attitudes measured by the Fraboni Scale of Ageism (FSA). Pre-intervention FSA scores (M= 43.83, SD=7.25) decreased significantly to post-intervention scores (M=40.19, SD=7.68), $t(241) = 10.35$, $p < .001$, indicating an overall reduction in ageist attitudes. Participants also demonstrated significant reductions in stereotype scores, with means decreasing from 21.29 to 18.85 ($t(257) = 2.61$, $p = 0.005$), suggesting a positive shift in perceptions regarding age-related social interactions. Additionally, affective attitude scores improved significantly from 9.30 to 8.45 ($t(255) = 7.06$, $p < .001$), indicating a more positive emotional outlook toward aging among participants post-intervention. Pearson's correlation coefficients further revealed a significant negative relationship between FSA scores and Palmore post-intervention knowledge scores, $r(248) = -0.268$, $p < 0.01$, highlighting that higher levels of knowledge about aging were associated with lower levels of ageist attitudes among participants.

Discussion

The findings of this study highlight the positive impact of the Introduction to Aging Studies course at Wichita

State University on undergraduate students' attitudes toward aging. Significant improvements were observed in participants' knowledge about aging, as evidenced by higher scores of the Palmore Facts on Aging quiz post-intervention compared to pre-intervention. Moreover, there was a notable reduction in ageist attitudes, as indicated by decreased score on the FSA scale, alongside reductions in stereotype scores and improvements in affective attitude scores. These results suggest a tangible shift towards more favorable perceptions and reduced biases concerning older adults among the student cohort. The significant decrease in FSA scores from pre-intervention to post-intervention underscores the effectiveness of educational interventions in addressing ageism among young adults. By providing students with comprehensive insights into aging issues through multidisciplinary education, this course not only enhanced factual understanding but also fostered empathy and compassion towards aging populations.

Conclusion

By investigating the perceptions and knowledge of aging among undergraduate students at Wichita State University, this research underscores the urgent need for interventions that promote understanding and empathy towards older adults in future healthcare professionals. The findings highlight a significant reduction in ageist attitudes among students enrolled in the Introduction to Aging Studies course, as evidenced by lower Fraboni Scale of Ageism scores and improved perceptions of age-related social interactions. These positive outcomes are promising in combating ageism and fostering more empathetic care practices. However, the study's reliance on a convenience sample from a single institution necessitates caution in generalizing these findings. Future research should aim to replicate these results across diverse populations and institutions to further validate the impact of educational interventions on attitudes towards aging and enhance the inclusivity of healthcare delivery for older adults.

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Efforts to Address Food Insecurity in Wichita, KS: A Needs Assessment

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Introduction

The purpose of this needs assessment is to examine the services and resources available to those managing food insecurity in the community of Wichita, Kansas. Wichita is a city in South-Central Kansas with a population of 397,532 as of 2020 (U.S. Census n.d). Of that population, 63% are White, 18% are Hispanic, and 11% are Black Americans. Poverty, defined as making less than $25,000 a year, affects 18.3% of people who live in Wichita (U.S. Census, n.d-a). As of 2021, there were 56,920 people who were food insecure in Sedgwick County (Feeding America, 2021).

A needs assessment was conducted to examine the agencies and resources addressing the prevalence of food insecurity in Wichita, Kansas. Bringing awareness to how food insecurity is being addressed in the community will also shed light on understanding the ways in which those afflicted by poverty and food insecurity are able to seek support and guidance from resources available within the community.

In a 2022 interview, Kansas State Network (KSN), a local news station, surveyed members of the community and found that the lack of food is not the main issue; it is not knowing where to get the food from. Interviewees also mentioned frustrations with grocery stores having limited items that were out of stock or overpriced. Surveyed members stated how the convenience of fast-food restaurants contribute to why individuals find it cheaper to eat out than cook meals at home. Lastly, this survey suggested the importance of organizations needing to come together (Herrera, 2022).

Food insecurity occurs when access to nutritionally adequate, safe foods are limited by acquiring food in a socially acceptable way (Bazerghi et al., 2016). Additionally, Bazerghi et al. (2016) suggests that food insecurity particularly affects people who are not financially secure. Connecting community resources like local food banks, food pantries, and programs provide food to families. Ensuring access to food is important to addressing hunger and ultimately

sustaining healthy bodies and the ability to grow properly. Previous research suggests that when organizations related to government, health, and food systems work together, a larger network can be formed to better meet the needs of those who are food insecure (Lofton et al., 2021). By bridging the gaps within the community, people's needs are met from all aspects of the different systems involved.

Methods

The first part of this needs assessment aimed to identify the number of resources available in various areas within the city. The Sedgwick County Health Department has recently identified four zip codes with the highest need for food resources: 67218, 67214, 67213, and 67210. These zip codes are southeast Wichita, northeast Wichita, the Delano District, and southwest Wichita, respectively. An initial internet search was conducted to determine what food resources are available within a five-mile radius of each zip code. In further searches, data was collected pertaining to additional information and social media presences. The key phrases used for this initial inquiry were "How do organizations address food insecurity?" "Building community gardens and recycling unused food," "Health impacts of food insecurity," "Government programs that help address food insecurity," "Access to food resources," and "Food pantries within Wichita, KS."

The second part of the needs assessment involved contacting key individuals within each organization to gain a detailed insight into the services being provided. Once organizations were identified, they were contacted by email and phone. Information was gathered to examine areas of need and strengths of resources. Individuals associated with each organization were asked to provide information and data about the services provided.

Results

The Kansas Food Bank is the main source of food resources for many pantries in the Wichita area. Approximately 30 pantries were identified in Wichita. Of these, 10 were contacted, and eight responded via emails. Two of the pantries responded to our inquiry by stating they are not in operation, despite still showing up in a search for food resources. This poses a challenge for someone who is food insecure, not knowing exactly what pantries are available to them.

The availability of food pantries and resources varied within the zip codes identified as highest need by the Sedgwick County Health Department. In zip code 67218, there were five food pantries, zip code 67214 had 17 food pantries, 67213 had three food pantries, and 67210 had one food pantry. Another option available to Wichitans are the Paxton's Blessing Boxes. These boxes are easily accessible on street corners and allow community members to provide non-perishable food items. There are approximately 50 boxes located throughout the Wichita area. However, it can be a challenge to keep these boxes filled because they are not managed regularly. Community members stock items believed to be needed; this can vary when and how often items are available.

Transportation

A major concern from community members related to the barriers accessing resources was the lack of transportation. Dear Neighbor Ministries, a food pantry servicing area code 67218, mentioned that on rare occasions people may receive day passes providing free public transportation for that day only. This can be a challenge because the bus is scheduled, and the pass can only be used the day it is received. Additionally, it can be a challenge to carry food a long distance or on public transportation. Shocker Support Locker, a pantry located at Wichita State University, is convenient for those who live on campus because it removes the need for transportation.

Supply

Many pantries rely on the Kansas Food Bank as their main source of distribution. One of the challenges is

not getting orders fulfilled, which can affect the amount of food available to be distributed to families. Pantries mentioned distributions happen once a month, but if someone needs food more often, they will not be turned away. Some pantries make a table available on distribution day for clients to give back items they may not use. This strategy gives clients the option to place those items on the table for others to take and reduce food waste. In one pantry, they had served over 142 families twice a month within a 27-28-day period. This issue needs to be investigated further as to how often distribution should happen in order to meet the needs of those who are food insecure.

Cultural Appropriateness

One goal of this research was to identify whether organizations offer culturally appropriate foods to accommodate people from different cultural backgrounds who visit their pantry. Organizations indicated cultural backgrounds are not considered when offering food, however, they do their best to accommodate requests. Interpreters or translators are also available for individuals who do not speak English. This allows clients to have a better experience and feel comfortable coming back to their pantry knowing someone speaks their language.

Collaboration

A notable finding was that many pantries create partnerships because of their relationship with the Kansas Food Bank. However, lack of communication between organizations prevents them from cooperating as a larger food system. Each nonprofit must seek their own funding. Each pantry operates as an individual entity with individual goals and may not communicate with partner pantries about how they can best work together. ICT Food Rescue is a local organization in Wichita that has already begun collaborating with bigger corporations to redistribute food. Their mission is to collect food that is being donated by these corporations and give it out to the community. Collaborating with other organizations can help reduce food waste and increase food supply in order to meet the demand of those who are food insecure. Also, creating a network within the community where organizations can refer clients to one another when they are not able to meet specific needs can further help the community.

Conclusion

In the areas identified as having the highest need, the number and availability of food pantries and resources varies significantly. For someone who is food insecure, not knowing the variation of hours and supply for each pantry can be challenging. Another challenge is the availability of accessible transportation to pantries. A more efficient approach to address food insecurity would be to ensure that organizations collaborate with one another to create larger systems and work as a team versus seeing one another as competition. Previous research shows that when organizations come together, they can better meet the needs of those who are food insecure (Lofton et al., 2021). They can also refer clients to other resources to best meet their needs. Consistent communication and regular meetings may be necessary to ensure the community's needs are clear. Although collaboration can be challenging, it is in the best interest of the community for us to bring government, health, and food systems together. Food insecurity impacts each of these sectors. Collaboration ensures policies are being put in place to improve food insecurity, and ultimately feeding those that are in most need by providing effective food resources.

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Sense of Belonging & College Students: A Qualitative Study

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Introduction

Transitioning to college can be challenging, especially for students away from home for the first time. Some of the challenges include academics, work, financial pressure, social engagement, and attempting self-care. The presence or absence of supportive relationships during this period plays a crucial role. Students with high sociability experience lower levels of loneliness and better friendship quality, making the transition smoother (Mounts et al., 2006). However, those who lack social support may struggle. A sense of belonging helps combat feelings of displacement and isolation, fostering resilience to face academic and social challenges. Finding a sense of belonging within a college campus is essential for students' mental well-being and academic success. A sense of belonging means feeling connected, accepted, and included in a group or community. Research has shown that this feeling is pivotal for higher retention rates among college students. When students feel a sense of belonging, they experience comfort, security, and acceptance. This positively impacts their mental health and academic outcomes (Museus & Chang, 2021). For instance, activities like student government, Greek life, and community service foster this sense of belonging and improves mental well-being and academic performance (Wolf et al., 2017).

This study explores sense of belonging among college students by analyzing their campus involvement and its association with mental health and academic performance outcomes. This research aims to provide insights into the relationship between campus engagement, sense of belonging, and student well-being, offering valuable implications for educational institutions and student support services. This introduces the research question: does involvement on campus impact mental wellbeing and academic engagement?

Methods

This research employs a quantitative approach, utilizing data collected from the National College

Health Assessment (NCHA). Specific questions within the NCHA survey are utilized to measure students' levels of involvement, mental wellbeing, and academic performance to assess sense of belonging.

The sample population used for this research is the 2022 response from the survey gathered at Wichita State University. The NCHA survey was open to all Wichita State University students, both undergraduate and graduate students. The survey did not limit participation based on any stipulations regarding race, ethnicity, religion, sex, sexual identity, and gender.

To assess campus involvement, participants were asked to report the number of hours spent per week engaging in campus clubs and organizations. In regard to academic performance, participants reported the number of hours they spent per week attending classes, discussion sections, or labs. Lastly, sense of belonging was measured using a single item, scored on a 4-point Likert scale, ranging from 1 (strongly disagree) to 6 (strongly agree).

Results

The correlation drawn from the data indicates that students with a high level of campus involvement are more likely to report a greater sense of belonging. Therefore, campus involvement affects sense of belonging. The correlation between belonging and mental well-being (MWB) highlights that students who report a higher level of sense of belonging are more likely to report a greater mental well-being. As levels of sense of belonging increase, so do levels of mental well-being. Belonging and approximate GPA show a similar correlation. Students who report a higher level of sense of belonging are more likely to report good academic performance.

Conclusion

Assessing sense of belonging can help colleges and universities better understand how to support students. It offers valuable implications for educational institutions, especially student support services. Universities can use this data to help gauge a sense of belonging on their campuses. High levels of sense of belonging can be attributed to high levels of campus involvement. Subsequently, high levels of both campus involvement and sense of belonging can result in positive academic performance and mental wellbeing. It is important to maintain a sense of belonging on college campuses for students for the sake of their academic performance and mental well-being.

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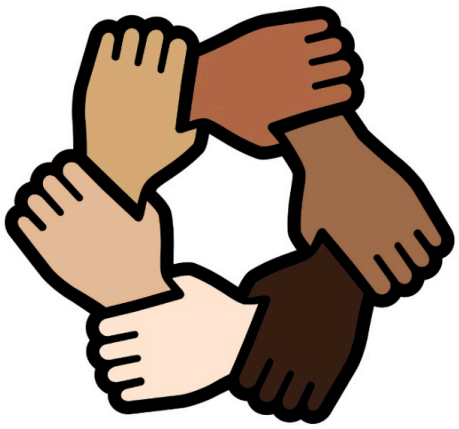

Stronger Together: Creating a Network of Scholars

Extended Literature Reviews Summaries

Rewarding Burnout: Childcare Providers as Emotion Workers

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Introduction

The purpose of this study was to uncover connections between early educational instructors and occupational stress/burnout to identify areas of future studies and potential remediation for current and future caregivers. Jobs requiring a high level of personal interaction often see burnout as a common theme among individuals within those professions (Jones et al., 2019). Burnout, a psychological response to chronic interpersonal stress due to occupational stress, is a main contributor to turnover within teaching and early childcare (Carson et al., 2010; Ntim et al., 2023; Oberle et al., 2020; Zhang et al., 2019). Burnout is broken into three categories: "emotional exhaustion; depersonalization; and reduced personal accomplishment" (Carson et al., 2010; Ntim et al., 2023; Zhang et al., 2019).

This research aims to fill the gaps in understanding the specific dynamics within early childhood education and propose intentional strategies for improving the emotional well-being and retention of caregivers in this field. A combined systematic review and meta-analysis of 26 journal articles pertaining to early childhood education, emotion work, and the effects of each on individuals were synthesized for an extended literature review. The meta-analysis approach of this systematic review allowed for the generation of overarching and common themes.

Emotion Work, Occupational Stress, and Burnout

Emotion work/Emotional labor is the act of inducing or suppressing one's true emotions in hopes of eliciting a positive response from customers or clients (Zhang et al., 2019). Surface acting, or emotional dissonance, is the act of adjusting one's facial responses or expressions and body language, often through suppression or faking, to match desired displays even when one does not feel the emotion they are expressing (Hong et al., 2023; Ntim et al., 2023; Seery & Corrigall, 2009). The process of deep acting is when one makes the intentional effort to change inner emotions to match desired emotions (Lee & Brotheridge, 2011; Zhang

et al., 2019). Display rules are the procedures of an institution relating to associates' appearance and interaction with customers, which ultimately determine the frequency in which workers use surface acting, deep acting, or natural acting (Lee et al., 2016; Lee & Brotheridge, 2011). Emotional enhancement refers to efforts intentionally made by organizational leadership to lift the self-esteem of others or bring them joy (Seery & Corrigall, 2009). Due to the demand for emotional regulation and empathy in childcare positions, there is a heavy desire for emotional labor to be provided in these positions.

Occupational stress leading to burnout is an international issue. One-third to one-half of teachers leave the field within their first five years (Oberle et al., 2020). General turnover rates for the early childcare field ranges from 26-40% per year (Totenhagen et al., 2016). Preschool teachers who are younger and earlier in their careers are at greater risk of emotional burnout (Sharay, 2020). Stress, an early indicator of emotional burnout syndrome, was experienced by more than half of teacher respondents, regardless of years of service (Sharay, 2020). Associates at a low level of emotional exhaustion were 2.5 times less likely to quit than someone experiencing medium levels of exhaustion (Totenhagen et al., 2016). Higher workloads and environments lacking supportive conditions have a high effect on turnover and employee movement (Jovanovic, 2013; Totenhagen et al., 2016). Having too many tasks, like cleaning and paperwork, can pull from quality care given to children (Jovanovic, 2013).

Workers who feel less attachment to their organization are more likely to engage in surface acting rather than deep acting; a misalignment of views as to where importance rests regarding children and their care can cause a worker to engage in faking to match beliefs of their organization (Seery & Corrigall, 2009). Surface acting has been linked to negative emotions and consequences such as intent to quit and burnout, whereas deep acting was associated with positive outcomes such as joy, making one less susceptible to burnout (Lee et al., 2016).

Coping Strategies

Because of this association between high stress and childcare, various coping strategies have been attempted. Coping techniques focused on utilizing avoidance (disengagement coping) significantly reinforced the link between job content and context stress, as well as chronic fatigue (Springer et al., 2023). Among coping strategies, disengagement was found to most strongly compound the relationship of stress to its negative consequences, resulting in elevated job context-related stress (Springer et al., 2023). Emotional enhancement, the creation and uplifting of positive emotions, however, had positive effects on worker emotional wellbeing, including lower emotional exhaustion and lower attrition likelihoods (Seery & Corrigall, 2009).

Vital factors for workplace flow include autonomy, relatedness, stability, goal-sharing, and acceptance of coworker strengths (Jones et al., 2019). Positive workplace flows decreased stress, and cooperative teams felt capable of managing workloads (Jones et al., 2019). Mindfulness training promotes self-awareness and teacher efficacy, which precedes a higher likelihood of drawing on positive coping techniques when stress is present (Cochran & Peters, 2022). Positive relationships, environmental domain, and life purpose consistently predicted psychological well-being in both active teachers and those in training (Lucas-Mangas et al., 2022).

Seventy eight percent of college-educated associates planned to remain in early childcare compared to 40% of those with solely a high school education (Totenhagen et al., 2016). Those with a bachelor's degree or higher see greater teacher-child relationship quality than those with an associate degree, on-job training, or no training (Stein et al., 2024). Only providers who had previously been trained in mental

health felt comfortable addressing the mental health needs of the children in their care and their own mental health concerns (Stein et al., 2024).

Discussion

Previous studies have focused on links between childcare and burnout. However, there is a need for further research to explore how daily levels of required emotion work impact susceptibility to burnout and emotional fatigue. Additionally, few findings focused on the home-life effects for childcare providers or the effects of how providing emotional labor as a profession may lead to an increase or lack of emotional availability to one's friends or family.

Teachers experiencing higher levels of burnout were perceived as less socially and emotionally competent by their students (Oberle et al., 2020). Often characterized by depersonalization and emotional exhaustion, teacher burnout is interrelated with teachers' social-emotional competence, which impacts students' and teachers' day-to-day experiences and ultimately has a direct influence on student-teacher relationships, classroom climate, and students' learning experiences (Oberle et al., 2020).

Future study is needed to understand how early childcare providers feel the effects of emotional labor during shifts that require high levels of emotional work. Additionally, further research should explore if early education providers with young children are less likely to be resistant against burnout than those without young children. Further study should identify remediation tactics and recommendations for individuals and organizations related to the field of early childhood education to decrease attrition, enhance the work-life balance of employees in this field and promote the emotional and educational well-being of children in their care.

A wealth of evidence spotlights the crucial role early education plays in society, emphasizing the need for effective retention strategies that focus on social-emotional learning techniques such as mindfulness from the onset of a teacher's career. Retention rates in the early childcare profession can be improved by emphasizing social-emotional learning early in educators' careers. Caregivers with more mental-health awareness experience lower levels of burnout than those with less mental-health awareness training. Addressing challenges through intentional and thoughtful retention strategies, enhanced training in emotional labor skills, work-life balance, and improved working conditions is essential for the sustainability and full effectiveness of early childhood education.

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Mental Health Challenges Confronting First-Generation Graduate Students: A Review of Literature

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Introduction

The pursuit of higher education, particularly at the graduate level, is a journey marked by both trials and triumphs. For first-generation college students venturing into the realm of graduate studies, this journey often comes with its own unique set of obstacles and opportunities. In this review, we delve into the nuanced experiences of first-generation graduate students, examining the multifaceted landscape of their mental health challenges and the factors that shape their academic trajectories. This literature review thoroughly examines the mental health challenges unique to first-generation graduate students, aiming to highlight the need for tailored interventions and support systems. By critically analyzing these challenges, the review emphasizes how socio-cultural factors impact mental health outcomes in this group. The goal is to advocate for and improve the overall well-being of first-generation graduate students within the academic environment. This review sets the stage for implementing evidence-based strategies to enhance mental health support for these students, promoting inclusivity and support in academia.

Understanding Experiences as a First-Time Graduate Student

Navigating a graduate journey involves mastering diverse disciplines with distinct demands, a challenge heightened for first-generation college students who face unfamiliar academic terrain while striving for excellence. Stallworth and Maurici-Pollock (2023) emphasize the importance of understanding these students within Library and Information Science (LIS), highlighting their unique struggles like limited familial academic guidance and financial constraints, which affect their success and retention in graduate programs. Miner's (2022) research further explores the social spaces of first-generation students, revealing complex academic, social, and professional hurdles. Miner underscores the need for tailored support in academia to nurture the academic and personal growth of first-generation graduate students effectively.

Imposter syndrome, burnout, and high expectations are significant challenges for first-generation graduate students, exacerbated by structural inequities in higher education. Addressing these barriers through systemic interventions and supportive environments is crucial.

Barriers

First-generation graduate students confront significant barriers impacting their academic progress and mental health, including burnout, imposter syndrome, and the pressure to meet high expectations. Morrison et al. (2019) discuss the specific challenges faced by Black and ethnic minority graduate-entry medical students, revealing systemic barriers that affect their academic performance and well-being. Their study emphasizes the need to address structural inequities within higher education institutions. Similarly, Rehfeld et al. (2024) advocate for reducing barriers to success for minority students in graduate education through systemic interventions. Another barrier is imposter syndrome, which is a psychological phenomenon where individuals doubt their abilities and fear of being exposed as frauds despite evidence of their competence (Bravata et al., 2020). Imposter syndrome is prevalent among graduate students, with first-generation students particularly vulnerable to academic and mental stress (Bravata et al., 2020). The combination of academic pressure, financial concerns, and the isolation of navigating an unfamiliar environment can contribute to heightened levels of stress and anxiety. Without adequate support, first-generation students may struggle to cope with the demands of graduate school, leading to negative outcomes like decreased academic performance and increased rates of attrition. Walter and Stouck (2020) discuss the challenges faced by these students in understanding the academic environment and norms of graduate education. Without prior exposure or guidance, first-generation students may find it difficult to navigate academic processes such as choosing courses, securing research opportunities, and networking with faculty. This lack of familiarity can hinder their academic progress and confidence, creating additional barriers to success in graduate school. Providing targeted support and mentorship tailored to the unique needs of first-generation students can help mitigate these challenges and promote their academic success.

Facilitators for Navigating Graduate/ Professional School Environment

Although graduate students encounter challenges, certain factors facilitate their journey. Perseverance, including grit and effective coping strategies, offers hope amidst adversity (Duckworth, 2016). Adaptation to school and student culture is crucial for success in academia (Stallworth & Maurici-Pollock, 2023). Aronson (2019) emphasizes the value of fostering a growth mindset among these students, encouraging them to see challenges as opportunities for personal development. By embracing resilience, adaptability, and a growth mindset, first-generation graduate students can navigate graduate education more effectively, enhancing their academic success and well-being. Resilience, adaptation to academic cultures, and effective coping strategies are key factors that support the success of first-generation graduate students. These qualities enable them to navigate challenges and achieve academic and personal growth in graduate and professional school.

Stress Management Strategies

There are several strategies to help manage stress and improve academic outcomes:

1. Improving Study Habits: Adopting effective study methods tailored to individual preferences and learning styles enhances academic performance. Techniques such as active learning, goal setting, and creating a conducive study environment optimize learning outcomes.
2. Promoting Time Management: Developing organizational skills through self-regulated learning strategies like goal setting and progress monitoring fosters efficient use of time, which is crucial for achieving academic goals.

3. Prioritizing Rest and Breaks: Taking regular breaks and ensuring/obtaining sufficient rest supports cognitive function, reduces stress levels, and enhances overall well-being, which is vital for sustained academic success.
4. Fostering Supportive Environments: Cultivating positive relationships with peers, mentors, and educators provides emotional support and constructive feedback, contributing to personal growth and academic achievement. Access to resources and clear goals further facilitate success in educational endeavors.

Conclusion and Future Research

The literature consistently highlights the detrimental effects of these challenges on the mental health of first-generation graduate students. Issues such as burnout, anxiety, depression, and feelings of inadequacy are prevalent due to the pressures of academic performance and navigating unfamiliar academic and social environments. There is a clear call for targeted interventions and support systems tailored specifically to the needs of first-generation first-year graduate students. Current academic support structures may not adequately address their unique challenges, necessitating the development of programs that promote resilience, provide mentorship, and offer culturally sensitive mental health resources. Creating inclusive academic environments is crucial for supporting the well-being and academic success of first-generation graduate students. Institutions must recognize and address systemic barriers that contribute to disparities in mental health outcomes within this demographic. Future research should focus on evaluating the effectiveness of existing support programs and developing new interventions that address the multifaceted needs of first-generation graduate students. Future studies should account for the unique mental health challenges faced by first-generation graduate students. A survey of first-generation students will be conducted to increase understanding of the barriers students face and how they overcome them. This research will provide additional information to help develop targeted interventions and support systems tailored to the needs of first-generation graduate students.

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Motivated Belief Updating: The Relationship Between Group Identity, Information Evaluation, and Avoidance

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Introduction

Research in behavioral economics and other social sciences shows that our decision-making is heavily influenced by heuristics, biases, and preconceptions. Overconfidence, openness to new information, belief persistence, motivated reasoning, and individual and group identity traits can all play a significant role in how we update our beliefs. These factors and other possible contributors, like external evaluations of personal performance and the nature of incentive structures, have the potential to disrupt ideal rational belief updating. Existing research helps us understand these biases and study them experimentally, allowing us to contribute to public policy and our collective understanding of human behavior. For over three decades, the study of motivated belief updating in economic experiments has grown, incorporating new hypotheses and improved research designs. This review covers heuristics and biases that affect belief updating and decision-making, starting with Camerer and Lovallo's work on overconfidence and including studies by Grossman and Owens, Ortolova and Snowberg, and Möbius et al. This approach helped us identify connected themes and new research areas like polarization and echo chambers, showing how biased beliefs form.

Information Selection, Evaluation, and Avoidance

Belief updating is deeply influenced by how we choose, evaluate, and avoid information, especially when information relates to one's self-image. Ego-relevant feedback affects belief updating, with individuals giving less cognitive weight to negative feedback (Ertac, 2011). People also tend to avoid information that contradicts their beliefs to protect their egos (Golman et al., 2022), and often prefer vague feedback to maintain their self-image (Castagnetti & Schmacker, 2022). Individuals exhibit biases in social learning wherein they switch prematurely from private to social information, at times leading to suboptimal decisions (Duffy et al., 2019). While information selection and avoidance can have a tangible and complex impact on

belief updating, overconfidence can also greatly affect belief and decision-making.

Overconfidence

Overconfidence can lead to excessive market entry based on beliefs and misperceptions of personal skill (Camerer & Lovallo, 1999). At times, overconfidence persists despite contradictory feedback, with poor performance attributed to being "unlucky" when external feedback is relevant to self-image (Grossman & Owens, 2012). Similarly, individuals are found to update their beliefs more accurately when presented with positive feedback compared to negative feedback (Möbius et al., 2022). Higher self-confidence can lead to more assertive, but sometimes less accurate, decision-making (Charness et al., 2018), and overconfidence in political behavior contributes to extremism and reduced receptivity to opposing viewpoints (Ortoleva & Snowberg, 2015).

Belief Persistence

Belief persistence refers to individuals clinging to existing beliefs even when faced with contradicting evidence. People tend to prefer belief-consistent explanations over more robust evidence, reinforcing belief persistence (Oktar & Lombrozo, 2022). In the context of belief persistence with respect to religiosity and life longevity, individuals were found to exhibit sensitivity to new evidence, but with a clear correlation between biased evaluation of evidence and anchoring to prior beliefs (Anglin, 2019). This preference for consistent beliefs can lead to a denial of reality and biased decision-making (Bénabou & Tirole, 2016). Belief reporting can also impact subsequent belief formation, with the process of belief elicitation impacting short-term decision-making (Sonnemans, 2024).

Motivated Reasoning

Motivated reasoning is when people process information in ways that support their existing beliefs. Political biases affect the search for and interpretation of new information; in some cases, this manifests as genuine difference in opinions and in other cases as insincere partisan "cheerleading" (Peterson & Iyengar, 2021). In another form of motivated reasoning, motivated skepticism, people are found to apply different standards of scrutiny depending on their political ideology (Taber & Lodge, 2006). Political information is often interpreted through partisan filters, with the strength of political affiliation impacting the acceptance of factual information and increasing polarization (Bullock et al., 2013; Bullock & Lenz, 2019). When examining gender differences, men had a greater tendency to engage in performance-motivated reasoning (Thaler, 2021).

Polarization and Echo Chambers

Polarization and echo chambers have a detrimental impact on modern discourse. Group identities shape beliefs and reinforce ideological divisions (Bauer et al., 2023), and social learning within partisan networks solidifies beliefs and creates echo chambers (Robbett et al., 2023). Widespread partisan positions on some modern issues may have been arbitrarily formed due to the actions of key first-movers through polarizing social influence and opinion cascades (Macy et al., 2019). Motivated reasoning affects trust in news sources, contributing to belief polarization (Thaler, 2020). Partisan differences in responses to the COVID-19 pandemic, specifically, can be attributed to variations in political messaging (Allcott et al., 2020). In many cases, polarized beliefs and responses can be traced to the relationships between social and group identity factors, motivated reasoning, and partisan differences in messaging.

Conclusion

The literature on heuristics, biases, and preconceptions presents a complex blend of factors that influence belief updating and decision-making. Cognitive biases like overconfidence, belief persistence, and motivated reasoning, exacerbated by the roles of individual identity and social dynamics, have the potential to

foster societal polarization and echo chambers. This research elucidates the need to understand these processes to design effective public interventions that will better promote accurate, unbiased information processing, and provides methodological insights to use as a foundation for our study.

To advance this understanding, we propose an experimental study examining how group identity impacts information evaluation and avoidance in motivated belief updating. Building on established methods within the existing literature, such as using Raven's Progressive Matrices as a measure of IQ and to means to invoke defense mechanisms related to personal intelligence, our study will explore the impacts of public disclosure of beliefs and specific demographic factors, including political affiliation, gender, age, and income. Our between-subjects experimental design will use a three-part questionnaire consisting of politics, IQ, and probability questions to reveal correlations between these identity factors and decision-making processes. By exploring polarization, motivated reasoning, and social pressure alongside demographic factors, our study means to incorporate new insights into the dynamics of rational decision-making and belief updating, contributing to a more comprehensive collective understanding of these processes.

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