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Wichita State University

Illuminating Pathways

30 Years of Excellence

McNair Scholars Program

Illuminating Pathways: 30 Years of Excellence

2024-2025 • Volume 30

WICHITA STATE UNIVERSITY

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From the Director

Welcome to the 30th volume of the Wichita State McNair Scholars Program Journal of Research Reports. This commemorative edition marks a significant milestone—30 years of excellence in undergraduate research, mentorship, and academic achievement. It reflects the enduring legacy of the McNair Scholars Program and the transformative journeys of the students who have walked its path.

This year's theme, "*Illuminating Pathways: 30 Years of Excellence*," celebrates the light our scholars bring to the academic world through their curiosity, resilience, and commitment to discovery. Each research report in this volume is a beacon—shining with insight, rigor, and the promise of future contributions to their fields.

Guided by dedicated faculty mentors, our 14 scholars have engaged in over 200 hours of intensive research, developed comprehensive documents, and presented their findings at our Annual Closing Symposium. This volume features three full manuscripts, nine research summaries, and two extended literature review summaries, each representing a unique perspective and scholarly voice.

We extend our deepest gratitude to the faculty mentors whose expertise and encouragement have shaped the academic and professional trajectories of our scholars. Their mentorship continues to be the foundation of our program's success. We also acknowledge the invaluable contributions of the McNair Scholars Program staff: **Thomas Babcock**, research coordinator; **Rebekah Aeschliman**, writing tutor; **Sara Gallo**, assistant director/success coach; and **Jasmine Sosa**, administrative specialist. Their dedication and support have been instrumental in guiding our scholars through each stage of their research journey.

Our sincere appreciation goes to the university leadership for their continued support. Special thanks to **Dr. Alicia Thompson**, Associate Vice Provost for for PreK–12 Engagement, and **Dr. Monica Lounsbery**, senior executive vice president and provost, for their unwavering commitment to the McNair Scholars Program and its mission.

As you explore this landmark volume, we invite you to reflect on the legacy of excellence it represents and the bright future ahead for our scholars. May their work inspire you as much as it has inspired us.

Ashley Cervantes, EdD
Program Director
Wichita State McNair Scholars Program

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Illuminating Pathways

30 YEARS OF EXCELLENCE

Research Manuscripts

Aggression and Antisocial Traits in a Post-Pandemic World

Kylie Flax and
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Abstract

Aggression is one of the most easily recognizable forms of antisocial behavior. Increased levels of aggression have consistently been correlated with anger and hostility, and recent studies have found a correlation between maladaptive cognitive emotion regulation strategies and increased aggression. Emerging research indicates that overuse of social media and technology is positively linked to ADHD and issues with executive control, emotion processing, and impulsivity, suggesting a potential link between technology overuse and aggression. Surging rates of technology usage have led to findings that high exposure to violence in the media can increase levels of aggression, as can the social isolation that results from socializing primarily through technological methods. During the COVID-19 pandemic, global rates of violent crime increased, likely due to the culmination of the above factors and others. As of 2025, criminal violence rates have returned to pre-pandemic rates, but little research has been done on subclinical, non-criminal levels of aggression since the end of the pandemic. This study uses a cross-sectional design to measure subclinical levels of antisocial traits associated with aggression in the college student population, comparing pre-pandemic rates to current rates.

Aggression and its Correlates

Antisocial behaviors, broadly described as problematic behaviors that violate social norms, have a wide array of impacts. These behaviors range from mild disobedience and lack of cooperation to commission of crimes and substance abuse (Piotrowska et al., 2019, as cited in Vaughan et al., 2022). Individuals exhibiting the behavior may be marginalized and subject to social or legal sanctions; their families and communities may struggle with anxiety and decreased wellbeing; and the justice system, victims, and families of perpetrators shoulder a significant financial burden (Vaughan et al., 2022). Aggression is one of the most easily recognizable forms of antisocial behavior. The most typical classification for types of aggression are hostile and instrumental, which differ primarily in their motives. Hostile aggression is characterized by the motive of causing harm, while instrumental aggression is motivated by some objective other than harm. They each have unique psychological correlations. Hostile aggression is associated with hostile attribution biases, internalizing problems, and intention-cue detection deficits in interpretation (Dodge & Coie, 1987, as cited in Ramírez & Andreu, 2006), while instrumental aggression is related to a positive evaluation of aggression with social gain and dominance, such as in leadership and socialization (Ramírez & Andreu, 2006). Aggression can also be categorized into physical or overt aggression, verbal aggression, and relational aggression (Kyranides et al., 2024).

Kyranides et al. (2024) found a correlation between increased levels of aggression and maladaptive cognitive emotional regulation strategies, such as blaming others, self-blame, and rumination. Furthermore, anger, hostility, and impulsivity have consistently been correlated with increased aggression (Kyranides et al., 2024; Ramírez & Andreu, 2006). Loneliness and a lack of social competence have also been connected to aggression (Al-Sejari & Al-Ma'seb, 2022; Chabbouh et al., 2023).

The Dark Triad

The Dark Triad (DT) is a set of three antisocial traits, often connected to aggression and its mediators (Paulhus & Williams, 2002). These traits are Machiavellianism, narcissism, and psychopathy. Machiavellianism is associated with an amoral and calculating personality, narcissism is connected to an excess of self-love and dominancy, and psychopathy is characterized by callousness and superficial charm (Gómez-Leal et al., 2023; Paulhus & Williams, 2002). These traits have been linked to maladaptive cognitive emotional regulation strategies and negatively associated with adaptive strategies (Gómez-Leal et al., 2023; Akram & Stevenson, 2021; Kyranides & Neofytou, 2021; Mojsa-Kaja et al., 2021), as well as relational aggression and hostile attribution bias (Jiang et al., 2024). Furthermore, Machiavellianism and psychopathy are predictors of anxiety sensitivity and intolerance of uncertainty (Sabouri et al., 2016, as cited in Mojsa-Kaja et al., 2021). Recent studies have added everyday sadism to the dark triad, creating the Dark Tetrad (Paulhus, 2016). Everyday sadists enjoy hurting others, often seeking out opportunities to hurt others verbally or physically (Paulhus & Dutton, 2016, as cited in Paulhus, 2016).

Technology

Emerging research indicates that the total time spent on devices is proportionately associated with lower cognitive abilities (Barr et al., 2015, as cited in Boulos, 2024), which previous research has linked to hostile aggression (Vitiello et al., 1990, as cited in Ramírez & Andreu, 2006). Total time on devices is also associated with decreased gray matter volumes in brain regions involved in executive control, emotion processing, language processing, and reward processing (Pezoa-Jares et al., 2012, as cited in Boulos, 2024). The rewarding structure of the internet environment also encourages reward-seeking behaviors, increasing impulsivity (Raiha et al., 2020, as cited in Boulos, 2024). Frequent use or overuse of social media is associated with socio-emotional dysregulation (Hormes et al., 2014, as cited in Boulos, 2024; Uhls et al., 2014, as cited in Boulos, 2024), decreased cognitive control, and reduced gray matter density in brain regions related to attention (Loh & Kanai, 2016, as cited in Boulos, 2024). These findings suggest a potential link between technology overuse and aggression.

Surging rates of technology usage have led to findings that high exposure to violence in the media can increase levels of aggression (Al-Sejari & Al-Ma'seb, 2022; Chabbouh et al., 2023). Psychological distress can be facilitated through a multitude of avenues,

including personal experiences, portrayals of violence in the media, and national or global crises. It is associated with verbal aggression, hostility, and anger, and has been found to act as a partial mediating factor between media violence and aggression (Chabbouh et al., 2023). Some studies have connected exposure to real-world violence with increases in aggression (Al-Sejari & Al-Ma'seb, 2022; Chabbouh et al., 2023). Other studies have found that playing violent video games has a long-term effect on aggression (Gentile et al., 2014; Krahé et al., 2012; Willoughby et al., 2012). Gentile et al. (2014) found that the relationship between violent game play and aggressive behaviors was fully mediated by aggressive cognitions, which are increased by violent game play.

Social isolation resulting from socializing primarily through technological methods may also contribute to aggression, as it may cause individuals to develop dysfunctional mental symptoms (Al-Sejari & Al-Ma'seb, 2022; Chabbouh et al., 2023). This may interfere with one's ability to accurately interpret social cues, resulting in increased aggressive behavior.

The COVID-19 Pandemic

During the COVID-19 pandemic, global rates of violent crime increased (Al-Sejari & Al-Ma'seb, 2022). In the United States, from 2019 to 2020, homicide increased by 26%, aggravated assault increased by 14%, and gun assault increased by 38% (Lopez & Boxerman, 2025). During the lockdown in Kuwait, researchers found that young, isolated individuals with low levels of education were more aggressive than other populations (Al-Sejari & Al-Ma'seb, 2022). A large portion of the global population experienced loneliness and isolation during the lockdown, resulting in an increase in social media usage to obtain information, entertainment, and socialization (Karhu et al., 2021). Given the potential impacts of solitude and primarily digital socializing, this may increase antisocial behavior from these individuals. A preliminary study in the U.S. found that individuals with violent ideation and disruptive behavior had an increased incidence of COVID-19; importantly, it is unlikely that COVID-19 directly caused these behaviors, but external factors caused by the pandemic (such as quarantine, loss of employment, and financial insecurity) may have contributed (Bari et al., 2022).

Celik et al. (2021) found a connection between socioeconomic stressors, an individual's level of post-traumatic stress symptoms, and aggression. This study also found that intolerance of uncertainty acted as a mediator for rumination, which increased post-traumatic stress symptoms. These factors had a significant positive impact on aggression. Furthermore, indicators of psychological distress and antisocial behavior increased in justice-involved youth pre- and post-COVID (Reid et al., 2022), suggesting that the strain of the pandemic decreased the youths' abilities to control their antisocial behavior. A study from Mojsa-Kaja et al. (2021) indicated that dark triad traits may predispose individuals to utilizing maladaptive cognitive emotion regulation strategies, emphasizing the likelihood of individuals resorting to these strategies during the uncertainty of the pandemic.

The Current Study

As of 2025, criminal violence rates have mostly returned to pre-pandemic rates (Lopez & Boxerman, 2025), but little research has been done on subclinical, non-criminal levels of aggression since the end of the pandemic. Given the multitude of negative effects that may occur from isolation, exposure to media violence, excessive technology use, and psychological distress, there is a possibility that antisocial tendencies and non-criminal aggression have increased. Of particular interest is the possibility that these are increased in the traditional undergraduate college student population, who would have been in high school during the lockdown. The long-term impacts of this isolation and rampant technology usage on developing adolescent brains are unknown.

The current study sought to identify whether there was a difference between the dark triad traits in college students before and after the pandemic, as well as analyze the levels of aggression in the current student population. We proposed the following hypotheses:

H1. Dark triad traits will be elevated in current college students compared to those before the pandemic.
H2. There will be a negative relationship between age and aggression.
H3. There will be a positive relationship between video game addiction, smartphone addiction, social media addiction, aggression, and dark tetrad traits.

Methods

Participants

Participants in this study were recruited through the SONA Experiment Management System, an online platform used to manage research in social sciences. These participants were undergraduate students at Wichita State University (WSU), and they were compensated with course credit or extra credit upon completion. There were 149 total participants, including 43 males and 106 females. Participants self-identified their race: 76 were White; 23 bi-racial; 20 Latine; 13 Black; 16 Asian, Asian American, or Pacific Islander; 1 Arab. Ages ranged from 18 to 50 years old (M = 21.34, SD = 5.41). Each participant completed the survey only once.

For the pre-COVID data, Short Dark Triad (SD3) scores from 2016 were utilized. These participants were recruited and compensated in the same manner as the current sample. There were 300 pre-COVID SD3 participants. Of whom, 96 were male and 204 female. Their ages ranged from 18 to 56 years old (M = 21.64, SD = 5.25).

Materials

Participants completed a demographics form, the SD3, the Revised Assessment of Sadistic Personality (ASP-8), the Short-Form Buss-Perry Aggression Questionnaire (BPAQ-SF), the Bergen Social Media Addiction Scale (BSMAS), the Video Game Addiction Test (VAT), and the Smartphone Addiction Scale Short Version (SAS-SV). Along with standard demographic information, we collected information surrounding our participants' experiences with COVID-19 and their preferred hobbies.

The SD3 (Jones & Paulhus, 2014) is a brief assessment that measures the Dark Triad of personality traits. The ASP-8 (Plouffe et al., 2017) is a scale to measure everyday sadism, designed to complement SD3. The BPAQ-SF (Bryant & Smith, 2001) measures aggression as a composite score from scales measuring physical aggression, verbal aggression, anger, and hostility. The BSMAS (Andreassen et al., 2016) measures social media addiction using the distinct common components of addiction (Griffiths, 2005). The SAS-SV (Kwon et al., 2013) measures smartphone addiction in a similar manner. The VAT (Van Rooij et al., 2012) measures video game addiction across the five factors of loss of control over gaming:, intra- and interpersonal conflict, preoccupation with gaming, using games for purposes of coping or mood modification, and withdrawal symptoms if the gamer is forced to quit.

The SD3 scores from the current participant pool were compared with SD3 scores from the 2016 participant pool to test H1. H2 was tested using age demographics data and BPAQ-SF scores. H3 was tested using the SD3, ASP-8, BPAQ-SF, BSMAS, VAT, and SAS-SV.

Analyses

SD3 scores between pre-COVID and post-COVID groups were evaluated using a one-way ANOVA. This analysis was followed by a series of regressions controlling for the effects of sex, age, and race on scores for Psychopathy, Machiavellianism, and Narcissism. Pearson correlation coefficients were calculated to examine relationships between dark tetrad traits, aggression, video game addiction, smartphone addiction, and social media addiction.

Results

The results of the one-way ANOVA revealed a statistically significant difference between the Psychopathy ($F(1, 445) = 11.59$, $p < .001$), Machiavellianism ($F(1, 445) = 7.06$, $p = .01$), and Narcissism ($F(1, 445) = 35.08$, $p < .001$) scores of the pre-COVID and post-COVID groups. See Table 1 for a comparison of the scores between groups. A series of linear regressions found that group membership had a significant impact on scores for psychopathy (see Table 2) ($F(4, 444) = 13.02$, $p < .001$, $R2 = 0.11$), Machiavellianism (see Table 3) ($F(4, 444) = 8.88$, $p < .001$, $R2 = 0.7$), and narcissism (see Table 4) ($F(4, 444) = 12.09$, $p < .001$, $R2 = 0.1$), even when controlling for the effects of sex, race, and age.

Table 1: Descriptive Statistics for Dark Triad Scores

Personality Trait	Mean		Std. Deviation	
	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID
Psychopathy	1.99	1.79	.61	.57
Narcissism	2.84	2.49	.56	.66
Machiavellianism	2.94	2.76	.61	.82

Table 2: Regression for Psychopathy Scores

Variable	Beta	*SE*	95% CI		β	*p*
			LL	*UL*		
Sex	-.318	.058	-.432	-.204	-.246	<.001
Age	-.003	.005	-.013	.007	-.026	.569
Race	.162	.055	.053	.27	.133	.004
Pre or post COVID	-.212	.058	-.325	-.099	-.167	<.001

Note. *SE* = Standard Error, CI = Confidence interval, *LL* = Lower Limit, *UL* = Upper Limit

Table 3: Regression for Machiavellianism Scores

Variable	Beta	*SE*	95% CI		β	*p*
			LL	*UL*		
Sex	-.279	.068	-.413	-.146	-.188	<.001
Age	-.010	.006	-.022	.002	-.078	.089
Race	.178	.065	.051	.305	.127	.006
Pre or post COVID	-.199	.067	-.331	-.067	-.136	.003

Note. *SE* = Standard Error, CI = Confidence interval, *LL* = Lower Limit, *UL* = Upper Limit

Table 4: Regression for Narcissism Scores

Variable	Beta	*SE*	95% CI		β	*p*
			LL	*UL*		
Sex	-.129	.060	-.248	-.010	-.096	.033
Age	-.012	.005	-.022	-.002	-.102	.025
Race	.094	.057	-.018	.207	.075	.101
Pre or post COVID	-.367	.060	-.484	-.249	-.279	<.001

Note. *SE* = Standard Error, CI = Confidence interval, *LL* = Lower Limit, *UL* = Upper Limit

A Pearson correlation coefficient was calculated to evaluate relationships between several factors (See Table 5). A statistically significant weak positive relationship was found between aggression and video game addiction (r (146) = .264, p = .001), social media addiction (r (146) = .171, p = .038), and smartphone addiction (r (146) = .170, p = .039). A similar relationship was found between everyday sadism and video game addiction (r (146) = .184, p = .025), social media addiction (r (146) = .206, p = .012), and smartphone addiction (r (146) = .261, p = .001).

Machiavellianism was weakly correlated with video game addiction (r (145) = .209, p = .011) and social media addiction (r (145) = .261, p = .001), but moderately correlated with smartphone addiction (r (145) = .422, p < .001). Narcissism was weakly correlated with social media addiction (r (145) = .197, p = .017) and smartphone addiction (r (145) = .246, p = .003). Psychopathy was weakly correlated with social media addiction (r (145) = .279, p < .001), but moderately correlated with smartphone addiction (r (145) = .329, p < .001). There was no significant relationship found between age and any variable of interest.

Table 5: Pearson Correlation Coefficiants Between Variables of Interest

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Psychopathy	147	1.79	.569	-								
2. Narcissism	147	2.49	.675	.377**	-							
3. Machiavellianism	147	2.76	.817	.438**	.260**	-						
4. Everyday Sadism	148	1.51	.565	.623**	.307**	.344**	-					
5. Aggression	148	2.60	.651	.425**	.155	.437**	.316**	-				
6. Social media addiction	149	2.91	.850	.279**	.197*	.262**	.206*	.171*	-			
7. Video game addiction	149	1.54	.536	.122	-.021	.209*	.184*	.264**	.134	-		
8. Smartphone addiction	148	2.76	.933	.329**	.246**	.422**	.261**	.170*	.626**	.249**	-	
9. Age	148	21.34	5.41	-.032	-.041	-.105	-.074	.063	-.125	-.069	-.142	-

* $p < .05$, ** $p < .01$

Discussion

The intention of this study was to analyze antisocial traits in an undergraduate student population post-pandemic. The analyses showed a significant difference between Dark Triad scores of students pre- and post-pandemic, with post-pandemic students scoring statistically significantly lower. The difference in scores between groups was robust even after conducting a regression controlling for the potential effects of sex (Semenyna et al., 2024), age (Kawamoto et al., 2020), and race (Trzesniewski et al., 2008; Twenge & Foster, 2008). However, due to the direction of this difference, these data fail to reject the null hypothesis for H1, which posited that dark triad traits would be elevated in current college students compared to those before the pandemic. The correlational analyses showed a significant positive relationship between many variables of interest, but none were found with age. Thus, the data failed to reject the null hypothesis for H2, which was that there would be a negative relationship between age and aggression. Aggression, everyday sadism, and Machiavellianism were positively correlated with video game addiction, social media addiction, and smartphone addiction. Although these data do not provide enough evidence to reject the null hypothesis for the hypothesis that there would be a positive relationship between video game addiction, smartphone addiction, social media addiction, aggression, and dark tetrad traits (H3), several notable relationships were found. Psychopathy and narcissism were positively correlated with social media addiction and smartphone addiction, and significant positive correlations were observed among all dark tetrad traits and aggression, except for aggression and narcissism.

The results of the analyses for H1 were particularly interesting, as they contradicted the original hypothesis. A potential explanation for this result may be found in the Flynn Effect, which refers to the consistent increase in IQ test scores across generations. Several hypotheses have been proposed to explain these massive gains in human intelligence and abstract thinking, including better education, pre- and post-natal nutrition, and urbanization (Flynn, 1998; Trahan et al., 2014). Though much of the previous research has not found a significant link between intelligence and dark triad traits (Lopez et al., 2023; Michels, 2021), many have found a positive relationship between cognitive ability and prosocial behavior (Guo et al., 2019; Lopez et al., 2023). The connection between IQ and dark triad traits is not straightforward, but the layers of their relationship may explain the differences in dark triad scores.

Higher levels of dark triad traits are significantly correlated with low levels of prosocial behavior, while cognitive ability is positively related to empathy-related responses, prosocial behavior, and prosocial value orientation. Thus, though low IQ is not directly related to antisocial behavior and traits, it may be indirectly related. Based on the Flynn Effect, it is possible the participants in this survey have slightly higher cognitive ability than those in the pre-COVID sample, resulting in lower levels of antisocial traits due to a more prosocial value orientation. Along with this, other studies have noted that during the pandemic, people displayed more prosociality in the form of altruistic behaviors (Luo et al., 2021), though these behaviors decreased as the pandemic subsided. The post-pandemic group would have an average age of 16 years old at the height of the pandemic in 2020, the age at which adolescents are developing their personal identity and values according to Erikson's theory of psychosocial development. If these adolescents were surrounded by encouragement to engage in prosocial and altruistic behavior, they may have adopted such behavior as part of their social values. This, combined with increasing intelligence and education in a prosocial environment such as a university, may explain the decline in antisocial personality traits.

The correlations observed between the variables of interest generally aligned with the results of previous studies. However, a key discrepancy emerged: the lack of significant relationships between narcissism and psychopathy with video game addiction. This contrasts with earlier research (Kim et al, 2008, as cited in Kircaburun et al., 2018; Kircaburun et al., 2018). A potential explanation is that the previous studies focused on gaming and thus had a participant pool comprised almost exclusively of gamers. This study considered video game addiction as a factor tangentially, potentially leading to generally low scores on the video game addiction scale among participants, as few reported spending substantial time gaming.

Limitations and Future Directions

The population of this study consisted solely of undergraduate students at Wichita State University, limiting the generalizability of these results to other populations, especially those outside of a university setting. Participants were predominantly White and female, which further limits the ability to generalize these findings. The questionnaires were self-administered online via the participant's personal device, which may have encouraged participants to rush through or be distracted while completing the questionnaires, decreasing the accuracy of the data. Time spent on completion varied widely, ranging from 4.76 minutes to 148.72 hours. Excluding 12 outliers, the average completion time was 16.61 minutes (SD = 6.57). It was expected for completion to take approximately 30 minutes.

Future studies would benefit from examining populations outside of the university setting. Education and prosocial institutions are proposed explanations for decreased violence; therefore, studies analyzing a population with minimal education and little access to structured institutions may have significantly different results. Ensuring the participant pool is representative sample of the population in terms of race and sex may also impact results. Researchers may also benefit from using scales that measure variables in various forms. For example, the BPAQ-SF is a well-validated tool for measuring aggression, but it does not measure relational aggression, a form more commonly exhibited in females and those with higher levels of narcissism.

References

Akram, U., & Stevenson, J. C. (2021). Self-disgust and the dark triad traits: The role of expressive suppression. *Personality and Individual Differences*, *168*, 110296.

Al-Sejari, M. M., & Al-Ma'seb, H. B. (2022). Aggression and violence during the lockdown caused by the COVID-19 pandemic in Kuwait. *Journal of Affective Disorders Reports, 10*, 100408.

Bari, S., Vike, N. L., Stetsiv, K., Woodward, S., Lalvani, S., Stefanopoulos, L., Kim, B. W., Maglaveras, N., Breiter, H. C., & Katsaggelos, A. K. (2022). The prevalence of psychotic symptoms, violent ideation, and disruptive behavior in a population with SARS-CoV-2 infection: Preliminary study. *JMIR Formative Research, 6*(8), e36444.

Boulos, L.-J. (2024). The brain digitalization: It's all happening so fast! *Frontiers in Human Dynamics*, *6*, 1475438.

Bryant, F. B., & Smith, B. D. (2001). Refining the architecture of aggression: A measurement model for the Buss–Perry Aggression Questionnaire. *Journal of Research in Personality*, *35*(2), 138–167.

Celik, D., Alpay, E. H., Celebi, B., & Turkeli, A. (2021). Intolerance of uncertainty, rumination, post-traumatic stress symptoms and aggression during COVID-19: A serial mediation model. *European Journal of Psychotraumatology, 12*(1).

Chabbouh, A., Hallit, S., Farah, N., Youssef, C., Hankache, A., Fekih-Romdhane, F., Bitar, Z., & Obeid, S. (2023). Examining correlates of aggression and mediating effect of psychological distress between exposure to media violence and aggression in Lebanese adults. *BMC Psychology*, *11*(1), 191.

Flynn, J. R. (1998). IQ gains over time: Toward finding the causes. In U. Neisser (Ed.), *The rising curve: Long-term gains in IQ and related measures* (pp. 25–66). American Psychological Association.

Gentile, D. A., Li, D., Khoo, A., Prot, S., & Anderson, C. A. (2014). Mediators and moderators of long-term effects of violent video games on aggressive behavior: Practice, thinking, and action. *JAMA Pediatrics*, *168*(5), 450–457.

Gómez-Leal, R., Gutiérrez-Cobo, M. J., Megías-Robles, A., & Fernández-Berrocal, P. (2023). The dark triad and subjective well-being: The mediating role of cognitive-emotional regulation strategies. *Scandinavian Journal of Psychology*, *64*(3), 368–375.

Griffiths, M. (2005). A 'components' model of addiction within a biopsychosocial framework. *Journal of Substance Use*, *10*(4), 191–197.

Guo, Q., Sun, P., Cai, M., Zhang, X., & Song, K. (2019). Why are smarter individuals more prosocial? A study on the mediating roles of empathy and moral identity. *Intelligence*, *75*, 1–8.

Jiang, Y., Tong, L., Cao, W., & Wang, H. (2024). Dark triad and relational aggression: The mediating role of relative deprivation and hostile attribution bias. *Frontiers in Psychology*, *15*.

Jones, D. N., & Paulhus, D. L. (2014). Introducing the Short Dark Triad (SD3): A brief measure of dark personality traits. *Assessment*, *21*(1), 28–41.

Karhu, M., Suoheimo, M., & Häkkilä, J. (2021). People's perspectives on social media use during COVID-19 pandemic. *20th International Conference on Mobile and Ubiquitous Multimedia*, 123–130.

Kawamoto, T., Shimotsukasa, T., & Oshio, A. (2020). Cross-sectional age differences in the dark triad traits in two Japanese samples. *Psychology and Aging*, *35*(1), 91–96.

Kircaburun, K., Jonason, P. K., & Griffiths, M. D. (2018). The dark tetrad traits and problematic online gaming: The mediating role of online gaming motives and moderating role of game types. *Personality and Individual Differences*, *135*, 298–303.

Krahé, B., Busching, R., & Möller, I. (2012). Media violence use and aggression among German adolescents: Associations and trajectories of change in a three-wave longitudinal study. *Psychology of Popular Media Culture*, *1*(3), 152–166.

Kwon, M., Kim, D.-J., Cho, H., & Yang, S. (2013). The Smartphone Addiction Scale: Development and validation of a short version for adolescents. *PLoS ONE, 8*(12), e83558.

Kyranides, M. N., Mirman, J. H., & Sawrikar, V. (2024). Verbal, physical and relational aggression: Individual differences in emotion and cognitive regulation strategies. *Current Psychology, 43*(19), 17673–17683.

Kyranides, M. N., & Neofytou, L. (2021). Primary and secondary psychopathic traits: The role of attachment and cognitive emotion regulation strategies. *Personality and Individual Differences, 182*, 111106.

Lopez, E., & Boxerman, B. (2025, January 22). *Crime trends in U.S. cities: Year-end 2024 update*. Council on Criminal Justice.

Lopez, J. I., Shimotsukasa, T., & Oshio, A. (2023). I really am more important than you: The relationship between the dark triad, cognitive ability, and social value orientations in a sample of Japanese adults. *Social Sciences & Humanities Open, 8(1)*, 100716.

Luo, Y., Shuster, A., Chung, D., O'Brien, M., Heflin, M., Perl, O., Kulkarni, K., Na, S., Fiore, V., Montague, R., & Gu, X. (2021). *Altruism in a time of crisis: Dissociable social valuation and perception during COVID-19 in the United States*. ResearchSquare.

Michels, M. (2021). General intelligence and the dark triad. *Journal of Individual Differences, 43*, 35–46.

Mojsa-Kaja, J., Szklarczyk, K., González-Yubero, S., & Palomera, R. (2021). Cognitive emotion regulation strategies mediate the relationships between dark triad traits and negative emotional states experienced during the COVID-19 pandemic. *Personality and Individual Differences, 181*, 111018.

Paulhus, D. L. (2016). The dark tetrad of personality. In V. Zeigler-Hill & T. K. Shackelford (Eds.), *Encyclopedia of Personality and Individual Differences* (pp. 1–6). Springer International Publishing.

Paulhus, D. L., & Williams, K. M. (2002). The dark triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality, 36*(6), 556–563.

Plouffe, R. A., Saklofske, D. H., & Smith, M. M. (2017). The Assessment of Sadistic Personality: Preliminary psychometric evidence for a new measure. *Personality and Individual Differences, 104*, 166–171.

Ramírez, J. M., & Andreu, J. M. (2006). Aggression, and some related psychological constructs (anger, hostility, and impulsivity): Some comments from a research project. *Neuroscience & Biobehavioral Reviews, 30*(3), 276–291.

Reid, J. A., Chenneville, T., Gardy, S. M., & Baglivio, M. T. (2022). An exploratory study of COVID-19's impact on psychological distress and antisocial behavior among justice-involved youth. *Crime & Delinquency, 68*(8), 1271–1291.

Semenyna, S. W., Vasey, P. L., & Honey, P. L. (2024). Sex and sexual orientation differences in dark triad traits, sexual excitation/inhibition, and sociosexuality. *Archives of Sexual Behavior*.

Trahan, L. H., Stuebing, K. K., Fletcher, J. M., & Hiscock, M. (2014). The Flynn effect: A meta-analysis. *Psychological Bulletin, 140*(5), 1332–1360.

Trzesniewski, K. H., Donnellan, M. B., & Robins, R. W. (2008). Do today's young people really think they are so extraordinary?: An Examination of secular trends in narcissism and self-enhancement. *Psychological Science, 19*(2), 181–188.

Twenge, J. M., & Foster, J. D. (2008). Mapping the scale of the narcissism epidemic: Increases in narcissism 2002–2007 within ethnic groups. *Journal of Research in Personality, 42*(6), 1619–1622.

Van Rooij, A. J., Schoenmakers, T. M., Van Den Eijnden, R. J. J. M., Vermulst, A. A., & Van De Mheen, D. (2012). Video Game Addiction Test: Validity and psychometric characteristics. *Cyberpsychology, Behavior, and Social Networking, 15*(9), 507–511.

Willoughby, T., Adachi, P. J. C., & Good, M. (2012). A longitudinal study of the association between violent video game play and aggression among adolescents. *Developmental Psychology, 48*(4), 1044–1057.

A Comparative Study of Astrophysical Opacity Codes

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Abstract

Accurate modeling of stellar evolution depends on valid data for opacities across different layers or zones of a star. Disagreement concerning opacity values under certain conditions has persisted for decades, especially at lower temperatures, where the data diverges as atoms and molecules form into solid particles or dust grains. In an effort to continue improving methods of opacity calculations, this research looks at the recent updates to the ÆSOPUS modeling software for Rosseland mean opacities at low temperatures. Comparisons are made between an altered version of the stellar atmosphere code PHOENIX, newer ATLAS Opacity Project tables, and data obtained from the ÆSOPUS 2.1 website. Data plots were created, and discrepancies are discussed as part of an ongoing project. The goal is to input the updated opacities into a stellar evolution code to model the effects on the lifespan of stars.

Introduction

Opacity plays a fundamental role in stellar astrophysics, serving as a critical parameter in the equations governing radiative transfer and energy transport within stars. It determines how efficiently radiation can travel through stellar material, directly influencing the temperature gradient, luminosity, and the overall structure of a star. Accurate opacity values are essential for constructing reliable stellar structure and evolution models, as they affect predictions of stellar lifetimes, pulsation behaviors, and elemental abundances. Stellar models are especially sensitive to opacity in regions where partial ionization of elements or molecular formation occurs, such as the outer envelopes of cool stars or the interiors of massive stars, where minor changes in opacity can lead to significant shifts in model outputs.[1–8] This sensitivity highlights the need for precise opacity calculations to refine our understanding of stellar behavior and evolution.

In astrophysics, opacity quantifies how effectively stellar matter absorbs or scatters photons and plays a crucial role in determining how energy is transported through stars.[1–4] Because stellar radiation spans a wide range of wavelengths and involves numerous interaction processes, mean opacities are used to simplify calculations. The Planck mean opacity is weighted by the blackbody radiation spectrum and is most applicable in optically thin conditions, where emission dominates.[1–3,5,7] In contrast, the Rosseland mean opacity is an inverse or harmonic average weighted by the temperature derivative of the Planck function and is better suited to optically thick regions, such as stellar interiors, where radiative diffusion governs energy transport.[1–3,5–7]

Opacity arises from several distinct processes. Bound-bound transitions involve electrons moving between discrete energy levels within atoms or ions, producing absorption lines. Bound-free transitions occur when a photon ionizes an atom, contributing to continuum opacity. Free-free transitions, or bremsstrahlung, happen when free electrons are accelerated in the field of ions, emitting or absorbing photons. Additionally, electron scattering, especially Thomson scattering, becomes important in hot, ionized plasmas where photons scatter off free electrons without significant energy loss.[2–7] The overall opacity in a star varies strongly with temperature, density, and chemical composition. Temperature affects the ionization state of the material, shifting the dominant opacity sources. Density influences particle interactions and line broadening, while chemical composition, particularly the abundance of heavier elements, can significantly impact opacity.[5–8]

Accurate and reliable opacity calculations are essential in astrophysics, as they directly influence our understanding of energy transport, structure, and evolution in stars and planets. To model these objects realistically, opacity data must be available across a broad range of physical conditions, particularly temperature and density, which span many orders of magnitude in different astrophysical environments—from the hot, dense interiors of stars to the cool, diffuse atmospheres of exoplanets. However, generating such data is highly challenging. Theoretical opacity modeling requires a detailed equation of state (EOS), precise atomic and molecular data, including millions of energy levels and transitions, and additional complications that arise from line broadening mechanisms. These factors must be accurately accounted for to produce reliable opacity tables for simulating stellar interiors and pulsations as well as for modeling planetary nebulae and various atmospheres. As such, improving opacity calculations remains a foundational goal in both stellar and planetary astrophysics.[5–9]

Several opacity calculation programs have been developed to provide the essential data needed for modeling stellar and planetary environments, each tailored to specific temperature regimes and based on different physical assumptions and numerical techniques. Widely used codes include OPAL (from the Livermore group)[10] and the Opacity Project (OP)[11] for high temperatures. Preferred low-temperature codes include PHOENIX,[12] the Accurate Equation of State and Opacity Utility Software (ÆSOPUS),[9] and the ATLAS Opacity Program (ATOP),[7] which is based on the ATLAS code series created by R. L. Kurucz.[13] Researchers have been extending and optimizing opacity codes for decades to cover a wider range of conditions that include cooler environments like stellar envelopes, brown dwarfs, and planetary atmospheres. These codes emphasize molecular opacities, dust

formation, and complex chemistry. Each program, however, differs in atomic and molecular databases, adopted solar abundances, equation of state (EOS) models, and the treatment of line lists and partition functions.[5–13] Prior inter-code comparisons have revealed discrepancies in specific temperature-density regimes, highlighting the sensitivity of opacity calculations to input physics and the need for ongoing refinement and cross-validation.[7–9]

The objective of this study is to compare opacity values generated by ATOP,[7] an altered PHOENIX code,8 and *ÆSOPUS*[9] across a range of temperatures and densities to evaluate the range of validity and consistency of the codes. These comparisons are motivated by recent updates and enhancements, including improvements in molecular line lists, atomic data, and equation of state models. By analyzing differences in opacity outputs across relevant astrophysical regimes—particularly in regions of partial ionization and molecule formation—this work aims to identify systematic discrepancies, understand their underlying causes, and assess the relative performance of each code. The findings are expected to have important implications for improving the accuracy of stellar and planetary models, refining input physics, and guiding future development of opacity tables used in astrophysical simulations.

Methods

Data tables were created using the publicly available *ÆSOPUS* 2.1 input form[9] for calculating low-temperature Rosseland mean opacities. Compiled tables from this website were compared to opacity tables from PHOENIX[8] and ATOP[7] for the corresponding parameters. Comparison parameters were restricted to available data from previously compiled PHOENIX[8] tables, with data presented in decimal exponents (dex) on a logarithmic scale where a dex of 3 is equivalent to 10^3, or 1000. Plotted data is presented for temperatures between $2.7 \leq \log(T) \leq 4.5$ in increments of 0.05 dex and densities between $-8.0 \leq \log(R) \leq +1.0$ in steps of 0.5 dex.

Several solar composition references were considered and compared. The referenced solar mixture[14] for the first set of example plots was chosen based on data provided by the *ÆSOPUS* group in Padova, Italy, courtesy of Diego Bossini, PhD (email communication, March 2025), for opacity tables that include grain species in the EOS. The solar mixture used for the second set of example plots is from Grevesse & Sauval.[15] This choice was made due to limitations in the available data from the modified PHOENIX[8] code.

The chemical composition of the opacity calculations includes three main values: hydrogen (X), helium (Y), and metals (Z), which encompasses all other elements. Comparison plots are presented for example cases X = 0.7, Z = 0.01 and X = 0.9, Z = 0.0, noting that X + Y + Z = 1.

Plots were made using the Interactive Data Language (IDL) Workspace software.[16] Limited data was smoothed using an interpolation technique. For each selected dataset, a plot was created to represent opacity values at the selected log(R) range. A comparative difference plot for each of the chemical compositions listed was also created to show discrepancies between the results.

Results

Grains vs. No Grains

Comparison plots are presented for example cases. Figure 1 shows side-by-side opacity values for calculations without grain species from ATOP[7] and *ÆSOPUS* 2.1 website[9] (*ÆSOPUS* 2.1 NoG) and with grain species from PHOENIX[8] and *ÆSOPUS* 2.1 Grains (Deigo Bossini, PhD, email communication, March 2025). The referenced solar mixture is from Magg et al.[14] with chemical mixture X = 0.7, Y = 0.29, and Z = 0.01, and with temperature range $2.7 \leq \log(T) \leq 4.5$ featuring density values log(R) = 1, −1, −2, −4, −6, and −8. The graphs display good agreement with higher temperatures. Divergence occurs near temperatures $3.5 \leq \log(T) \leq 3.6$ with more prominent differences appearing at higher density values $\log(R) \geq -4$ (Figure 1, panels a-d). Noticeable discrepancies occur on each panel where *ÆSOPUS* 2.1 NoG reports higher opacity values at lower temperatures than *ÆSOPUS* 2.1 Grains.

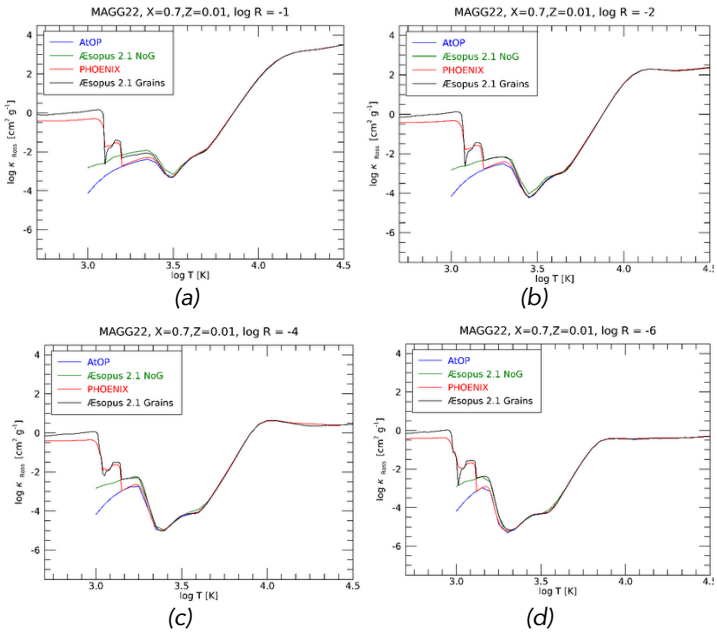
Comparisons With and Without Lithium

Figure 2 shows opacity plots for each code without including grain species. Side-by-side comparisons (Figure 2, panels a, c, and e, and Figure 3, panels a and c) for ATOP[7] and PHOENIX,[8] and *ÆSOPUS* 2.1[14]

with and without initial lithium abundance. Difference plots (Figure 2, panels b, d, and f, and Figure 3, panels b and d) provide visual representation of discrepancies between the codes. The solar mixture is from Grevesse & Sauval[15] with chemical mixture X = 0.9, Y = 0.1, and Z = 0.0 with temperature range $2.7 \leq \log(T) \leq 4.5$ featuring density range log(R) = 1, −1, −2, −4, and −6.

Discrepancies are noticed for the given interval of conditions beginning where temperatures are between $3.5 \leq \log(T) \leq 3.6$ and at higher densities (log(R) = 1) with a gradual shift to be seen at lower temperatures as density decreases. The comparison plots do confirm decent agreement between the codes with differences within the accepted range of variability. The same spike around these conditions can be seen in greater detail in the difference plots (right panels). Comparing densities where $-5 \geq \log(R) \geq 0$, the plots show increased divergence at higher temperatures between $4.0 \leq \log(T) \leq 4.5$. A small difference is shown in Figure 2, panel b, which increases to a significant divergence as density decreases. With only a small initial amount (Li/H = 4.98×10−10), this seemingly insignificant quantity makes a dramatic difference in the code at lower temperatures and densities.

Figure 1: Side-by-side opacities using referenced solar mixture from Magg et al.[14]



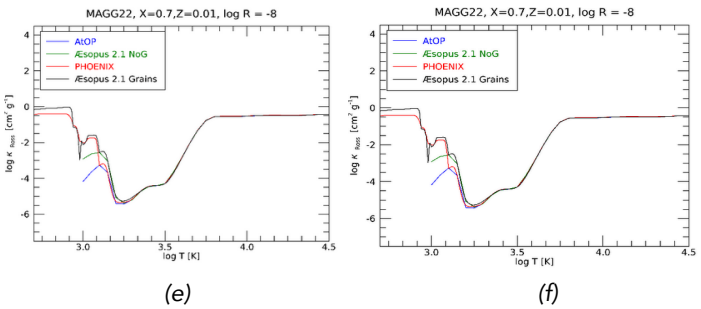


Figure 2: Side-by-side opacities and difference comparisons using referenced solar mixture from Grevesse & Sauval15 for higher density.

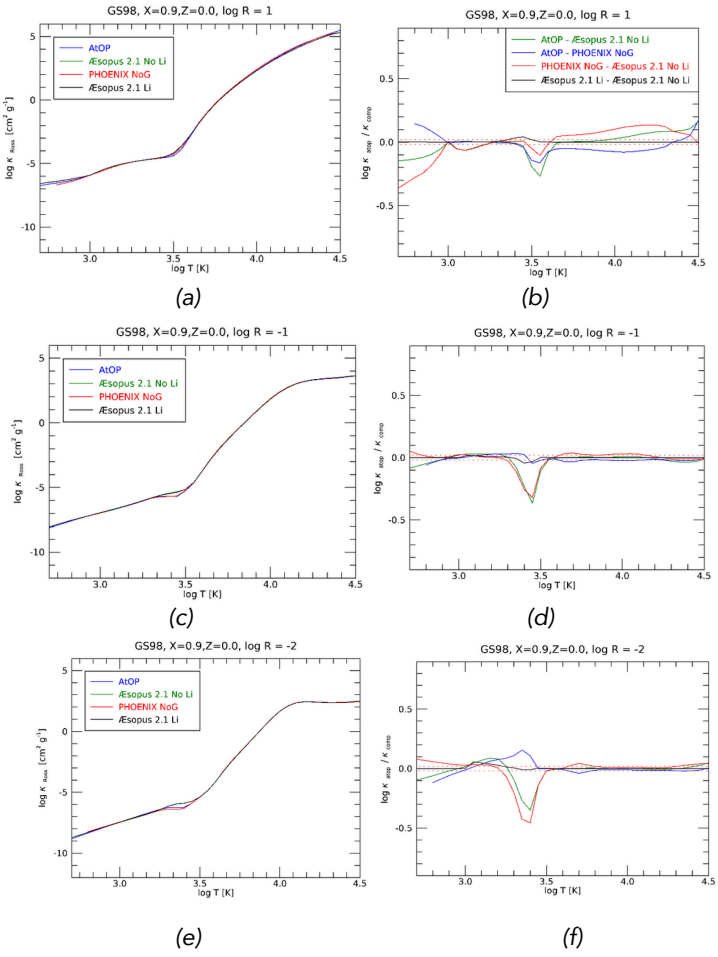
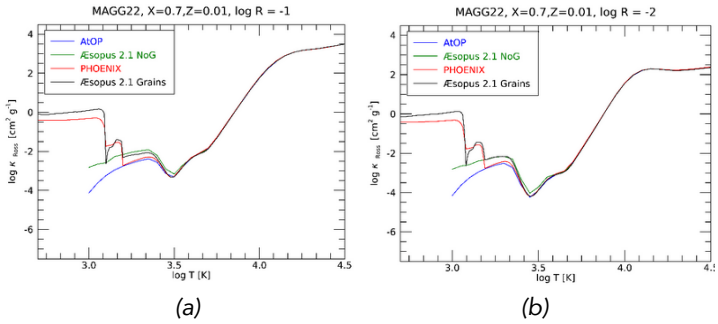
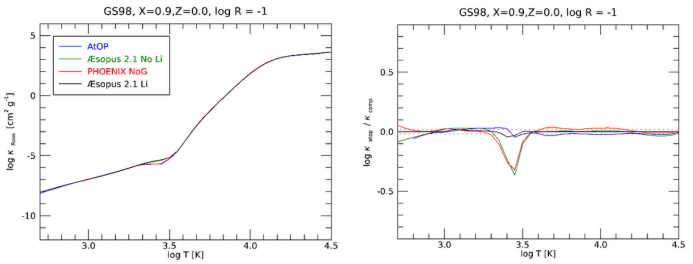


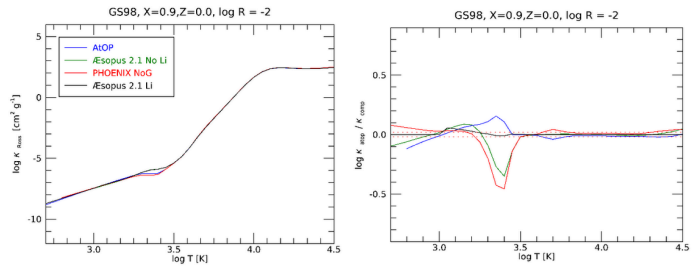
Figure 3: Side-by-side opacities and difference comparisons using referenced solar mixture from Grevesse & Sauval[15] for low density.





(c)

(d)



(e)

(f)

Discussion

Differing opacity values can be caused by many factors. Small differences in values that are higher or lower by a fractional amount are ascribed to differences in input data such as equations of state, line lists, treatment of line profiles, and even initial solar mixtures. Including grain species creates marked changes in final opacity and results, especially at lower temperatures.[8] As shown in the panels of Figure 1, grains become increasingly important at lower temperatures. Around the temperature of log(T) = 3.2 and density of log(R) = -4, the divergence is significant. The web interface is certainly in agreement with well-established codes[7-8] at higher temperatures and densities but breaks down as these parameters decrease. Seemingly insignificant and microscopic particles can occur in great amounts and contribute significantly to the overall opacity. Comparing a minuscule initial value for lithium (Li) abundance can also impact the data in a nontrivial amount under certain conditions — even in a gaseous state, as is evident in the panels of Figures 2 and 3, especially in Figure 3, panels a and c at low density.

The plots in Figure 1 do not align with expectations as they show higher opacity values for a calculation that does not consider grain species than one where grains are included. The examples shown use different solar abundances and chemical mixtures, each affecting the overall opacity. This anomaly, however, is not explained by any variation of expected input values or parameters. The discrepancies shown around temperatures of 3.5 ≤ log(T) ≤ 3.6, which is more apparent in panels a, b, c, and d in Figure 1, could be an artifact in the new code (Deigo Bossini, PhD, email communication, March 2025) that is left over from the previous version.[17] The divergence becomes more pronounced at lower temperatures and densities. Following Figure 2 from panels a, c, and e to Figure 3, panels a and c, the code appears to split at lower and lower temperatures as density decreases. The corresponding difference comparison plots (Figure 2, panels b, d, and f, and Figure 3, panels b and d) highlight this further. Updates are ongoing, and it is possible that this discrepancy will be corrected in the future.

It should also be noted that ÆSOPUS 2.1 switches to a different EOS code (GGchem) for temperatures between 2.6 ≤ log(T) ≤ 3.477, or 400 K to 3000 K, with no mention of which code covers the remaining lower temperatures down to 100 K. This is the regime where grains form and have a significant impact on opacity calculations. It is unclear as to whether the web interface switches to GGchem for computations at lower temperatures.[9]

In modeling the atmospheres and evolution of objects that are described in these regimes, precise values and the inclusion of grain species are vital. A web interface provides an exciting promise of faster answers but greatly reduced accuracy. The online calculator is incredibly useful within certain parameters — notably higher temperatures where solid grains are not likely to form. Quick data can be obtained for a wide variety of values that can be set beforehand by each individual user, providing a convenient and useful tool for researchers and the public.

There are many aspects of this new code that are yet to be explored. Comparisons at extremes of the extended parameters are limited by available data from the altered PHOENIX code[8] and computational capability of ATOP.[7] Going forward, more detailed comparisons should be made between sources and input values for the opacity codes included here.

As technology has improved, an abundance of methods and sources have become more readily available for academic and public use. The altered

PHOENIX code[8] at Wichita State University (WSU) may prove to be nonrecoverable. The ATOP7 code does not include grain species and is based upon an older ATLAS opacity code[18] rather than the most recent version.[19] As investigations continue into the differences in these programs, research should aim to modify an existing code or combine aspects of multiple codes into a more accurate opacity calculator.

Conclusion

One goal of the ÆSOPUS web interface[9] is to decrease calculation time for opacity data tables. Future work should focus on time reduction without removing considerations of grain species necessary for accurate values and subsequent modeling. Small steps can be taken to gradually reduce production time for now. Looking ahead, quantum algorithms or quantum computers should be considered to increase accuracy and reduce calculation time. These quantum tools are not sufficiently developed for this application, so research should focus on small but impactful changes until such technology becomes available. By building on existing tools and refining them with both classical and emerging technologies, further studies can contribute to the development of a faster, more accurate, and more universally applicable opacity calculation code for future astrophysical modeling.

References

1. Chandrasekhar S. *Radiative Transfer*. Dover Publications; 1960.
2. Chandrasekhar S. *An Introduction to the Study of Stellar Structure*. Dover Publications; 1939.
3. Mihalas D. *Stellar Atmospheres*, 2nd ed. W. H. Freeman and Company; 1978.
4. Ryden B, Peterson BM. *Foundations of Astrophysics*. Addison-Wesley; 2010.
5. Alexander DR, Johnson HR. Model Atmospheres for Cool Supergiant Stars. *The Astrophysical Journal*. 1972; 176:629-643.
6. Alexander DR. Low-Temperature Rosseland Opacity Tables. *The Astrophysical Journal Supplement Series*. 1975; 623(29):363-374.
7. Alexander DR, Ferguson JW. Low-Temperature Rosseland Opacities. *The Astrophysical Journal*. 1994; 437:879-891.
8. Ferguson JW, Alexander DR, Allard F, et al. Low-Temperature Opacities. *The Astrophysical Journal*. 2005; 623:585-596.
9. Marigo P, Addari F, Bossini D, et al. ÆSOPUS 2.1: Low-Temperature Opacities Extended to High Pressure. *The Astrophysical Journal*. 2024; 976(1).
10. Iglesias CA, Rogers FJ. *The Astrophysical Journal*. 1996; 464:943-953.
11. Seaton MJ, Yan Y, Mihalas D, Pradhan, AK. Opacities for Stellar Envelopes. *MRNAS*. 1994; 266:805-828.
12. Hauschildt, PH. A fast operator perturbation method for the solution of the special relativistic equation of radiative transfer in spherical symmetry. *JQRST*. 1992; 47(6):433-453.
13. Kurucz, R (1970). Atlas: a Computer Program for Calculating Model Stellar Atmospheres. *Smithsonian Astrophysics Observatory Special Report*. 1970; 309.
14. Magg E, Bergemann M, Serenelli A., et al. Observational constraints on the origin of the elements. Astronomy & Astrophysics. 2022; 661(A140).
15. Grevesse N, Sauval, AJ. Standard Solar Composition. *Space Science Reviews*. 1998; 85:61-174.
16. NV5 Geospatial. (2024). IDL (Version 8.8.2) [Computer software]. NV5 Global, Inc.
17. Marigo P, Woitke P, Tognelli E, Girardi L, Aringer B, & Bressan A. ÆSOPUS 2.0: Low-temperature Opacities with Solid Grains. *The Astrophysical Journal*. 2024; 960(1).
18. Kurucz, R (1993). *ATLAS9 stellar atmosphere programs and 2 km/s grid* (Kurucz CD-ROM No. 13) [CD-ROM]. Smithsonian Astrophysical Observatory.
19. Kurucz, RL (2013). *ATLAS12: Opacity sampling model atmosphere program* [Computer software]. Astrophysics Source Code Library.

Research Manuscript

From Sound to Synapses: Music's Impact on Psychological States & Emotional Intelligence through Mental Imagery

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Abstract

Music has long been recognized as a powerful medium capable of evoking profound psychological and emotional responses. Over the past few decades, research has increasingly focused on understanding how music influences psychological states, emotional intelligence, and the mind's ability to create vivid mental imagery. This review explores three key themes: Music's impact on psychological states, its role in shaping emotional intelligence, and its ability to create scenes in the mind's eye. Using Braun and Clark's Thematic Analysis (2023), there were six themes that emerged from qualitative interviews of six individuals (N=6). By synthesizing findings from seminal works and recent experimental research, this review highlights the interconnectedness of music, emotion, and cognition, while identifying gaps for future research.

Music's Impact on Psychological States

Music's ability to evoke and affect psychological states has been widely documented. According to Juslin and Sloboda (2010), the 1990s marked a significant turning point in public and academic interest in the psychological effects of music, particularly with the popularization of the idea that music can temporarily improve spatial-temporal reasoning called the "Mozart Effect" (p. 81). This has been developed and is now attributed to general arousal while listening to music rather than the specific qualities of Mozart's music (Juslin & Sloboda, 2010). In this period, Goleman developed the Theory of Emotional Intelligence (EI) with the assertion that EI is the ability to recognize, understand, and manage individual emotions (1995). Furthermore, those with high EI have the ability to recognize and influence the emotions of others. These phenomena sparked a wave of research into how music influences cognitive and emotional processes.

Development of the emotivist positions contrasts with the traditional cognitivist position that argues music is merely a passive representation, expressing emotions but not actually causing those emotions in listeners. Cognitivists, for example, might compare music to a painting of a storm—it represents intensity without causing the experience of being in the rain. In contrast, the emotivist position argues that music acts more like a stimulus, causing physical as well as emotional changes, such as faster heartbeat or chills that listeners cannot consciously control (Rickard, 2004). The ramifications of this difference are important; if music has the ability to cause emotions directly instead of simply representing them, then it holds great potential as a mood influencer, concentration enhancer, or coping strategy, thus opening up new possibilities for its role in mental health, therapy, and the daily management of emotions. Margulis's emphasis on music's rhythm, personality, and emotional contour redefines music's nature. It is not a passive backdrop; instead, it is an active, embodied experience. In claiming that music provokes visceral memories, bodily sensations, or unarticulated emotions, Margulis emphasizes music's capacity to circumvent language and rational thought, thus directly accessing the listener's mind and body (2013). For instance, a driving rhythm might unconsciously increase a listener's heart rate, and a mournful melody might induce feelings of sorrow without requiring a specific memory to prompt that reaction.

This view defies reductive accounts of music as purely symbolic or abstract. Instead, it positions music as a powerful tool capable of shaping psychological states in real time, with important implications for fields like therapy, where non-verbal emotional processing is essential, or education, where rhythm and emotional engagement could enhance learning. Moving beyond "mere semantic associations," music becomes a universal medium of emotion—one that has the power to transcend cultural or linguistic divisions and positively affect well-being (Margulis, 2013).

Further insights into music's psychological impact come from neuroscientific research. Auditory processing involves complex neural mechanisms, beginning with the cochlea and extending to the central nervous system (CNS) (Wallin, 1991). When soundwaves enter the ear, the cochlea performs a mechanical frequency analysis, which is then transmitted to the CNS for further processing (Marty & Scherrer, 1969, as cited in Wallin, 1991). When soundwaves reach the inferior colliculus (IC), a midbrain structure, it absorbs auditory information and facilitates auditory attention (Aitkin, 1985, as cited in Wallin, 1991). This neural processing is the beginning of music's ability to influence mood and cognition. Wallin (1991) also highlights music's evolutionary significance, suggesting that it helps individuals retain, restore, and adjust their "vital character" by manipulating emotions under social constraints (p. 329). Thus, music serves not only as a source of pleasure but also as a tool for psychological regulation.

Moreover, research has demonstrated that music-evoked memories are often more vivid and emotionally intense than memories triggered by other stimuli, such as recalling a childhood memory from a scent (Margulis, 2022). As one study noted, "music has the power to transport listeners into highly detailed autobiographical memories and imagined scenarios" (Margulis, 2022, p. 4). These findings align with earlier research suggesting that music can serve as a tool for cognitive and emotional regulation.

Music's Role in Emotional Intelligence

Emotional intelligence, the ability to recognize, understand, and manage emotions, is another area where music demonstrates significant influence. Juslin and Sloboda (2010) emphasize that music's emotional power lies in its ability to evoke intrinsic emotions, which are stored in memory and re-evoked through auditory stimuli. This process aligns with C. F. Wilson's (1975) concept of the "generalized learner," stating that higher mammals, including humans, can mentally re-experience emotions without external triggers (as cited in Wallin, 1991, p. 328). Wallin expands this idea, arguing that music transforms fleeting emotions into durable mental templates, enabling individuals to re-perform and recombine emotional experiences (1991). This capacity for emotional rehearsal and refinement suggests that music may enhance emotional intelligence by providing a safe space for emotional exploration and expression.

Moreover, music's role in emotional intelligence is deeply rooted in its sociocultural context. Musical imagination is socially situated, meaning that musical experiences are inextricably linked to the social and cultural environments in which they occur (Light & Butterworth, 1992, as cited in Hargreaves et al., 2012). This sociocultural perspective underscores the importance of context in shaping emotional responses to music. For example, a piece of music may evoke nostalgia in one individual while eliciting joy in another, depending on their personal and cultural associations. Crowther et al. (2023) reinforce this notion, stating that "music facilitates engagement and emotional connection, particularly in diverse learning environments where students may experience emotional barriers to traditional education" (p. 7). By fostering emotional awareness and empathy, music contributes to the development of emotional intelligence.

Music's Capacity to Evoke Mental Imagery

Music's capacity to evoke vivid mental imagery is a testament to its profound impact on perception and cognition. Sacks (2007) describes how involuntary musical imagery, or "earworms," can suddenly emerge in the mind, often without apparent cause (pp. 34-35). These spontaneous mental images are not merely random; they reflect the brain's ability to store and retrieve complex auditory information. Sacks (2007) distinguishes between imagery triggered by overexposure and imagery arising from deeply ingrained memories, suggesting that the latter involves richer, more mysterious cognitive processes. This phenomenon highlights music's unique ability to bridge the gap between perception and imagination.

Furthermore, musicians often have distinct "hearings" of a piece, which evolve over time as they become more familiar with the music (Bamberger, 1991, as cited in Hargreaves et al., 2012, p. 160). This variability in musical perception underscores the idea that sound-time phenomena are not inherently structured but hold the potential for multiple interpretations. By engaging the listener's imagination, music transforms auditory stimuli into vivid mental scenes, enriching the perceptual experience.

According to a recent study, music-evoked visual imagery can blend the areas of memory and imagination, creating mental scenes that are perceived as real and imagined at once (Margulis & McAuley, 2023). This highlights the cognitive depth of music's interaction with mental imagery. The ability of music to evoke mental imagery is well documented in psychological literature. Music can stimulate vivid imagery and memories, allowing listeners to conjure scenes, emotions, and experiences associated with the music. This phenomenon is supported by the understanding that music is a form of expression of personality and identity, and a way to evoke specific emotions and feelings (Alberhasky & Durkee, 2024). The structured nature of song lyrics, which often follow a narrative arc, enhances this capacity by providing a framework for the listener's imagination to fill in details.

Current Study

Previous research reveals a complex interplay between music, psychological states, emotional intelligence, and mental imagery. Music's ability to evoke emotions and change psychological states is supported by both empirical research and neuroscientific evidence. Its role in enhancing emotional intelligence is rooted in its capacity to transform fleeting emotions into durable mental templates, while its ability to create scenes in the mind's eye highlights its profound impact

on perception and cognition. However, gaps remain in understanding how individual differences, such as cultural background and personal experiences, shape these effects.

While empirical work acknowledges individual variation in musical response—for example, differences in baseline emotional intelligence, musical history, or individual associations—the underlying process contributing to such variation remains an under investigated area. The role of psychological dispositions like individual differences in emotional sensitivity in the use of the emotional information embedded in music is not clearly defined. It involves questions about the extent to which people consciously or unconsciously use music as a means of intensifying, dampening, or altering the intensity of emotional experiences. Similarly, while anecdotal evidence exists for the popularity of music curation as a self-regulation device of music created specifically for emotional management, questions about the benefits of having a formal and intentional music-listening experience over passive use of music exist, particularly regarding emotional resilience and cognitive plasticity.

This study aims to address these gaps by exploring how formal and personalized interaction with music affects psychological state and emotional intelligence. Based on an understanding that musical structure and emotion provoke responses in neural, cognitive, and mnemonic systems, psychometric measurement, physiological analysis (i.e. documenting subconscious physical responses), and self-reporting methods will be used to identify how listeners' pre-existing psychological profiles and emotional intelligence influence their responses. By focusing on interaction between universally stimulating aspects of music and individual variables relevant to each listener, such as autobiographical relevance and baseline levels of empathy, this study aims to clarify mechanisms by which music can be composed to foster emotional development and support the induction of mental imagery.

Methodology

The study employed a qualitative experimental design to investigate how deliberate engagement with music across diverse emotional and temporal categories influences emotion recognition, mental imagery, and psychological states. Structured interviews and thematic analysis were used to explore participants' subjective experiences.

A purposive sample of 6 participants aged 19–21 years (M = 20.33; SD = 0.75) was recruited via volunteer sampling from Wichita State University. Inclusion criteria required normal hearing ability (self-reported) and no diagnosed auditory impairments. This age range was selected to capture neuroplasticity effects associated with prefrontal cortex development (Arain et al., 2013).

A pool of 20 songs was created and sorted into five broad emotional categories based on dominant affective themes (refer to Table 1). Each category included four songs (two instrumental, two lyrical) spanning from classical to contemporary eras. Songs were selected through peer debriefing to create five numerically balanced, separate, broad categories: Vitality, Longing, Tension, Connective, and Wonder.

Emotional Intelligence (EI) Assessment: The American College of Healthcare Administrators (ACHCA) Emotional Quotient Self-Assessment (30-item, 5-point, Likert scale) provided baseline EI scores (Druthers Agency Inc., 2018).

Audio Equipment: Noise-canceling headphones (Edifier W820NB Plus Noise Cancelling Headphones) and blindfolds were used to minimize sensory distractions.

Interview Protocol: A structured interview script included two questions repeated per song:

1. "If this song were in a movie montage, what would be happening during the montage while it played?"
2. "Can you repeat your answer, adding any missed or new details?"

Procedure

First, participants provided written informed consent along with a verbal briefing on the study's purpose and procedures. Following granted consent, the ACHCA Emotional Quotient Self-Assessment was administered to establish an individual baseline EI for understanding participant responses. Once finished,

participants wore noise-canceling headphones, were blindfolded in a sound-controlled laboratory, and were tested for any outside influences that could still be heard or seen.

Following a successful test of sensory deprivation, participants experienced four songs. Each participant experienced one from four out of the five emotional categories through a randomized drawing of labels. Each individual participant's four songs did not contain repeated categories or more than two types of the same lyrical or instrumental structure. Each set of songs were played in a randomized order. After each song, participants were asked to remove the headphones but not the blind fold. Each participant verbally answered the two structured interview questions, and their responses were recorded.

Following the end of the experiment, participants were asked for clarification of physical responses to ensure accurate reporting. Participants were then given an opportunity to be verbally debriefed after being provided with debriefing documentation. Once the participant left, audio recordings were anonymized (e.g., labeled "S01," "S10," etc.), and the ACHCA EQ Assessment was scored.

Once all data was collected, thematic analysis followed the six-phase framework outlined by Braun and Clarke (2022): familiarization, coding, theme development, review, definition, and reporting. Transcripts were reviewed iteratively to identify initial patterns. Inductive codes (e.g., "kinetic imagery," "nostalgic reflection") were then assigned to interview excerpts. Following, codes were grouped into themes (e.g., "Awe as a Catalyst for Empathy"). Once themes were found, they were then refined for internal consistency and relevance to research questions. Final themes were named and contextualized with exemplar quotes. Results of the analysis were synthesized to address the research question and hypotheses.

To ensure validity of analysis and results, a triangulation of EI scores, song categories, and interview data was cross-referenced. Once all analysis was finished, a peer debriefing with two independent researchers audited coding decisions for analysis validity.

Results

A total of six participants from diverse ethnic backgrounds (three White, one Latino, one African, one Asian) and varying Emotional Quotients (EQ) (Range= 3.6-4.46; M= 3.92, SD= 0.31) (refer to Table 2) engaged with music across five song classification emotional categories (Vitality, Longing, Tension, Connective, Wonder). By using thematic analysis, several themes emerged as universal or highly recurrent across all participants. These themes reflect shared psychological, cultural, and emotional patterns in how music influences cognition, emotion, and identity.

Participants unilaterally provided evidence of emotional transformation and resilience showing that music serves as a catalyst to process adversity, grief, and existential uncertainty, reframing struggles into narratives of growth. Subject 1 described maternal loss in *Flying* (VL1) as a journey from sorrow to empowerment, noting, "The Bridge [sad] the daughter succumbs to the pain… [then] the big orchestral moment is the daughter knowing her mom's presence is still with her."

Physical responses mirrored this arc, with deep breaths at 1:06 during melancholic passages and full-body relaxation at 2:50 during climactic swells. Subject 4 reinterpreted dissonant chords in *World O World* (WL1) as a shift from "Catholic funeral imagery" to collective joy, synchronizing their breath with vocal crescendos noted in the physical response that their breath synced to pulse at 0:22. Subject 6 redefined disillusionment in *Flying* (VL1) as self-creation, stating, "Learning to create their own magic after reality cracks," paired with stomach-based breathing at 2:52 during introspective moments.

Juxtapositions providing a theme of duality and contrast of emotions, time, and reality emerged as central to musical interpretation. Subject 2 contrasted nostalgic "Kansas sunsets" with present anxiety in *Voyager* (WI1), describing "movement relieved by the middle… but unresolved grief lingers." Physiological markers included slowed breathing at 0:45 and pulsed head nods at 1:30. Subject 4 blended mourning and ecstasy in *World O World* (WL1), noting "dissonant chords resolving into joy" while neck stretching at

6:02 during climax. Subject 6 juxtaposed a "perfect day" with "cracks in reality" in *Flying* (VL1), with subtle smiling at 2:20 fading into curious head tilts at 2:15, as tension escalated.

Ethnic identity and personal history shaped musical meaning-making, showing the importance of cultural and autobiographical influence. Subject 3 linked *The Mountain Song* (CL2) to Nigerian oral tradition, recounting, "Dad tells the kids how he met their mom… climb the mountain," while rocking synced with pulse at 1:08 during storytelling sections. Subject 4 tied *World O World* (WL1) to Latino spirituality, interpreting "Catholic funeral imagery… turning discomfort into joy," with breath aligned with choral swells at 0:22.

The cross-participant usage of natural imagery symbolized emotional states, while technology reflected modern anxieties, creating a clear theme of Nature vs. Technology influencing perceptions. Subject 2 externalized inner conflict in *Voyager* (WI1) through "thunderstorms vs. golden hour" imagery, with breathing sped up at 3:08 during storm motifs. Subject 5 critiqued institutional failure in *Run Boy Run* (TL1) via "government-created zombies… conscious but not alive," paired with rhythmic head nodding at 0:25 as defiance intensified.

Music facilitated escapes into nostalgic pasts or fantastical worlds, relying on the ability to escape into nostalgia to influence current perceptions of music. Subject 5 reframed poverty in *Test Drive* (VI2) as a "magical train ride… foreign but transformative," with smiles at 0:45 during nostalgic melodies. Subject 3 used *Nothing/Sad 'N Stuff* (LL1) to escape foster care memories, describing "storms with tension but contained… rainbow after disaster," while relaxed body posture at 1:53 signaled catharsis.

The only thing that all participants experienced consistently from song to song is the usage of physical response mirroring emotional arcs. Subject 4 synchronized breathing with vocal swells at 0:22 in *World O World* (WL1), while their neck stretching at 6:02 marked a climactic release. Subject 5 demonstrated rhythmic head nodding at 0:25 and intense pulsing at 2:59, in *Run Boy Run* (TL1), mirroring lyrical defiance.

Discussion

This study explored how music modulates psychological states, emotional intelligence (EI), and mental imagery through embodied and culturally situated processes. Six universal themes emerged: (1) Emotional Transformation & Resilience, (2) Duality & Contrast, (3) Cultural & Autobiographical Influence, (4) Nature vs. Technology, (5) Nostalgia & Escapism, and (6) Somatic Engagement. These findings firmly support the hypotheses that emotional awareness governs musical affect and autobiographical and cultural relevance scaffold emotional responses. Critically, the results suggest further investigation into long-standing theories in music psychology, positioning music as an active, culturally rooted tool for emotional regulation and identity construction. Below, we contextualize these analyses, their theoretical implications, and future directions.

The findings suggest that two foundational assumptions need further investigation: Cognitivist Representation (Juslin & Sloboda, 2010) and Universal Emotional Coding. Results analysis shows that music is not a passive "symbol" of emotions but a causal agent, rather than the cognitivist representation of music being representative of emotion. For example, Subject 1's grief-to-empowerment arc during *Flying* (VL1)—marked by somatic shifts (deep breaths to full-body relaxation)—demonstrates music's capacity to generate physiological and emotional changes. Emotional coding has often been seen as universal when listening to music no matter the autobiography of the listener. Results suggest that cultural identity overrides acoustic features. For example, the Nigerian participant mapped *The Mountain Song* (CL2) onto oral traditions. This implies mending the "one-size-fits-all" models and prioritizing cultural narratives.

Although the focus was on the somatic response of the participants, results can lead to a new dimension of Goleman's (1995) EI Model: somatic attunement and metaphorical literacy. Physical responses (e.g., rhythmic tapping, breath syncing) were central to emotion regulation and often were used to resolve uncomfortable emotions (Subject 5's defiance in *Run Boy Run*). This reveals a new layer of emotional intelligence as physical responses are often joined

with emotions experienced. Those with higher EI correlated with nuanced metaphor decoding (Subject 4's "dissonance as purification"), while moderate EI relied on generalized metaphor for indirect articulation (Subject 6's "portal to fantasy") showing that high EI is an understanding of the emotion itself rather than the recognition of the emotion alone.

Participants showed use of music to rehearse resilience by blending past, present, and future (e.g., Subject 1's "flashbacks of dancing with mom" during grief processing). This expands Wallin's (1991) "emotional templates" into a dynamic framework for nonlinear temporal navigation.

Toward a Unified Framework: The MUSE Theory

Building on the empirical patterns and paradigm shifts revealed in this study, I propose the Multidimensional Unified Synchronization Effect (MUSE) Theory. This theory is a framework that explains how music unifies sensory, emotional, and cultural processes into a coherent psychological experience. While still in development, the MUSE Theory bridges the gaps between cognitivist, emotivist, and universalist perspectives by emphasizing dynamic synchronization across neural, bodily, and cultural systems.

The MUSE Theory is developed on three base principles: music as a synchronizing force, cultural and autobiographical scaffolding, and the threshold of resonance. Music's power stems from its ability to align (synchronize) normally distinct brain networks. Crucially, these systems don't operate in isolation, but rather they phase-lock together, creating a unified experience greater than the sum of its parts. Unlike universalist models (e.g. Juslin's BRECVEM), the MUSE Theory argues that synchronization is filtered through autobiographical and cultural backgrounds. This can be seen in the Latino participant's reinterpreted dissonance as spiritual catharsis (Subject 4). These "cultural schemas" act as tuning forks, shaping which neural networks synchronize and how strongly. However, not all music resonates equally. The MUSE Theory introduces the concept of a synchronization threshold with the experience of familiar or culturally salient music easily surpassing this threshold, triggering full emotional and somatic engagement. Unfamiliar music may fail to synchronize memory or emotion networks, resulting in passive listening.

Using these principles leads us to a framework separated into three areas: emotional transformation, somatic engagement, and genre fluidity. This framework uses three schema layers fulfilling the inclusion of psychological, somatic, and autobiographical variables of an individual's schema. The Temporal Binding Mechanism (TBM) (Haggard & Cole, 2007) uses music's ability to bind discrete elements (rhythm, melody, timbre) into a unified experience via cross-regional neural synchronization. The Hierarchical Predictive Integration (HPI) (de Koning & Jamshidnejad, 2023) identifies the occurrence of cognitive music processing across three bidirectional layers: sensorimotor layer, schema layer, and experiential layer (Gkintoni et al., 2025). The Adaptive Resonance Threshold (ART) (Carpenter & Grossberg, 2002) is a dynamic threshold that influences multiple areas of the individual's perceptual response: autobiographical schemas, individual psychological state, and acoustic milieu. Autobiographical schemas trigger stronger limbic synchronization than unfamiliar genres. Individual psychological state influences perception and immersion with the ability for deepening somatic engagement (Gkintoni et al., 2025). Acoustic milieu develops cross-regional synchronization shown in contrasting voices like dissonance when paired with rhythmic intensity (Pallesen et al., 2015).

Limitations and Future Directions

This study revealed robust patterns in how music synchronizes the neural, cultural, and physiological systems to transform psychological states. This is supported by evidence of participants' grief-to-empowerment arcs, culturally scaffolded meaning-making, and somatic resonance. However, its small sample size (N = 6) inherently limits broader generalizability. This constraint calls for future research with larger, cross-cultural cohorts to validate the findings. Further, a development of general coding for intercoder reliability tests to enable replicability of response analysis would increase validity.

Future areas of exploration could be built on findings of real-time somatic engagement (e.g., synchronicity between choral swells and breath rate, defiant tapping

to dystopian rhythms) and, the development of embodied-cultural semantics using music to construct meaning through somatic-cultural feedback loops (e.g., Subject 3's rocking synced to Nigerian storytelling pulses). It also adapts the idea of genre fluidity as fixed rule to be individualized because participants' genre-emotion mapping (Renfrow et al., 2011) were often subverted (e.g., Vitality evoked grief; Tension fostered empowerment).

Practical applications could be explored. Music therapy could incorporate culturally tailored interventions by leveraging heritage-specific metaphors for participants or somatic integration with breathwork and movement to enhance Emotional Intelligence (EI) training for trauma survivors. It could replace rigid mood playlist algorithms, instead prioritizing individualized emotion-genre mappings and simulating "fantasy sanctuaries" (e.g., Subject 6's enchanted forest) for anxiety relief. Education can become interpersonal by development of EI curriculum through teaching metaphorical decoding through music. Ultimately, longitudinal studies must examine whether sustained engagement with MUSE-informed practices (e.g., metaphor-decoding curricula) sculpts neural plasticity in emotion-regulation networks. By tracking how cerebellar beta-delta limbic coupling evolves through music-based EI training, research can transcend current limitations and fully illuminate music's capacity to recompose shattered selves into resilient harmonies.

Conclusion

Music emerges from this research not as a passive soundtrack to human experience, but as an active architect of psychological transformation. My findings reveal how culturally situated listeners harness music's structure to synchronize neural, bodily and emotional systems—transforming grief into empowerment through orchestral swells, dissonance, into collective joy through breath-synced choral crescendos, and dystopian narratives into acts of rhythmic defiance. These processes suggest review of long-standing cognitivist and universalist assumptions, proving that cultural schemas conduct musical emotion rather than merely filtering it. When Nigerian heritage transformed rhythmic pulses into ancestral storytelling or Latino spirituality reinterpreted harmonic tension as spiritual catharsis, culture rewired perception itself.

The Multidimensional Unified Synchronization Effect (MUSE) Theory crystallizes this paradigm shift. It positions music as a biological synchronizer where gamma oscillations bind spectral details to cultural landscapes (swelling string becoming jungles of Asia), theta-beta coupling bridges harmonic expectations with autobiographical meaning (flute melodies resurrecting maternal presence), and delta rhythms align phrasing with somatic catharsis (neck stretching mirroring emotional release). This integration reaches the Adaptive Resonance Threshold (ART), a dynamic neural tipping point, exclusively when cultural familiarity, psychological vulnerability, and acoustic intensity converge. This explains why identical musical stimuli provoked profoundly divergent experiences; resonance requires alignment between sound and the listener's life story.

These insights encourage transformative applications. Music therapy has the potential to evolve beyond generic playlists towards cultural-semantic scaffolding, leveraging heritage-specific metaphors to breach resonance thresholds in trauma recovery. Technology should design adaptive systems that modulate harmonic novelty and rhythmic complexity based on individual synchronization profiles. Education can pioneer metaphor-decoding curricula where students map emotional duality, like storms clashing with golden hour light, to cultivate embodied emotional intelligence.

While limited in scale, this study illuminates music's profound capacity to rebuild shattered selves through neural choreography. Future research now should quantify resonance thresholds across cultures, track how musical training sculpts synchronization networks, and engineer immersive "synchronization environments" in digital therapeutics. Ultimately, this work affirms that music's highest purpose transcends mere representation. From sound to synapses, it actively recomposes our biological and cultural rhythms into resilient new harmonies.

References

Alberhasky M, Durkee PK (2024) Songs tell a story: The Arc of narrative for music. *PLoS ONE* 19(5): e0303188.

Alluri, V., Toiviainen, P., Jääskeläinen, I. P., Glerean, E., Sams, M., & Brattico, E. (2012). Large-scale brain networks emerge from dynamic processing of musical timbre, key and rhythm. *NeuroImage*, 59(4), 3677–3689.

Arain, M., Haque, M., Johal, L., Mathur, P., Nel, W., Rais, A., & Sharma, S. (2013). Maturation of the adolescent brain. *Neuropsychiatric Disease and Treatment*, 9, 449–461.

Braun, V. and Clarke, V. (2022). *Thematic Analysis: A Practical Guide*. Thousand Oaks, CA: SAGE Publications.

Carpenter, G. A., & Grossberg, S. (2002). Adaptive Resonance Theory. *The Handbook of Brain Theory and Neural Networks, Second Edition*. Techlab. bu.edu/files/resources/articles_cns/carpenter_grossberg_SRT_2003.pdf

Crowther, G. J., Jenkins, L. D., & Adjapong, E. (2023, April 27). *Teaching Science with the "Universal Language" of Music: Alignment with the Universal Design for Learning Framework*. Advances in Physiology Education.

de Koning, C., & Jamshidnejad, A. (2023). Hierarchical Integration of Model Predictive and Fuzzy Logic Control for Combined Coverage and Target-Oriented Search-and-Rescue via Robots with Imperfect Sensors. *Journal of Intelligent and Robotic Systems: Theory and Applications*, 107(3), Article 40.

Druthers Agency Inc. (2018), *American College of Health Care Administrators EQ Self-Assessment Checklist*.

Gkintoni, E., Aroutzidis, A., Antonopoulou, H., & Halkiopoulos, C. (2025). From neural networks to emotional networks: a systematic review of EEG-based emotion recognition in cognitive neuroscience and real-world applications. *Brain Sciences, 15*(3), 220.

Gnanateja G. N., Devaraju D. S., Heyne M., Quique Y. M., Sitek K. R., Tardif M. C., Tessmer R. and Dial H. R. (2022) On the role of neural oscillations across timescales in speech and music processing. *Frontiers in Computational Neuroscience* 16:872093. doi: 10.3389/fncom.2022.872093

Goleman, D. (1995). *Emotional Intelligence*. Bantam Books.

Haggard, P., & Cole, J. (2007). Intention, attention and the temporal experience of action. *Consciousness and Cognition*, 16(2), 211–220.

Hargreaves, D. J., Miell, D. E., & MacDonald, R. A. R. (Eds.). (2012). *Musical Imaginations*. Oxford University Press.

Juslin P. N. (2013). From everyday emotions to aesthetic emotions: towards a unified theory of musical emotions. *Physics of Life Reviews*, 10(3), 235–266.

Juslin, P. N., & Sloboda, J. A. (Eds.). (2010). *Handbook of Music and Emotion*. Oxford University Press.

Koelsch S, Fritz T, V Cramon DY, Müller K, Friederici AD. Investigating emotion with music: an fMRI study. *Human Brain Mapping* 2006 Mar;27(3):239-50. doi: 10.1002/hbm.20180. PMID: 16078183; PMCID: PMC6871371.

Margulis, E. H. (2013). Attention, temporality, and music that repeats itself. In *On Repeat: How Music Plays the Mind* (pp. 67–74). essay, Oxford University Press.

Margulis, E. H., & McAuley, J. D. (2022, October 26). *Using Music to Probe how Perception Shapes Imagination*. Trends in Cognitive Sciences.

Pallesen K. J., Bailey C. J., Brattico E., Gjedde A., Palva J. M., Palva S. (2015) Experience drives synchronization: the phase and amplitude dynamics of neural oscillations to musical chords are differentially modulated by musical expertise. *PLoS ONE 10*(8): e0134211.

Rickard, N. S. (2004). Intense emotional responses to music: A test of the physiological arousal hypothesis. *Psychology of Music*, 32 (4), 371-388.

Rentfrow, P. J., Goldberg, L. R., & Levitin, D. J. (2011). The structure of musical preferences: A five-factor model. *Journal of Personality and Social Psychology, 100*(6), 1139–1157.

Sacks, O. (2007). *Musicophilia: Tales of Music and the Brain*. Knopf.

Wallin, N. L. (1991). *Biomusicology: Neurophysiological, Neuropsychological, and Evolutionary Perspectives on the Origins and Purposes of Music*. Pendragon Press.

Yurgil K. A., Velasquez M. A., Winston J. L., Reichman N. B., and Colombo P. J. (2020) Music Training, Working Memory, and Neural Oscillations: A Review. *Frontiers in Psychology*. 11:266.

Appendix

Table 1: Song Association Table

Label	Category	Song Title	Artist	Lyrics/Instrumental	Time
VL1	Vitality	Flying	Cody Fry	Lyrics	3:58
VL2	Vitality	Second Child, Restless Child	The Oh Hellos	Lyrics	2:46
VI1	Vitality	Sogno Di Volare	Christopher Tin	Instrumental	3:53
VI2	Vitality	Test Drive	John Powell	Instrumental	2:36
LL1	Longing	Nothing/Sad 'N Stuff	Lizzy McAlpine	Lyrics	4:27
LL2	Longing	THINGS BEHIND...	Bon Iver	Lyrics	2:21
LI1	Longing	Ethereal- Slowed	Txmy	Instrumental	3:17
LI2	Longing	Televangelism	Ethel Cain	Instrumental	3:03
CL1	Connective	her	JVKE	Lyrics	2:51
CL2	Connective	The Mountain Song	TopHouse	Lyrics	3:14
CI1	Connective	Spring 1	Richter/Vivaldi	Instrumental	2:34
CI2	Connective	Gleam	Periwinkle	Instrumental	4:29
TL1	Tension	Run Boy Run	Woodkid	Lyrics	3:33
TL2	Tension	HOPE	NF	Lyrics	4:24
TI1	Tension	Winter	Vivaldi	Instrumental	3:36
TI2	Tension	Symphony No. 9- IV	Dvorak	Instrumental	6:15
WL1	Wonder	World O World	Jacob Collier	Lyrics	6:14
WL2	Wonder	Denis Was A Bird	Tom Rosenthal	Lyrics	4:06
WI1	Wonder	Voyager	Ethan Hibbs	Instrumental	4:12
WI2	Wonder	Want to Love	Just Raw	Instrumental	1:22

Note: Song VI1 was not used in any interview due to the ending of the experiment session with six participants rather than ten participants due to time constraints.

Table 2: Subject Emotional Intelligence Rating

Subject #	Self-Awareness	Empathy	Motivation	Self-Confidence	Self-Control	Social Competency	Total
1	3.6	4.6	3.4	4	3.4	3.6	3.76
2	4.4	4.4	4.8	4.4	4.4	4.4	4.46
3	4.2	4.5	4.2	3	3.2	4	3.85
4	4.4	4.6	3.8	3.8	4	3.8	4.1
5	3.6	4.6	4.2	3	3.2	3.2	3.6
6	3.6	3.6	4	3.8	3.6	4	3.77

Note: Results are out of 5.00

Table 2: Subject Emotional Intelligence Rating

Emotional Intelligence (EQ) Framework		
Score Range	*Range Label*	*Description*
1.00-1.99	Emerging Awareness	Identifies basic emotions but cannot explain their source.
1.00-1.49	Initial Recognition	
1.50-1.99	Basic Awareness	Labels basic emotions with simple or generalized reasoning.
2.00-2.99	Developing Understanding	
2.00-2.50	Situational Responses	Connects more specific emotions to obvious triggers.
2.50-2.99	Expanding Connections	Links emotions to personal experiences in a personal way.
3.00-3.99	Reflective Insight	
3.00-3.49	Personal Reflection	Explains emotions using specific memories or values.
3.50-3.99	Dynamic Understanding	Adjusts emotional interpretations based on context or reflection.
4.00-4.99	Nuanced Understanding	
4.00-4.49	Complex Interpretation	Analyzes mixed emotions (e.g., "bittersweet" or "melancholy")
4.50-4.99	Strategic Insight	Connects emotions to metaphors, identity, relationships, or societal themes
5.00	Integrative Wisdom	

Illuminating Pathways

30 YEARS OF EXCELLENCE

Research Summaries

You're eagles! Stretch your wings and fly to the sky.
- Ronald E. McNair

Motivations of Latino Voters: Importance of Issues Related to the 2024 Presidential Election

Dimas Gonzalez and
Sara Mata, PhD

Hispanic Serving Initiatives

Introduction

According to USA Facts (2022), the Hispanic/Latino population in Kansas had the most growth increasing from 302,174 in 2010 to 383,035 in 2022, an increase of 80,861. As the Latino population increases in Kansas, understanding the political motivations and reasoning for voting in local as well as presidential elections is essential. The political power of Latinos will continue to increase, as trends suggest the growth is expected to continue. According to the Pew Research Center (2024), about 1.4 million Hispanics become eligible to vote every year. Additionally, in 2024, Latinos have grown at the second-fastest rate with an estimated 36.2 million eligible to vote, up from 32.3 million in 2020, 50% of the total growth in eligible voters (Pew Research Center, 2024). With tremendous voting power, it is vital to know what persuades Latinos to participate in civic engagement and what issues or topics bring them to the polls.

The political climate in Kansas offers an interesting mix throughout the years. Although Kansas currently has a Democratic Governor, Laura Kelly, most governors in Kansas have historically been Republican (Ballotpedia, 2025). Voting mostly conservative, the political climate in Kansas has primarily leaned towards Republican candidates. According to the AP News (2024) Kansas voted Republican in the previous six Presidential elections. In the last presidential election, 56% of Kansas voters voted for the Republican Party, 41.4% voted for the Democratic Party, and 2.6% voted for an Independent Party (AP News, 2024). In the 2022 elections, data from the Kaiser Family Foundation (KFF, 2022) shows that only 59% of eligible voters in Kansas voted, and 41% of the population did not vote. In addition, Kansas Secretary of State (2025) shows that a substantial number of Kansans failed to register to vote. As of July 1, 2023, 2.25 million people in the state were eligible to vote and only 1.95 million had registered, leaving about 300,000 unregistered potential voters (Wirestone, 2024).

According to the 2024 Kansas Speaks survey from the Docking Institute of Fort Hays State University published by the Kansas Reflector (Carpenter, 2024), 59% of Kansans stated they were dissatisfied with Biden as president and only 28.5% satisfied. On the other hand, 46.4% approved and 27.1% disapproved of Democratic Gov. Laura Kelly. When it comes to

increasing access to healthcare, 75% of participants expressed that expanding access was crucial. Regarding the economy, 43.7% believed Kansas was experiencing a weak economy in 2022, while 37.6% reported a weaker economy in 2024 (Carpenter, 2024). While Kansas typically votes conservatively, in recent years Kansas has voted progressive on certain issues affecting the state. In 2019, the courts found that the Kansas Constitution protects the right to abortion (Shorman & Korte, 2019). In 2022, Kansas voters decided to preserve the right to have an abortion in a statewide election by voting no on the amendment to ban abortion by 59% (Lysen et al., 2022). Carpenter (2024) found that out of 645 participants, 36% of respondents stated that illegal immigrants should be arrested and placed in detention camps until deportation hearings, while 45% responded that illegal immigrants were a threat to public safety.

The purpose of this research is to gain a better insight into what motivates Latinos in Kansas to vote. Although there is data on Latinos in Kansas and an understanding of how nationally Latinos vote, this research looked specifically at better understanding the perspective and complexity of the motivation for civic engagement. Having a better understanding as to what influences the Latino demographic to vote can provide insight into increasing the number of Latinos participating in civic engagement. In addition, knowing what topics, matters, and issues are important can also help to know where to focus when informing and educating constituents in the community. The findings of this research aim to fill in the gaps of this area and explore the motivations of Latino voters as they relate to the 2024 presidential election.

Methods

A survey was developed to better understand the factors influencing voting within the Latino community. The survey asked Latino voters in Kansas their motivations to the following topics and were asked to rank their top three: Healthcare, Education, Immigration, Criminal Justice Reform, Climate Change and Environment, Housing and Homelessness, Racial and Social Equality, Voting Rights and Election Integrity, National Security and Foreign Policy, Inflation, Abortion, and Crime/ Violence.

The survey was conducted online, distributed in August of 2024, and was intentional to get a pulse prior to the 2024 presidential election. The survey was distributed via online platforms/social media. In addition, this survey was supported by the Kansas Latino Community Network, a non-profit, non-partisan civic engagement and leadership development organization. The Latino Community Network assisted in providing resources to send SMS messages to registered voters who self-identified as Latino.

The survey was active from August through October 2024 and initially collected 264 responses. 84 participants met the criteria for identifying Latine to be examined for this study. Of the 84 self-identified Hispanic/Latino participants of this study, 40 identified as female, 39 as male, and three as non-binary. Regarding employment status, 31 stated they were employed full-time, 15 were retired, eight employed part-time, seven were unemployed, seven identified as students, and five stated they were self-employed. When asked about the level of education each participant received, 25 listed they have some college level education. 19 had earned a bachelor's degree, and 13 had a high school diploma or GED. Fifteen participants received a graduate degree or professional degree, while the remaining 10 participants received an associate degree. Sixteen participants self-reported their age range from 18-24. Thirty ranged from 25-30, sixteen ranged from 41-50, and the remaining 21 participants ranged from 51-65 years of age.

Results

Findings suggest there were four key political topics that motivated the Latino community to vote during the 2024 presidential election: Economy and Jobs, Immigration, Healthcare, and Education.

Participants who completed the survey ranked Economy and Jobs as the most pressing issue. Fifty-eight percent of the individuals ranked this as their highest priority. Regarding immigration, 52% of Latinos rated this as a pressing issue entering the 2024 presidential election. Healthcare was identified as the third most important issue, with 39% of the participants identifying this as one of their top concerns. Education was ranked fourth, with 27% of participants selecting it as a motivating issue to vote.

Discussion

This study explored the pressing issues that have affected the Latino electorate in the state of Kansas prior to the 2024 presidential election. It offered a unique lens on identifying what were the most pressing political issues in the Latino community during this period. The findings highlighted four key issues as political priorities: Economy and Jobs, Immigration, Healthcare, and Education as the most important issues for Latino Kansans.

The Pew Research Center (2024) released a national study surveying a representative sample of all registered voters in the United States. The findings suggest that the Kansas Latino voter is relatively consistent with the overall registered voters' political perspective. Eight-in-ten registered voters said that the economy will be very important to how they vote in the 2024 presidential election (Pew Research Center, 2024), which coincides with the findings of this study. The results of this study indicate healthcare was ranked number three in importance among Kansas Latinos, but the national surveyed voters listed this as number two (Pew Research Center, 2024). About six-in-ten voters today say immigration is very important to their vote. The results of this study indicate that immigration is the second most important political issue for the Latino community in Kansas, whereas immigration ranked as the sixth most important topic for the broader electorate, with 61% of registered voters indicating that it was a pressing issue (Pew Research Center, 2024).

In addition to these findings, this study benefited from a diverse pool of participants, which included a wide range of perspectives from different education and age groups. This diversity provided a rich set of data and offered deeper insights into the varied experiences and motivations within the Latino community in Kansas.

References

AP News. (2024, December 19). *2024 Kansas election results: AP News*. Associated Press News. https://apnews.com/projects/election-results-2024/kansas/?r=0

Ballotpedia. (2025). *Party control of Kansas state government*. Ballotpedia. https://ballotpedia.org/Party_control_of_Kansas_state_government

Carpenter, T. (2024, October 28). *Survey reveals potential tapering of Kansas gap between GOP, Democratic presidential candidates*. Kansas Reflector. https://kansasreflector.com/2024/05/15/engaging-with-kansas-politics-might-be-complicated-but-its-easier-than-this-board-game/

Kaiser Family Foundation. (2023). *Number of voters as a share of the voter population, by age. KFF*. https://www.kff.org/other/state-indicator/number-of-individuals-who-voted-in-thousands-and-individuals-who-voted-as-a-share-of-the-voter-population-by-age/?currentTimeframe=0&selectedRows=%7B

Kansas Secretary of State. (2025). *Election Statistics Data*. Kansas Secretary of State. https://sos.ks.gov/elections/election-statistics-data.html

Lysen, D., Ziegler, L., & Mesa, B. (2022a, August 3). *Voters in Kansas decide to keep abortion legal in the state, rejecting an amendment*. NPR. https://www.npr.org/sections/2022-live-primary-election-race-results/2022/08/02/1115317596/kansas-voters-abortion-legal-reject-constitutional-amendment

Pew Research Center. (2024, September 09). *Issues and the 2024 election*. Pew Research Center. https://www.pewresearch.org/politics/2024/09/09/issues-and-the-2024-election/

Shorman, J., & Korte, L. (2019, April 29). *Right to abortion protected by state constitution, Kansas Supreme Court rules*. Governing. https://www.governing.com/archive/tns-abortion-protected-kansas-supreme-court.html

USA Facts. (2022, July) *Our changing population: Kansas*. USA Facts. https://usafacts.org/data/topics/people-society/population-and-demographics/our-changing-population/state/kansas/

Wirestone, C. (2024, May 15). *Engaging with Kansas politics might be complicated. but it's easier than this board game*. Kansas Reflector. https://kansasreflector.com/2024/05/15/engaging-with-kansas-politics-might-be-complicated-but-its-easier-than-this-board-game/

Before you can make a dream come true, you must first have one.
- Ronald E. McNair

Human-Robot Collaboration's Impact on Ergonomic Strain

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Introduction

Industrial robots have become more common in manufacturing lines and have gained intelligent features such as complex movement (Murray et al., 2017). Software for industrial robots has also improved, with various methods of programming which include online, offline, and augmented reality (Pan et al., 2012). Dassault Systèmes software, Delmia, utilizes several of these methods and has simulation capabilities (Banga et al., 2021). With these advancements, industrial robots have impacted manufacturing by improving efficiency and costs, leading companies towards factory automation (Campilho & Silva, 2023). The shift towards factory automation has been characterized as Industry 4.0, which introduces ideas such as human-robot collaboration and smart factories (Lasi et al., 2014). Human-robot collaboration expands industrial robotics by having a person and collaborative robot work in the same space (Vysocky & Novak, 2016). With human-robot collaboration, it is important to consider the potential impact on ergonomics. Ergonomics is the study of human-machine interaction and anything that can impact that interaction with the focus of improving it (Bridger, 2008). Factors such as ergonomic strain, which is discomfort caused by repetitive movement and posturing, are significant in the evaluation of new manufacturing methods such as human-robot collaboration (Parsons, 2000).

The objective of this research is to evaluate the ergonomic strain between two workstations with and without human-robot collaboration. This was evaluated by running two simulations using Delmia's 3DEXPERIENCE software in which the first simulation had a worker assemble a gearbox and the second simulation involved a collaborative robot helping with the assembly. Ergonomic reports were generated from each simulation and compared to determine if human-robot collaboration improves ergonomic strain.

Methods

Two simulations with the task of assembling a gearbox were created using Delmia's 3DEXPERIENCE R2025x platform. Applications on the platform such as Plant Layout Design, Ergonomic Workplace Design, and Process Planning were used to create layouts of the workstations, gearbox assembly, and ergonomic simulations. The workstation for the first simulation included a workbench and a power drill, and the second

simulation included the collaborative robot, conveyor belt, bin for bolts, and shadowbox which contained the parts for the gearbox and acted as a workbench. The gearbox was made up of three parts: housing, bearing cover, and bolts. The assembly process for the first simulation involved the worker placing the bearing cover on the housing, inserting the bolts, and screwing the bolts down. The second simulation involved the same assembly process; however, the robot was responsible for screwing the bolts down. With the Ergonomic Workplace Design app, worker tasks were created to assemble the gear box. For example, a task was created that made the worker pick up a bolt. Ergonomic reports were generated for the two simulations and included 4 worker models ranging from 5th/95th percentile female and 50th/95th percentile male.

The ergonomic report generated for each of the simulations had six sections: risk overview, efficiency, risk by anthropometry, risk type by anthropometry, undefined risk by anthropometry, and risk joint. The risk overview gives the total number of worker tasks, and the number of risks found. The efficiency category deals with value-added and non-value-added tasks and their risk levels. Value-added indicates that a task adds a part to the final assembly. Risk and risk type by anthropometry deal with the number of risks and their levels for each worker model. Undefined risk by anthropometry includes risks that the software could not determine because the posturing engine could not find a posture, or a posture was impossible. Risk by joint includes the number of risks for each joint in the assembly operation.

Results

For the first simulation, there were a total of 15 tasks. For the 50th percentile male and female, and 95th percentile male, the tasks did not pose any mid- or high-level risks. However, the 5th percentile female had eight tasks that had mid-level risk and one task with an undefined risk level. The undefined risk was due to an object being unreachable. Four tasks presented mid-risk levels to the back and four tasks to the shoulder joints. As for the efficiency of worker tasks, six tasks were categorized as non-value-added, and nine tasks were value-added. The risk overview for the first simulation is reported in Table 1.

Table 1: Risk Overview for Simulation 1

Anthropometric Profile	Worker Task Count per Risk Level			
	Undefined	Low	Mid	High
5th Percentile Female	1	6	8	0
50th Percentile Female	0	15	0	0
50th Percentile Male	0	15	0	0
95th Percentile Male	0	15	0	0

The second simulation had a total of 10 tasks. For the 50th and 95th percentile male, all 10 tasks presented low-level risks. For the 5th and 50th percentile female, four tasks posed mid-level risks. No tasks had any high-level risks. As for the efficiency of the tasks, five tasks were categorized as non-value-added and five were value-added. There were no undefined risks reported in this simulation. All mid-level risks involved shoulder joints. Risk overview for the second simulation is reported in Table 2.

Table 2: Risk Overview for Simulation 2

Anthropometric Profile	Worker Task Count per Risk Level			
	Undefined	Low	Mid	High
5th Percentile Female	0	6	4	0
50th Percentile Female	0	6	4	0
50th Percentile Male	0	10	0	0
95th Percentile Male	0	10	0	0

Discussion

For the first simulation, the 5th percentile female's back and shoulder joints were at risk. These risks were associated with the tasks involving inserting the bolts, picking up the power drill, and screwing the bolts down. The second simulation had a decrease in the number of tasks due to the collaborative robot being responsible for drilling operations. The tasks that involved grabbing the bolts from the bin presented mid-level risk to the 5th and 50th percentile female and mainly impacted their shoulder joints.

With the tasks that involved picking up a power drill and screwing the bolts down no longer being needed in the second simulation, the 5th percentile female

had a decrease in mid-level risk tasks. However, the second simulation also presented some new areas of risk as well. The repetitive task of grabbing the bolt from a bin presented mid-level risks to the 5th and 50th percentile female. This could have been minimized if the bin were to have been placed lower so that the female worker models would not have to reach so far up. Nevertheless, simulation 2 had fewer overall tasks that caused mid-level risks in comparison to the first simulation. This could indicate that in a human-robot collaborative workspace, there could be fewer tasks that pose ergonomic risks than in a worker-only setting.

A limitation to this study involves the categorization of the power drill. The categorization was not completely accurate as the options for categorization seemed limited. This led to an awkward grasp of the power drill, and it was not obvious if there could be more options added to the categorization. However, this highlights a potential area of research that involves tooling, how they are grasped, and how it can impact the ergonomics of a workspace.

Conclusion

The objective of this research was to evaluate the ergonomic strain between a workspace with and without human-robot collaboration. To accomplish this, Delmia's 3DEXPERIENCE platform was used to create two simulations involving assembling a gearbox. The first simulation only involved a worker assembling the gearbox and in the second simulation, a collaborative robot was added. Ergonomic reports were generated for each simulation and showed a decrease in mid-level risks and the number of tasks for the second simulation. This could indicate that a decrease in worker tasks could lead to a decrease in the ergonomic strain. Human-robot collaboration could be an effective solution to decreasing ergonomic strain as it allows for a robot to take over tasks that involve repetitive motion or motion that involve awkward posture. Furthermore, this method of manufacturing does not completely cut out the worker, instead alleviating labor that could introduce ergonomic strain.

References

Murray, R. M., Li, Z., & Sastry, S. S. (2017). *A Mathematical Introduction to Robotic Manipulation.* CRC Press.

Campilho, R. D. S. G., & Silva, F. J. G. (2023). Industrial Process Improvement by Automation and Robotics. *Machines, 11*(11), 1011.

Lasi, H., Fettke, P., Kemper, H.-G., Feld, T., & Hoffman, M. (2014). Industry 4.0. *Business and Information Systems Engineering, 6*, 239–242 (2014).

Vysocky, A., & Novak, P. (2016). Human-Robot collaboration in industry. *MM Science Journal.*

Pan, Z., Polden, J., Larkin, N., Duin, S. V., & Norris, J. (2012). Recent progress on programming methods for industrial robots. *Robotics and Computer-Integrated Manufacturing,* 28(2), 87-94.

Banga, H. K., Kalra, P., & Koli, K. (2021). Utilization of Delmia Software for Saving Cycle Time in Robotics Spot Welding. *Advances in Intelligent Systems and Computing* (pp. 265-275). Springer Singapore. https://doi.org/10.1007/978-981-33-6981-8_22

Bridger, R. (2008). *Introduction to Ergonomics.* Routledge.

Parsons, K. C. (2000). Environmental ergonomics: a review of principles, methods and models. *Science Direct, 31*(6), 581-594.

Whether or not you reach your goals in life depends entirely on how well you prepare for them and how badly you want them.
- Ronald E. McNair

Using ArcGIS Pro to Estimate Flood Risk to Archaeological Sites in Eastern Kansas

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Introduction

The risks of flooding and erosion on archaeological sites are crucial to consider for those aiming to preserve and protect them. The artifacts and sites left by previous generations are essential for understanding human history. Understanding the risks posed to these sites can aid in preventing damage, and therefore, information loss. Across eastern Kansas, there are over 14,000 archaeological sites in need of risk assessment. This research aims to determine where support and specific protocols may need to be implemented in archaeological sites so their integrity can be preserved.

Flooding

Looking at past flooding events and patterns can aid in predicting the severity of future flooding. In the United States, there has been an increase in variability in rainfall on damaging floods in the decades leading up to a study by Douben, which suggests that climate and societal factors have affected the total growth of damaging floods (2006). Rainfall magnitude and intensity are the primary factors in creating runoff from a storm and are important to track in a highly variable hydrologic climate such as Kansas (Rahmani et al., 2016). Most weather stations, especially in eastern Kansas, have shown a positive trend in annual maximum rainfall, which is consistent with both national and global trends that have been credited to climate change (Rahmani et al., 2016). In eastern Kansas, stations recorded approximately 33% greater measurements for intense rainfall than western stations (Rahmani et al., 2016). The warm season is known for its increased risk of thunderstorms that produce extreme rainfall and flash flooding (Kunkel et al., 2013); this is important to note when trying to understand the highly variable precipitation events in Kansas (Rahmani et al., 2016). One example of a large flooding event is the 1951 stream floods in eastern Kansas; damage in the Kansas River occurred at several sites recorded through stream gages, in which some sites were able to return to the state they were in prior to the flood event, but recovery was absent or impossible for others (Bowen & Juracek, 2013).

Site Formation Processes

Site formation processes create historic and archaeological records, and there are two categories: cultural and natural (Schiffer, 1987). Cultural formation processes are caused by human behavior, such as

discarding materials, ritual practices, or caching items (Schiffer, 1987). Natural formation processes are caused by the natural environment surrounding a site, like animal behavior, natural disasters, and erosion, and they inevitably determine what is preserved or decayed (Schiffer, 1987). These occurrences make it difficult to form conclusions based upon the face value of an artifact. Bettis and Mandel (2002) found that patterns of erosion and alluviation have a significant impact on what ultimately remains of sites, which establishes a great need to account for and distinguish cultural from natural site formation processes. It is crucial to investigate how flood-based erosion may impact the landscape and sites involved so we can best understand how to prevent further inundation and damage in the future.

Geographic Information Systems

A Geographic Information System, otherwise known as GIS, is a spatially referenced database that can be applied in several ways, including data visualization, management, and analysis (Eber, 2004). It has the capability to efficiently interpret aerial photographs and geophysical images in an archaeological context with extremely detailed mapping and description (Neubauer, 2004). It can also perform calculations based on graphical attributes which are particularly useful and efficient (Neubauer, 2004). According to Chambers (2019), GIS can create and utilize a Digital Elevation Model (DEM) to aid in assessing flooding-based erosion risk to archaeological sites. Researchers have used GIS to analyze site formation processes and erosion. For example, Guiney et al. (2021) determined erosion risk at the Magna Fort at Hadrian's Wall posed by weather patterns with a similar aim to foster conversations about site preservation and used GIS to aid in their understanding of erosion and similar risk factors. Howland and Thompson (2024) conducted a similar investigation along the Georgia coast to assess erosion risk from hurricanes. The study found that a significant number of archaeological sites were at risk of erosion, inundation, and other related natural phenomena, leading to discussion of the preservation of these sites (Howland & Thompson, 2024). This study may serve as an example of the significance of researching the risks of flooding-based erosion in eastern Kansas.

Research Questions

Research regarding flood and erosion risk to archaeological sites has increased in recent decades. However, Kansas-specific research is limited, despite the variable hydrologic climate and large number of rivers within the state. Investigations into the risks of flooding-based erosion using GIS have proved useful in determining this risk and igniting conversation about site preservation. Using historical flood data to determine the severity of past Kansan floods in combination with depth-to-flood data may reveal the severity of risk to archaeological sites as well as how many sites face this risk.

Methods

Using stream gage data from the United States Geological Survey (USGS), various heights above the mean river depth were recorded, which were used to calculate mean averages. Some outliers were removed in the calculation of the averages as they were believed to be severe errors. This combined with depth-to-flood data from the FLDPLN model, in which each pixel is assigned a value representing how many feet of flooding must be in place for that area to be affected, was used to create a three-class model in ArcGIS Pro. Zone 1, covering zero to 0.6666 feet of flooding, represents areas most likely to be affected by a flood; Zone 2, covering 0.6666 to 5.1542 feet of flooding, represents a reasonable expectation for the most severe flooding cases; and Zone 3, covering 5.1542 to 51 feet of flooding, represents a more theoretical severity as flooding events this extreme have not been recorded by the USGS.

Archaeological site data was provided by the Kansas Historical Society, giving the locations, names, and other information regarding every recorded archaeological site in Kansas. The data was clipped to only include archaeological sites within eastern Kansas, overlapping the depth-to-flood data to prevent errors later in the investigation, leaving 14,226 archaeological sites to be assessed. Two queries were performed to determine the number of archaeological sites within and intersecting each zone in varying flood classes.

Results

The findings of this research depict the number of archaeological sites across eastern Kansas that are at

risk of inundation within various flood scenarios. The number of sites completely within and intersecting each class as well as the percentage of the 14,226 sites being investigated were calculated (Table 1). The area of land in each class of flood zone was also calculated, with the Class 1 zone having an area of about 107.82 mi², Class 2 (composed of Zones 1 and 2) being 366.83 mi², and Class 3 (composed of all zones) being 10,375.78.95 mi².

Table 1: Sites Completely Within and Intersecting Flood Zone Classes

Flood Class	Sites Within		Sites Intersecting	
Class 1 (Zone 1)	0	0%	439	3.086%
Class 2 (Zones 1 and 2)	1	0.007%	634	4.457%
Class 3 (All Zones)	4,940	34.725%	6,599	46.387%

Discussion

Findings indicate that nearly one half of all archaeological sites in eastern Kansas experience some risk of inundation. Every site at risk implies that there is physical and spatial data at risk of being lost, impacting archaeologists' understanding of past populations of Kansas. With 439 sites currently intersecting Zone 1, comprising 3.086% of eastern Kansas archaeological sites, and being at immediate risk of flooding, it is imperative to begin discussing the preservation of these sites. Since the Class 3 flood zone covers a large area of the eastern portion of the state, finding that nearly one half of the sites being studied within it did not come as a surprise. Although these sites are not currently at a high risk of being inundated, that may change in the future as the weather becomes more variable and severe. To develop this analysis further, it would be beneficial to establish more flood zones between Class 2 and 3 because of the considerable gap between them. Creating more zones may provide better risk assessment and more specific language to use when discussing site preservation. Another limitation to this research is that depth-to-flood data was only available for the eastern region of Kansas. Eastern Kansas does experience the most rainfall in the state (Rahmani et al., 2016); however, a more complete analysis, including data for western Kansas, would contribute greatly to further discussion about how to best protect Kansan archaeological sites.

References

Bettis, E. A. III, Mandel, R. D. (2002). The effects of temporal and spatial patterns of Holocene erosion and alluviation on the archaeological record of the Central and Eastern Great Plains, U.S.A. *Geoarchaeology*, 17: 141-154.

Bowen, M. W., Juracek, K. E. (2013). Assessment of the geomorphic effects of large floods using streamgage data: the 1951 floods in Eastern Kansas, USA. *Physical Geography, 32*(1), 52-77.

Chambers, S. J. (2019). *Modeling erosional sensitivities of archaeological sites using DEM's from low altitude UAV imagery* [Undergraduate honors thesis, University of Wollongong]. Science, Medicine & Health – Honours Theses.

Douben, K. J. (2006). Characteristics of river floods and flooding: a global overview, 1985-2003. *Irrigation and Drainage*, 55(1), 9-21.

Ebert, D. (2004). Applications of archaeological GIS. *Canadian Journal of Archaeology*, 28(2), 319-341.

Guiney, R., Santucci, E., Valman, S., Booth, A., Birley, A., Haynes, I., Marsh, S., & Mils, J. (2021). Integration and analysis of multi-modal geospatial secondary data to inform management of at-risk archaeological sites. *International Journal of Geo-Information, 10*(9), 575.

Howland, M. D., Thompson, V. D. (2024). Modeling the potential impact of storm surge and sea level rise on coastal archaeological heritage: A case study from Georgia. *PLoS ONE 19*(2): e0297178.

Kunkel K., Stevens L., Stevens S., Sun L., Janssen E., Wuebbles D., Kruk M., Thomas D., Shulski M., Umphlett N.. (2013). Regional climate trends and scenarios for the US national climate assessment: part 4. Climate of the US Great Plains. NOAA Technical Report NESDIS 142, Washington, DC, 91 pp.

Neubauer, W. (2004). GIS in archaeology – the interface between prospection and excavation. *Archeological Prospection*, 11(3), 159-166.

Rahmani, V., Hutchinson, S. L., Harrington, J. A., & Hutchinson J. M. S. (2016). Analysis of frequency and magnitude of extreme rainfall events with potential impacts on flooding: a case study from the central United States. *International Journal of Climatology*, 36(10), 3578-3587.

Schiffer, M. (1987). *Formation Processes of the Archaeological Record*. University of New Mexico Press.

True courage comes in enduring, persevering, the preparation and believing in oneself.
- Ronald E. McNair

Parent Satisfaction with Wichita Applied Behavior Analysis (ABA) Services

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Introduction

Autism Spectrum Disorder (ASD) involves a wide range of symptoms that differ in severity and can impact one's ability to succeed in both academics and future employment. Common symptoms include deficits in social communication and difficulty with eye contact, social interactions, and managing transitions (Garey, 2024). While there are people with autism who can succeed in school and in the job market, there are also those who will need support for their whole lives. One of the main, though sometimes controversial, treatment options for people with autism is Applied Behavior Analysis (ABA), which uses positive reinforcement to produce desired behaviors. The controversy primarily focuses on the belief that it is too rigid in nature and causes children to suppress harmless self-stimulatory behavior (Garey, 2024). Understanding parent satisfaction with ABA services can provide insight into whether they believe ABA is successful.

Globally, recent studies have attempted to answer the question of parent satisfaction with mental health services. Bulut Ozer and Halfon's study used the Experience of Service Questionnaire (ESQ) to determine parent satisfaction with psychological health services in a clinical setting. The ESQ is based on a two-factor system. The "Care" factor covers the individual relationships between patients and therapists, while the second factor, "Environment," primarily focuses on those environmental factors such as accessibility and transportation (Bulut Ozer & Halfon, 2024). Another facet of the study, participant demographics, included parent age, sex, reason for referral, and treatment type received. When the study was completed, the authors found that satisfaction levels were significantly associated with the level of gains in therapy; that is, participants who had better treatment outcomes were more likely to be satisfied (Bulut Ozer & Halfon, 2024). However, the study also notes that children's satisfaction tends to be lower than that of parents.

This study aims to measure parents' satisfaction with ABA services in the Wichita Metropolitan Area. The survey, disseminated to parents, is modeled after the ESQ, with slight modifications. Demographic questions such as parental education level and the payment methods used to cover ABA services were also included. Information about parent satisfaction

with local services can help community providers better tailor their intervention services, provide potential service providers a roadmap to success, and offer parents information about local services that meet the individual family's needs.

Methods

The sample included three adults aged 18 or older. Participants were recruited through the distribution of flyers to various behavioral health service providers in the Wichita metropolitan area. Participants were parents of children with autism who were receiving Applied Behavior Analysis (ABA) services. All respondents were from the Wichita area and received services in Wichita. One child previously received speech language services and occupational/physical therapy services, another currently receives occupational/physical therapy services and previously received speech language services, and the last child currently receives speech language services as well as psychiatry/medication management services, with previous occupational/physical therapy services. The first respondent's child is six years old, the next is twelve, and the third is ten years old.

The survey was conducted online through Qualtrics. Participants completed one questionnaire with 26 total questions. Nine questions were modeled after the Experience of Service Questionnaire (ESQ), which measures satisfaction in child and adolescent mental health services (Bulut Ozer & Halfon, 2024). The ESQ measures satisfaction with care as well as the service environment. For this study's survey, questions 1-6 ask for consent to the survey, age of participant, and where the participant is from and received services from, as well as how services are received. Questions 7-15 are on a 5-point Likert scale (1 = disagree, 5 = agree), and measure care factors like satisfaction with the therapist and environmental factors like convenient appointment times. Questions 16-26 collect demographic information, such as where ABA services are held, how long transportation takes, whether the child is in school with an IEP or receiving other services, how many hours of ABA per week, level of education of the parents and whether they are the biological parent, adoptive parent, foster parent, or legal guardian of the child.

Results

The parent whose child (the six-year-old) received in-home, telehealth services, answered disagree seven times and neutral twice to questions 7-15 on the survey, including questions like, "I am treated well by the people who work with my child." The parent whose child received in-person, in-clinic services (twelve-year-old) had a mix of the response types (one slightly disagree, two disagree, four neutral, and two agrees), while the parent whose child received in-person, in-home services (ten-year-old) was mostly in the agree and neutral range, with four slightly agree, two agree, and three neutral answers. The parent of the six-year-old was unsure about how many hours of ABA their child received, while the twelve-year-old had 15 hours and the ten-year-old had 20 hours total.

Discussion

Although there were only three participants, there is a trend between the three that suggests dissatisfaction with care. Few ESQ questions were answered slightly agree or agree. The parent with the youngest child (six years old) reported least satisfaction with care, indicating "disagree" the most to the ESQ questions, suggesting the possibility of a difference between services for older children (aged 10-12) and younger ones. However, the six-year-old also had in-home, telehealth services, while the other two received services in-person. This could also be a contributing factor to the six-year-old's parents' dissatisfaction with their services. It is hard to tell if the number of hours of ABA impacted satisfaction in this case, as the parents who answered primarily disagree responded they were unsure how many hours of services their child received per week. However, the parent whose child received the most amount of ABA (20 hours, split between school and home) had the most varied satisfaction levels, with agree, slightly agree, and neutral answers to the ESQ questions. All the children had previously received or were currently receiving other services in addition to ABA. The parent whose child had the most currently ongoing services aside from ABA was also the one who had the highest satisfaction with care, indicating the most "neutral" and "agree" to the ESQ questions. A previous study found that collaboration between professionals and families was important in satisfaction with care (Wodehouse & McGill, 2009);

therefore, multiple currently ongoing services for a child suggests that parents are kept well-informed on how best to address issues surrounding a child with ASD (Mullan et al., 2021). This may be a contributing factor to the higher level of satisfaction compared with the other two parents' responses.

The main limitation of this study is the lack of participants. Since only three responses were usable, the broader generalizability of findings remains limited. Similar to several previous studies, the diversity of responses is relatively low, making it impossible to compare responses between varying demographics (McIntyre & Zemantic, 2016). Along with these limitations, the subjective nature of survey instruments could reduce the validity of findings. While a pilot test was not conducted for this survey, the findings of this study indicate that a more comprehensive study would be desirable. While not completed in this study's survey, future studies should seek to understand the individual autism symptoms of each participant's child. Future research should focus on obtaining a larger sample size so that the information can be used to help clinics and providers. However, despite the lack of participants, those who did answer pointed out dissatisfaction with the services. Future research should build upon this study to collect more data for distribution to Wichita ABA service providers. The results of this study provide a durable template for future investigations.

References

Bulut Ozer, P., & Halfon, S. (2024). Satisfaction in mental health care: Examining psychometric properties of experience of service questionnaire. *Clinical Child Psychology and Psychiatry*.

Garey, J. (2016). *The controversy around ABA*. Child Mind Institute. https://childmind.org/article/controversy-around-applied-behavior-analysis/

McIntyre, L. L., & Zemantic, P. K. (2016). Examining Services for Young Children with Autism Spectrum Disorder: Parent Satisfaction and Predictors of Service Utilization. *Early Childhood Education Journal*, 45(6), 727–734.

Mullan, A., Boyd, K. & McConkey, R. (2021) The Impact of a Brief Home-Based Intervention on Families with a Child with Autism Spectrum Disorder. *Journal of Developmental and Physical Disabilities*, 33, 693–708.

Wodehouse, G. & McGill, P. (2009), Support for family carers of children and young people with developmental disabilities and challenging behaviour: what stops it being helpful?. *Journal of Intellectual Disability Research*, 53: 644-653.

Do not let the world's adversity either stifle your enthusiasm, nor blind your vision. The struggle towards excellence must ever be conducted on the high plains of self-confidence, a sense of purpose, and positive thought.
- Ronald E. McNair

Electromyography-Based Onset Force Detection for Assessing Hand Squeezing Ability in Stroke Patients

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Introduction

Stroke is one of the leading causes of long-term disability, severely affecting motor control and reducing independence in activities of daily living. Reduced hand function and grip strength have a profound impact on patients' quality of life (Hilkens et al., 2024; Lee et al., 2023). Hand squeezing ability serves as a practical and meaningful clinical indicator of motor recovery. However, traditional clinical assessments of grip strength often lack the sensitivity to detect subtle improvements or neuromuscular changes, thus limiting their utility in guiding rehabilitation interventions.

Electromyography (EMG), a method that records electrical activity of muscles, has gained attention as a more sensitive and precise tool for assessing neuromuscular function (Beretta-Piccoli et al., 2020). EMG can detect muscle activation even before visible movement occurs (Mills, 2005; Papazian et al., 2021), making it a promising technique for early-stage stroke rehabilitation where progress may not be outwardly observable. Moreover, advanced EMG signal analysis and real-time feedback capabilities can provide critical insights into performance, fatigability, and recovery trends (Reaz et al., 2006).

Despite its potential, EMG remains underutilized in stroke rehabilitation, particularly in grip strength assessments. There is a gap in the literature concerning how EMG data can be systematically used to personalize and adapt therapeutic strategies (Langhorne et al., 2011). This study addresses that gap by exploring the role of surface EMG in assessing hand squeezing ability during stroke rehabilitation, with a specific focus on identifying differences in muscle activation timing and strength between healthy and simulated stroke participants.

Methods

This study employed a quantitative experimental design to compare forearm muscle activation during hand-squeeze tasks between healthy individuals and those mimicking post-stroke motor impairments. Surface EMG data was collected using the BIOPAC system, while a custom MATLAB-based program was developed to detect the onset of muscle activation and analyze signal characteristics.

Two groups of six participants were recruited. Group 1 consisted of healthy individuals with no neuromuscular

impairments, while Group 2 included participants simulating stroke-like impairment by intentionally delaying or minimizing their squeezing effort. Participants self-reported their health status, and written informed consent was obtained. A JavaScript-based program provided a visual cue instructing participants to squeeze a red foam ball for one second every five seconds. Each session lasted approximately one minute.

Surface electrodes were placed on the forearm muscles responsible for finger flexion. Data were collected in five-second intervals and analyzed using MATLAB to calculate activation onset, amplitude, and frequency. The software's performance was validated against manual assessments for accuracy and consistency.

Results

Results showed clear distinctions between the healthy and simulated stroke groups. Healthy participants-initiated muscle activation approximately 0.25 seconds after the cue, while the simulated group exhibited a delayed response, averaging around 0.75 seconds. Signal strength also differed: healthy individuals produced EMG peaks exceeding 0.8 mV, compared to 0.4 mV for the simulated group. These findings indicate diminished and delayed neuromuscular responses under simulated stroke conditions.

Variability in EMG signals further supported these differences. The healthy group showed low variability in onset time and signal strength (standard deviations of ~0.03 s and 0.07 mV, respectively), whereas the simulated group had higher variability (approximately 0.11 s and 0.16 mV). The custom MATLAB software demonstrated high accuracy, differing from manual inspection by less than 0.05 seconds, thereby validating its reliability for future clinical use.

Discussion

The study reinforces EMG's value as a sensitive and reliable tool for evaluating motor impairment and recovery in stroke rehabilitation. The delayed and inconsistent activation observed in the simulated stroke group mirrors patterns reported in clinical literature regarding stroke-related neuromuscular dysfunction (Papazian et al., 2021). These patterns likely result from disrupted neural communication, slower motor unit recruitment, and increased muscular fatigue all common in stroke patients.

The use of a custom MATLAB program to detect EMG onset adds an important methodological innovation. The close match between automated and manual detections supports the integration of such tools in both clinical and research settings, aligning with prior research on the benefits of automated EMG processing (Reaz et al., 2006).

A notable limitation present in this study is the use of simulated stroke conditions rather than data from real stroke patients. This matters because simulated conditions may not accurately reflect the complexities and variability found in actual stroke cases, potentially skewing the results. Future studies should seek to obtain as realistic a sample as possible to accurately assess data.

A secondary limitation is the relatively small sample size. This is significant as it prevents the application of powerful statistical tests, such as an independent samples T-test, which would determine whether observed differences are statistically significant. Future studies should aim to expand the number of participants to allow for stronger data analysis.

Finally, the data were subject to the influence of external factors such as electrode placement and skin conductivity on EMG signals. This is important because variations in these factors can lead to inconsistent EMG readings, affecting the reliability of the findings. While these limitations do reduce the generalizability of this study, the results found here are still promising, as they provide valuable insights that could inform future research directions.

Conclusion

This study demonstrates the effectiveness of surface EMG in detecting neuromuscular differences between healthy and impaired conditions. The findings validate EMG as a promising tool for stroke rehabilitation, especially when paired with automated detection software. By offering a more nuanced and data-driven assessment of muscle function, EMG can help clinicians tailor interventions and improve patient outcomes. As rehabilitation moves toward individualized care, tools

like EMG will be essential for closing the gap between generalized therapy protocols and specific patient needs.

References

Beretta-Piccoli, M., Cescon, C., Barbero, M., Dalla Torre, A., & Gatti, R. (2020). Evaluation of performance fatigability through surface EMG in health and muscle disease: State of the art. *Arab Journal of Basic and Applied Sciences*, 28(1), 21–40.

Hilkens, N. A., van der Worp, H. B., Kappelle, L. J., & Nederkoorn, P. J. (2024). Stroke. *The Lancet, 403*(10446), 2820–2836.

Langhorne, P., Bernhardt, J., & Kwakkel, G. (2011). Stroke rehabilitation. *The Lancet, 377*(9778), 1693–1702.

Lee, M.-T., Chen, H.-C., Lin, C.-H., & Hsieh, C.-L. (2023). Grip strength differences in middle-aged and older adults and individuals with stroke. *European Journal of Physical and Rehabilitation Medicine, 59*(3).

Mills, K. R. (2005). The basics of electromyography. *Journal of Neurology, Neurosurgery & Psychiatry, 76*(2), ii32–ii35.

Papazian, C., Zanders, H. R., & Stein, J. (2021). Electromyography recordings detect muscle activity before observable contractions in acute stroke care. *Archives of Rehabilitation Research and Clinical Translation, 3*(3), 100136.

Reaz, M. B. I., Hussain, M. S., & Mohd-Yasin, F. (2006). Techniques of EMG signal analysis: Detection, processing, classification, and applications. *Biological Procedures Online, 8*(1), 11–35.

Shang, X., Wang, Z., Zhang, Y., & Li, J. (2021). Grip training improves handgrip strength, cognition, and brain white matter in minor acute ischemic stroke patients. *Clinical Neurology and Neurosurgery, 209*, 106886.

Yu, J., Kim, J., Lee, S., & Park, K. (2020). AI-based stroke disease prediction system using real-time electromyography signals. *Applied Sciences, 10*(19), 6791.

You're eagles! Stretch your wings and fly to the sky.
- Ronald E. McNair

Bringing it Home: How Emotional Labor Affects Home Life Balances

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Introduction

The purpose of this study is to measure the impacts of teacher occupational burnout on their home/life balances between four subsets of people: those with children under the age of 6, those with children over the age of 6 but not yet over 18, those without children, and those with children over the age of 18. Burnout, also known as emotional exhaustion, is a psychological response to chronic interpersonal stress, broken into three categories: "emotional exhaustion; depersonalization; and reduced personal accomplishment" (Carson et al., 2010; Ntim et al., 2023; Zhang et al., 2019). Positions held by teachers and childcare laborers often harbor a heavy desire for emotion work, or emotional labor, the act of inducing or suppressing one's true emotions in hopes of eliciting a positive response from customers or clients, to be provided in the forms of emotional regulation and empathy (Zhang et al., 2019). Surface acting, one of the main forms of emotion work, requires 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). Current gaps exist within the study of surface acting spillover and how it affects the home/life balance of caregivers, their families, and their children. Studies lack research on how this affects the children within the home and whether caregivers are susceptible to burnout during specific windows of a child's life. Previous studies demonstrate that high-stress jobs requiring extensive emotional work can lead to occupational burnout and fatigue (Springer et al., 2023; Zapf et al., 2021). Surface-acting spillover has been shown to have detrimental effects on relationship satisfaction levels, particularly in "perceived inauthenticity" and emotional distance (Bartels et al., 2023). Misalignments between emotions and outward displays caused by surface acting elicit "negative states in the work domain, such as depletion and negative affect, which then lead to detrimental outcomes in the home domain…" (Bartels et al., 2023). This study hypothesizes that those with children under the age of 6 will be more likely to struggle with occupational burnout. Additionally, this study hypothesizes that those without children and those with children outside of the home are less likely to engage in surface acting after leaving their job. Lastly, this study hypothesizes that burnout levels will decrease

as children's age increases. This research aims to fill the gaps in understanding the specific dynamics that affect early childhood education providers and home/life balances, and to propose intentional strategies for improving the emotional well-being and coping mechanisms for said workers.

Methods

Five participants were recruited from the McConnell Air Force Base Child Development Center. All five participants were female and identified as white. Participants ranged from ages 22 to 34, with the median age being 27. Two participants had children both under the age of 6 and over the age of 6, P2 (ages 4 and 8), and P4 (ages 2 and 6). P5 fell into the category of having children over the age of 6, with one child (aged 14). P1 and P3 had no children. No participants fell into the subset of parents with children over the age of 18. The lowest level of education was participant 3 with solely a high school diploma, and the highest level of education was participant 5 with a bachelor's degree in psychology. Participants 1 and 4 both had an associate's degree in early childhood education, and participant 2 had a high school diploma with additional education in cosmetology.

Participants were first given the 33 question Burnout Assessment Tool (BAT) (work version) by Wilmar Schaufeli, Hans De Witte, and Steffie Desart, a quantitative 5-point Likert scale self-report questionnaire intended to measure stress levels, cognitive and emotional impairments, mental distress, and physical stress symptoms (Schaufeli et al., 2019). The results of the Burnout Assessment Tool are broken down into 7 categories: total core symptoms, exhaustion, mental distance, cognitive impairment, emotional impairment, psychological distress, and psychological complaints. Psychological distress and psychological complaints are combined as secondary symptoms when scoring. Statistical norms come from a Flemish population and are provided within the BAT user manual (Schaufeli et al., 2019, pp. 15-16). Participants then engaged in one-on-one interviews, consisting of 8 questions, designed to measure how emotion work and burnout affect home/life balance. These questions pertained to motivational levels, coping mechanisms, surface acting spillover, and how the aging of children impacts parenting.

Results

This study examined how emotional labor and burnout among childcare providers affect their home/life balance, with a focus on whether having children and their ages contributes to differences in burnout risk.

Participants varied in their burnout susceptibility; four participants were at risk in four or more of the six categories, with some showing very high risk in areas like exhaustion, emotional impairment, and mental distance. The highest risk scores did not consistently align with individual parenting status or child's age. One participant was found not at risk of burnout.

When questioned about motivational levels, all participants reported low motivation post-shift. Some needed full days of recovery, and others expressed guilt or resentment due to family obligations. Schedule type (opening vs. closing) impacted motivation levels and home dynamics. Common experiences with surface acting spillover included irritability, withdrawal, overstimulation, and lack of patience with loved ones after work. Participants noted emotional distancing from partners and children, especially on high surface-acting days. Relationship strain was reported across all cases, often tied to fatigue and time scarcity. Participants stated using a range of coping strategies to help mediate burnout, including exercise, mindfulness, isolation, and peer support. However, coping effectiveness and social support varied. One participant described excessive walking as a maladaptive coping strategy.

Participants offered mixed views on parenting difficulty over time. Most agree that early childhood is more physically demanding, while later years involve greater emotional complexity. However, perceived parenting stress was not directly correlated with reported burnout levels. One childless participant (P1) had no significant burnout risk; the other (P3) showed very high risk in most categories. Among those with young children, one (P2) showed moderate risk, while another (P4) was at high risk across several metrics. A participant with a school-aged child (P5) showed minimal risk in most categories, with higher risk only in emotional-related areas.

Discussion

This study sought to test three hypotheses. The first hypothesis was that parents of children under the age of 6 will suffer from higher rates of burnout than those with children over the age of 6 or no children at all. No evidence was found that those with children under the age of 6 suffer from higher rates of burnout than those without children or with children over the age of 6. While higher risks of burnout were observed in parents of children under the age of 6, they were also observed in those without children or those with children over the age of 6. The age of children does not seem to be a factor in the risk of burnout.

The second hypothesis that was tested was that parents without children in the home or those without children will be less likely to engage in surface acting after leaving the workplace. While parents with children in the home suffered high levels of withdrawal after a shift, childcare providers without children were less likely to engage in surface acting after leaving their job than those with children. P1 disclosed an ease at being able to leave stressors at work, whereas P3 found they lack energy to provide surface acting when they return home after the end of their shift.

The third and final hypothesis was that burnout levels will decrease as children age. The potential for burnout was less likely in the participant with a child over the age of 6 than in those with children under the age of 6. However, results were not significant enough to confidently support that participants with older children had lower levels of risk for burnout or emotional exhaustion than those with children under the age of 6.

With annual childcare provider turnover rates between 26–40% (Oberle et al., 2020; Totenhagen et al., 2016), burnout remains a key factor in both workplace and home/life disruption. This study highlights how occupational emotion work not only affects professional settings but spills into caregivers' personal relationships and wellbeing. The findings highlight the need for systemic support structures and better emotional labor training to improve retention and quality of care.

Limitation include having a small sample size. Future studies with a larger sample size could allow for more insight into individual beliefs about complications throughout the aging process, personal spillover effects, and aid in dissimilarity between participants. Furthermore, the sample did not include all established subsets, preventing information that may have been provided by those with children over the age of 18. Additionally, this study lacked variance within participant demographics. Further, this study occurred within one location, utilizing federal employees, multiple of which were military affiliated. This study was also a one-time measurement of burnout that did not account for variances over time, which potentially limits the validity of these findings. While the results are still noteworthy, it is likely that variance would be found within the same test population had they been polled on different days over time. Future studies should seek to deploy a time-series analysis or repeated observations to increase generalizability and validity of findings. Finally, short interview periods limited information obtained. Extended interview periods would have allowed for a deeper understanding of variables that alter home/life balances. Variances between shifts are lacking as well as differences between workweeks and periods of time off, which would better showcase the effects of surface acting on home/life balances as compared to the workdays in which interviews occurred. Questions that more directly inquire about personal stress levels may provide also a deeper understanding of how home/life balances are affected by surface acting spillover and the repercussions of such.

References

Bartels, A. L., Lennard, A. C., Scott, B. A., & Peterson, S. J. (2023). Stopping surface-acting spillover: A transactional theory of stress perspective. *Journal of Applied Psychology*, 108(3), 466–491.

Carson, R. L., Baumgartner, J. J., Tsouloupas, C. N., & Matthews, R. A. (2010, May 14). Emotional Exhaustion, Absenteeism, and Turnover Intentions in Childcare Teachers: Examining the Impact of Physical Activity Behaviors. *Journal of Health Psychology*.

Hong, J., Zhao, J., & Pan, R. (2023). Effects of emotional labor on the turnover intention of kindergarten teachers: A moderated mediation model. *Social Behavior and Personality: An International Journal, 51*(10).

Ntim, S. Y., Qin, J., Antwi, C. O., Aboagye, M. O., Chen, S., & Mensah, E. T. (2023). Early childhood educators' emotional labor and burnout in an emerging economy: The mediating roles of affective states. *Heliyon, 9*(3).

Oberle, E., Cooray, M. S., Pinto, J. B. R., & Gist, A. (2020, July 25). Do students notice stress in teachers? Associations between classroom teacher burnout and students' perceptions of teacher social–emotional competence. *Wiley Online Library*.

Schaufeli, W.B., De Witte, H. & Desart, S. (2019). User Manual – Burnout Assessment Tool (BAT) – Version 2.0. *KU Leuven*, Belgium: Internal report.

Seery, B.L. and Corrigall, E.A. (2009), Emotional labor: Links to work attitudes and emotional exhaustion, *Journal of Managerial Psychology*, 24(8), 797-813.

Springer, A., Oleksa-Marewska, K., Basińska-Zych, A., Werner, I., & Białowąs, S. (2023). Occupational burnout and chronic fatigue in the work of academic teachers–moderating role of selected health behaviours. *PLoS ONE, 18*(1).

Totenhagen, C. J., Hawkins, S. A., Casper, D. M., Bosch, L. A., Hawkey, K. R., & Borden, L. M. (2016). Retaining Early Childhood Education Workers: A Review of the Empirical Literature. *Journal of Research in Childhood Education, 30*(4), 585–599.

Zapf, D., Seifert, C., Schmutte, B., Mertini, H., & Holz, M. (2001). Emotion Work and Job Stressors and Their Effects on Burnout. *Psychology & Health, 16*(5), 527.

Zhang, Q., Yin, J., Chen, H., Zhang, Q., & Wu, W. (2019). Emotional Labor Among Early Childhood Teachers: Frequency, Antecedents, and Consequences. *Journal of Research in Childhood Education, 34*(2), 288–305.

The Risk of Virtual Addiction in Borderline Personality Disorder Like Symptoms

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Introduction

Due to demands of most jobs, social interactions, and places of education, internet access is required; however, excessive use can potentially lead to addiction (Kurniasanti et al., 2019). Internet Gaming Disorder has been recognized by the American Psychiatric Association (APA), but there is little research that explores the extent of this problem (APA, 2022), and other potential online addictions have been overlooked.

Smartphones can easily fit in the palm of the hand and the back of a pocket. This type of access can lead to a phone being addictive to simply have, but excessive use can lead to issues like sleep loss, lack of exercise, and poor academic performance (Alosaimi et al., 2016). Smartphones also give access to social media, leading to potential misuse and addiction, which can lead to mental distress like depression, loneliness, and anxiety (Collins & Grant, 2025).

In-person shopping addiction is well researched (Maraz et al., 2016), but is less so for its digital counterpart, leaving a gap in research on potential risks. Naturally, the internet has made shopping far easier thanks to the ease of access; flashy advertisements, discount offers, and even the simplicity of clicking a button to purchase has led to the potential of developing online shopping addiction (Rose & Dhandayudham, 2014).

Gambling is another activity that has been made easier due to the internet. Gambling is already a disorder within the Diagnostic and Statistical Manual of Mental Disorders (DSM), but its digital counterpart remains under analyzed (APA, 2022). Research by Chóliz and Lázaro-Mateo has found that within a Spanish population, those who gambled online had a higher risk of pathological gambling than those who did not gamble online (2021), but more research is needed to see the risk of this addiction via the internet.

Borderline Personality Disorder and Impulsivity

Borderline Personality Disorder (BPD) is a Cluster B Personality Disorder recognized in the DSM-5-TR defined as a pattern of instability regarding relationships, self-image, and affects (APA, 2022). Impulsivity is a criterion within a BPD diagnosis (APA, 2022) and has been shown to have interactions with

addiction and addictive behaviors, especially in the youth population (Rømer Thomsen et al., 2018). With BPD and impulsiveness, addiction has been recorded to be a risk. Impulsiveness can have relationships with non-substance addiction behavior and an elevated sense of urgency, therefore increasing likelihood of addiction (Rømer Thomsen et al., 2018). With BPD and impulsiveness being correlated, there is the possibility of BPD being correlated with addictions.

Purpose of the Current Study

There is a gap in the literature regarding addictions (Collins & Grant, 2025; Kurniasanti et al., 2019), particularly with nonwestern populations (Alosaimi et al., 2016; Chóliz et al., 2021; Maraz et al., 2016). This study will look to find potential correlations of online addictions, BPD, and impulsiveness and the potential risk of addiction in those with BPD-like symptoms in online spaces. This study employs a survey that measures the level of addiction like behaviors, BPD, and impulsiveness to find potential connections.

Methods

One-hundred and forty-nine participants (106 females, 43 males) from Wichita State University were enlisted via the SONA Experiment Management System. Participants completed a multi-questionnaire Qualtrics survey. Questionnaires included a demographics form, the Bergen Social Networking Addiction Scale (BSMAS) (Andreassen et al., 2016), the Video Game Addiction Test (VAT)(Van Rooij et al., 2012), the Smartphone Addiction Scale – Short Version (SAS – SV)(Kwon et al., 2013), the short version of the Impulse Behavior Scale (S-UPPS-P)(Cyders et al., 2014), the McLean Screening Instrument for BPD (MSI-BPD)(Zanarini et al., 2003), the Online Shopping Addiction Scale (OSA)(Zhao et al., 2017), and the Problem Gambling Severity Index (PGSI)(Miller et al., 2013).

Results

A Pearson correlation was used to analyze potential connections between impulsiveness, BPD, social media, shopping, smartphone, and video game addictions. Due to limited data, gambling addiction was removed from the final analysis. A linear regression analysis was used to measure the effects of BPD, sex, impulsiveness, race, and age compared to social media addiction.

The Pearson correlation reported that all the addictions, aside from video game addiction, were statistically significant with BPD, gender, and impulsiveness. The McLean Screening Instrument showed statistical significance at the 0.01 level for impulsiveness ($r(146) = -.28$, $p = .001$), social media ($r(145) = -.50$, $p < .001$), and smartphone addiction ($r(146) = .29$, $p < .001$) with significance at the 0.05 level for shopping ($r(146) = -.20$, $p= .012$). Impulseivity and social media were negatively correlated while smartphone addiction was positive. Impulsiveness reported statistical significance at the 0.01 level for social media ($r(147) = -.34$, $p < .001$), smartphone ($r(146) = -.38$, $p < .001$), and shopping addiction ($r(146) = .31$, $p < .001$). Social media addiction was statistically significant with two other addictions, those being a positive correlation for smartphones ($r(146) = .62$, $p < .001$) and a negative correlation with shopping ($r(146) = -.30$, $p < .001$). Video game addiction showed no significant correlations, except with smartphone addiction, which was statistically significant at the 0.01 level ($r(146) = .24$, $p = .002$). Using linear regression, results showed statistically significance between social media addiction, impulsiveness, and BPD ($F(5, 142) = 15.47$, $p < .001$) with $R2 = .35$.

Discussion and Limitations

Results indicate that there are significant correlations between BPD, impulsiveness, and online addictions. Impulsiveness is a criterion for BPD, so its significance is expected (APA, 2022). Similar results were found in studies conducted by Ahmed (2022) and Collins and Grant (2025), finding a positive correlation with BPD, screen time, and social media. Impulsiveness may be higher in people who have an internet or shopping addiction, meaning the risk could be higher in people with BPD. No significant correlation was found between BPD and video game addiction. This aligns with the results from Sevintuna et al. (2024), suggesting video game addiction may be present in other psychopathic disorders rather than personality disorders.

Significant correlations between impulsiveness, social media, smartphones, and shopping were expected. Social media, smartphones, and shopping have the aspect of instant gratification, which can lead to continuous usage. The correlation of smartphones with social media and video games is logical as both have

increased ease of access from smartphones. Shopping also has ease of access; information from credit/debit cards and shipping location can be saved, leading purchases to be as easy as a single click of the button.

Significance in the regression model suggests that social media addiction is particularly risky with BPD. BPD has other symptoms such as unstable interpersonal relationships, fear of abandonment, and self-image issues (APA, 2022). Social media may exacerbate these symptoms due to the 24/7 access to people social media can give. This access, mixed with the impulse to use or check social media, could explain the strong relationship between social media and BPD.

A key limitation of this study was its small sample size. Every participant was a student at Wichita State University, limiting the broader applicability of the findings. Younger adults tend to have high levels of impulsiveness in non-substance addictions (Rømer Thomsen et al, 2018), which may not be present in older demographics.

Future Directions and Conclusion

Further research should aim to measure addictions like gambling in more contemporary manners–particularly online forms of gambling. Methods to measure these online versions of addictions should be further developed to more accurately assess the risk of addiction as well as its prevalence. The correlation between BPD and addictions should also be studied further. Impulsiveness has been shown to correlate with all addictions. If impulsiveness is a symptom of BPD, it would mean that these addictions as well as others may be more prevalent in those with BPD. This could lead to more understanding of BPD and addictions, allowing treatments to be developed.

This study explored the correlations of impulsiveness, BPD symptoms, and online addictions. Results provided evidence that there are correlations with online addictions, impulsiveness, and BPD symptoms. These results signal that expanded research with larger and more diverse samples is desirable to increase the validity of the findings. Technology becomes more integrated in everyday life, researching how to reduce the risk of these addictions—BPD symptoms or not—should be a priority.

Works Cited

Ahmed, A. (2022). Screen time addiction and its relationship with borderline personality disorder and psychological distress. *Annals of Human and Social Sciences*, 3(2), 785-795.

Alosaimi, F. D., Alyahya, H., Alshahwan, H., Al Mahyijari, N., & Shaik, S. A. (2016). Smartphone addiction among university students in Riyadh, Saudi Arabia. *Saudi Medical Journal*, 37(6), 675.

American Psychiatric Association. (2022). Diagnostic and statistical manual of mental disorders (5th ed., text rev.).

Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors*, 30(2), 252.

Barker, V., Romaniuk, L., Cardinal, R. N., Pope, M., Nicol, K., & Hall, J. (2015). Impulsivity in borderline personality disorder. Psychological Medicine, 45(9), 1955-1964.

Chóliz, M., Marcos, M., & Lázaro-Mateo, J. (2021). The risk of online gambling: A study of gambling disorder prevalence rates in Spain. *International Journal of Mental Health and Addiction*, 19, 404-417.

Collins, M., & Grant, J. E. (2025). Social media addiction and borderline personality disorder: a survey study. *Frontiers in Psychiatry, 15*, 1459827.

Cyders, M. A., Littlefield, A. K., Coffey, S., & Karyadi, K. A. (2014). Examination of a short English version of the UPPS-P Impulsive Behavior Scale. *Addictive Behaviors, 39*(9), 1372–1376.

Kurniasanti, K. S., Assandi, P., Ismail, R. I., Setiawan Nasrun, M. W., & Wiguna, T. (2019). Internet addiction: a new addiction? *Medical Journal of Indonesia, 28*(1), 82–91.

Kwon, M., Kim, D. J., Cho, H., & Yang, S. (2013). The smartphone addiction scale: development and validation of a short version for adolescents. *PloS one, 8*(12), e83558.

Maraz, A., Urbán, R., & Demetrovics, Z. (2016). Borderline personality disorder and compulsive buying: A multivariate etiological model. *Addictive Behaviors, 60*, 117-123.

Martin, M. (2021). *Computer and internet use in the United States: 2018.* American Community Survey Reports.

Miller, N. V., Currie, S. R., Hodgins, D. C., & Casey, D. (2013). Validation of the problem gambling severity index using confirmatory factor analysis and rasch modelling. *International Journal of Methods in Psychiatric Research*, 22(3), 245–255.

Rømer Thomsen, K., Callesen, M. B., Hesse, M., Kvamme, T. L., Pedersen, M. M, Pedersen, M. U. (2018). Impulsivity traits and addiction-related behaviors in youth. *Journal of Behavioral Addictions 7*(2), 317-330.

Rose, S., & Dhandayudham, A. (2014). Towards an understanding of Internet-based problem shopping behaviour: The concept of online shopping addiction and its proposed predictors. *Journal of Behavioral Addictions, 3*(2), 83-89.

Sevintuna, A. F., Bornovalova, M. A., & Salomon, K. (2024). Correlates of Borderline Personality Disorder Traits and Internet Gaming Disorder in College Students. *Journal of Personality*.

Van Rooij, A. J., Schoenmakers, T. M., Van den Eijnden, R. J., Vermulst, A. A., & van de Mheen, D. (2012). Video game addiction test: validity and psychometric characteristics. *Cyberpsychology, Behavior, and Social Networking, 15*(9), 507-511.

Zanarini, M. C., Vujanovic, A. A., Parachini, E. A., Boulanger, J. L., Frankenburg, F. R., & Hennen, J. (2003). A screening measure for BPD: the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD). *Journal of Personality Disorders, 17*(6), 568–573.

Zhao, H., Tian, W., & Xin, T. (2017). The development and validation of the online shopping addiction scale. *Frontiers in Psychology, 8*, 735.

Exploring Mental Health Challenges in First-Generation Graduate Students: A Qualitative Study

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Introduction

The mental health challenges faced by first-generation graduate students of color represent a critical area of concern in higher education. These students encounter significant barriers, including imposter syndrome, familial expectations, financial pressures, and cultural adjustments which impact their well-being and academic success (Bravata et al., 2020; Morrison et al., 2019). Broad mental health support initiatives have been implemented, yet many fail to address the intersectional struggles of first-generation graduate students of color, who navigate both systemic disadvantages and deeply personal emotional challenges (Stallworth & Maurici-Pollock, 2023).

This study examines these issues, highlighting how systemic structures and lived experiences shape mental health outcomes. While existing research has identified key challenges and coping strategies, there remains a need for deeper qualitative exploration of how students personally experience and navigate these intersecting pressures in their daily lives. This study will address that gap through interviews with three first-generation graduate students of color, centering their voices to inform more responsive support systems.

Methods

This qualitative study employs thematic analysis to explore the lived experiences of first-generation graduate students of color, with particular attention to mental health challenges, coping strategies, and institutional support needs. The research design centers on in-depth, semi-structured interviews to allow for both structural and experiential examination of participants' narratives. The study seeks to illuminate how students navigate complex academic environments while managing personal and systemic stressors.

Participants were recruited through word of mouth and convenience sampling. A total of three graduate-level students were selected based on specific inclusion criteria: each identified as a first-generation graduate student of color, defined as having no parent who completed a graduate degree, and self-identifying as part of a racially or ethnically minoritized group. Additionally, participants were either currently enrolled in graduate school or had graduated within the past year from a master's or doctoral program.

The interview protocol progressed from broad opening questions about participants' academic journeys to focused exploration of four key themes derived from literature: imposter syndrome (Bravata et al., 2020; Parker et al., 2023), financial pressures (Allen et al., 2022; Morrison et al., 2019; Rehfeld et al., 2024), familial expectations (Miner, 2022; Parker et al., 2023), and cultural adjustment (Rehfeld et al., 2024). The protocol concludes with an open-ended invitation for additional reflection.

Results

Three participants from diverse backgrounds were recruited: Participant A (Mexican American man, late 30s), Participant B (African American male veteran, 40s), and Participant C (Mexican American woman, early 20s).

Imposter syndrome manifested differently across participants, with the youngest participant describing persistent self-doubt: "I always feel like I'm not where I should be." The veteran connected this to structural isolation: "There's nobody on this campus that looks like me" among faculty. One participant shared: "Oh, 1,000% like to this day, I still feel it... being in spaces, because originally, before I went into my field, I wanted to be a speech therapist or go into audiology and so, within that field, it was predominantly white women and so huge imposter syndrome." Another explained: "Self-doubt a little bit... but when you walk into a room and you're the only minority there, and as an African American male, you're often the only male in certain rooms, it often feels like, okay, maybe I picked the wrong thing, or maybe I'm in the wrong place." Participant C described her first day experience: "Going into graduate school and being with others that are further ahead of me in the program has been a scary thing... I would come in and I have a class with people that are like third and fourth years, and they're using all this terminology. And I was like, I have no idea what you're talking about right now, and I don't belong here."

Everyday stressors included financial pressures that varied by circumstance, with participants viewing these as part of completing their graduate school experience. Participant B stated, "There's always that little niggle in the back of your mind about money," while describing more severe challenges, "There was a point in time in which I might, I might have to eat less meals because I don't know where my next money is going to come from, so I got to stretch this out." Familial expectations ranged from having none to expecting the same level of involvement in everyday family life. Participant A explained, "For me, and this is very open, I don't think that my family has expectations, given that I'm first gen, immediate and extended... The expectation was high school. Get your high school diploma. That's it." Participant B shared, "I was the black sheep of the family, so they didn't think I made it this far," while Participant C described ongoing obligations and "over explaining what I'm doing to my family... they also would expect me to, like, drop everything." Regarding sense of belonging and cultural adjustment, Participant B emphasized comfort within his program "So, I've been fortunate with the department that I'm in, that I've known a lot of these professors for about a year or two. So, there's really no adjusting to grad school culture." while Participant C reflected on the importance of programming that helps students feel involved and supported in their environment.

Discussion

This study explored the lived experiences of graduate school life among three diverse first-generation students of color, revealing four connecting themes: imposter syndrome, everyday graduate school stresses, impact of familial expectations, and sense of belonging and cultural adjustment. The impact of imposter syndrome was intensified by institutional changes, particularly the elimination of the Office of Diversity and Inclusion, which had provided crucial support. Participants developed coping strategies which they framed as empowerment rather than assimilation. As one participant explained: "I like code switching in certain areas. It allows me to, like, show my level of education and the knowledge that I have in one hand, and then going home and being my like, crazy funny self with, like, my friends or family." Participants also described deliberately asking questions "to make my presence known that I'm actively listening" and "showcasing like my abilities," demonstrating intentional strategies to assert competence in academic spaces. Their experiences challenge deficit models that blame students for their struggles, instead

revealing institutional shortcomings while showcasing remarkable resilience through peer networks and self-care strategies. The everyday financial struggles were intensified by their first-generation status and lack of familial financial support, with unpredictability of stipend payments creating additional stress and cognitive burdens that extended beyond typical graduate school pressures.

Three institutional reforms emerge from these findings: ensuring living wages through stipends and emergency funds, expanding mentorship and faculty diversity, and auditing administrative policies for unintended barriers. These reforms directly address participants' core struggles, as living wages would alleviate financial pressures that forced participants to "eat less meals," while expanded mentorship would address the isolation noted by participants. Study limitations include the small sample size of three participants, which provides rich insights but limits generalizability, and the exclusion of students who left programs before completion, potentially exposing results to survivorship bias. Future research should consider focus groups for larger samples while maintaining narrative depth, recruit former students who didn't complete programs, and examine how factors such as gender, socioeconomic status, immigration status, and sexual orientation intersect with race and first-generation status to create unique graduate school experiences.

Conclusion

The findings revealed that participants actively reframe their challenging experiences as sources of strength and agency. However, these individual resilience strategies highlight the need for systemic institutional changes rather than placing the burden of adaptation solely on students. This study challenges deficit models that blame students for their struggles, instead revealing how institutional shortcomings create unnecessary barriers. Supporting first-generation graduate students of color requires comprehensive institutional reforms including living wage stipends, expanded mentorship and faculty diversity, and policy audits to eliminate unintended barriers. These changes would create environments where students can thrive rather than merely survive their graduate education.

References

Allen, H. K., Lilly, F., Green, K. M., Zanjani, F., Vincent, V.B., & Arrie, A. M. (2022). Graduate student burnout: Substance use, mental health, and the moderating role of advisor satisfaction. *International Journal of Mental Health and Addiction, 20*, 1130–1146.

Bravata, D. M., Watts, S. A., Keefer, A. L., Madhusudhan, D. K., Taylor, K. T., Clark, D. M., Nelson, R. S., Cokley, K. O., & Hagg, H. K. (2020). Prevalence, predictors, and treatment of impostor syndrome: A systematic review. J*ournal of General Internal Medicine, 35*(4), 1252–1275.

Miner, M. A. (2022). Caught in limbo: Mapping social spaces for first-generation students in graduate school. *Humanity & Society, 46*(3), 395–418.

Morrison, N., Machado, M., & Blackburn, C. (2019). Student perspectives on barriers to performance for Black and minority ethnic graduate-entry medical students: A qualitative study in a West Midlands medical school. *BMJ Open, 9*(11), e032493.

Parker, J. S., Haskins, N., Coleman-Chatman, T., Duru, C., Ramirez, D., Chae, N., ... Nortey, A. (2023). Dismantling the imposter syndrome: A case study of early career women of color in school mental health fields. *The Journal for Specialists in Group Work, 49*(1), 3–24.

Rehfeld, D. M., Renbarger, R., Sulak, T., Kugler, A., & DeMeyer, P. (2024). Improving equitable access to graduate education by reducing barriers to minoritized student success. *Education Sciences, 14*(3), 298.

Stallworth, R., & Maurici-Pollock, D. (2023). Who are first-generation graduate students and why should LIS care? *Journal of Education for Library and Information Science, 64*(4), 512–522.

Before you can make a dream come true, you must first have one.
- Ronald E. McNair

The Economic Reward for a Degree in Economics

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Introduction

A shift towards service work and an uptick in demand for skills in the labor market have increased the need for postsecondary education for young adults entering the workforce. Studies find college graduates enjoy higher wages, more desirable jobs, and less chance of unemployment (Carnevale et al., 2021; Chan, 2016; Wolla et al., 2023). The result has been an influx in student enrollment over the past half-century (Andrews et al., 2022; Korhonen, 2023). As students enter college with hopes of obtaining a great return on their investment, it is important to recognize that not all degrees have the same economic return.

Among academic fields, economics has garnered particular attention. Black et al. (2003) found economics majors had positive results regarding occupational distribution, average wage gap from other majors, and propensity for obtaining a higher degree, that illustrated their economic reward. Economics majors have great versatility in the labor market, demonstrated by a wide dispersion across occupations. They had relatively higher earnings and lifetime wealth. Similarly, economics majors had relatively greater propensity to obtain a higher degree, demonstrating economics' value in graduate school preparation. These factors indicate that when compared to similar majors like business, economics is superior in many categories (Black et al., 2003).

Recent research on economic reward in more concentrated sampling populations yields conflicting results. Bleemer & Mehta (2022) investigated the effect of studying economics on University of California, Santa Cruz student's starting wages. Using a stipulation that required students pursuing economics to meet a certain GPA threshold before being admitted to the major, researchers examined the discontinuity between those just above and below the threshold. Students just above had a 46% increase in earnings, increasing long-term rewards and labor market outcomes (Bleemer & Mehta, 2022). Andrews et al. (2017) conducted a similar investigation at five Texas universities. Comparing students who barely met GPA required to pursue a business degree to those just below, Andrews et al. found business majors had significantly higher wage gains of 80% to 130%, 12+ years after entering college (Andrews et al., 2017). Akbari & Aydede (2015) suggests economics produces

lower economic reward than business majors, having lower hourly wages than all business majors excluding marketing (Akbari & Aydede, 2015).

Current Study

Existing literature demonstrates the economic benefit of an undergraduate degree in economics compared to other majors varies. However, while Black et al. (2003) looked at this phenomenon through a national survey, the various changes in the US economy throughout the past few decades warrant a fresh perspective on the issue. More recent studies focusing on smaller groups of schools (Akbari & Aydede, 2015; Bleemer & Metha, 2022; Andrews et al, 2017) limited the scope, making analysis of current trends nationwide difficult. This study seeks to add to this investigation by further exploring the current outcomes of majoring in economics compared to other majors by using the 2021 National Survey of College Graduates (NSCG) to conduct an aggregate data analysis on a national scale. Observing these trends determines whether economics still retains comparable economic rewards to the past and reveals its standing among other majors.

Methodology

Similar to Black et al. (2003), the NSCG's 142 fields of study were aggregated to avoid small sample sizes and coded to further delineate responses into more specific major groups. The sample was restricted to individuals ages 25-55 and excluded surveyors without major or salary responses. This brought the final sample to 63,576 respondents, 1,179 of whom were economics majors.

To examine wage differences of different college majors, the following regression model used by Black et al. was employed: $\ln(y_i) = g(X_i) + M_T\beta + u_i$ (2003). In this model, the term $\ln(y_i)$ is the natural log of *ith* worker's wage rate per hour (calculated by standard practice of dividing salary by annual hours worked, or the average hours per week multiplied by 52). X_i is a vector of demographic covariance that includes age, race (Asian, Native, Black, White, Hispanic, Pacific or Other), and gender (male or female). *M* is a vector of education covariates (college majors), and β represents parameters of interest. The variable u_i is the function's error term.

Since the function of $g(X_i)$ is not specified parametrically, this regression demeans data for each cell in X. The data is then regressed on the vector of college majors to predict the effect of each major on wages earned. This approach allows wage differences linked to college majors to be determined by comparing workers with identical demographic characteristics. This model was then estimated with STATA statistical software, with standard errors reported to allow each cell differing variances through STATA's cluster command. Economics was excluded, serving as the base from which all other majors are compared. Relative wage gaps were then investigated, along with occupational distribution and population within graduate programs.

Results

When examined alongside a cohort of majors, economics displays breadth and larger distribution in occupational outcomes. Larger percentages work in fields such as mid-level managers, top-level managers, or economists, with majors heavily concentrated in accounting, auditing, finance and management-related occupations. While lower in concentration, they are further spread in a range of other occupations as well, such as law and various business-related positions. While not the most prevalent, economics majors are well-represented among higher-earning occupations and occupations akin to management-level positions.

The next comparison focuses on the highest degree earned by those in different undergraduate majors. Degree categories include bachelor's, master's, professional degree (JD, MD, MBA, etc.), and PhD. Within specific higher degree groups, economics was in the top five highest percentages to get a master's degree (21.54% getting a master's degree) and the top seven highest to get a professional degree (0.59% getting a professional degree). This is consistent with individuals majoring in economics being more likely than other majors to pursue higher management with MBAs or work in the law field with a JD. Marketing, social service, other non-S&E, science, history and political science majors had higher percentages of students pursuing a professional degree. However, it's worth noting that within this dataset, only social science and marketing majors had over 1% of students with a professional degree. Economics had no PhD earners in the total population of 36 PhD earners.

Using the regression model, economics majors compare well regarding wages. According to the results of the investigation, economics is in the top nine wage earners. Computer science, finance, and all engineering majors earned a higher relative wage than economics, with gaps for computer science, aerospace engineering, chemical engineering and electrical engineering being considerably higher. Not surprisingly, those in majors like education, the arts, social services, liberal arts, history, other social sciences, and other non-science/engineering majors, made considerably less than economics majors. When compared to business majors specifically, economics falls in the higher relative area of earnings, falling only below finance majors.

Conclusion

According to the results of this investigation, economics appears to have a favorable economic benefit. Economics degree holders have a broader range of occupations, suggesting economics majors have more versatility in their job selection than others. They also have a relatively high proportion of management-level positions, suggesting those in economics have more ability to advance within and take leadership roles in their occupations.

Economics similarly benefits from positive average wage gaps. While surpassed by a few STEM-based majors and finance, economics proves to bring in relatively higher wages to most majors assessed. It ranks second in the field of business, and while not quite meeting the top spot per Black et al's (2003) estimates, continues to surpass those in other fields of business. Finally, economic benefit is strengthened through the propensity of economic majors to pursue graduate education. Economics holds one of the highest proportions to get above a bachelor's degree, taking spots in the top five and seven to get either a master's or professional degree. This solidifies the value of an economics degree in preparing those studying it for graduate school.

Possible limitations to this study include high p-values (e.g. > 0.05) for accounting, other science/engineering majors, other business and math & statistics, which indicate observed difference in earnings for these groups is not statistically significant and consequence of random variation rather than actual underlying difference. For future studies, accessing wage differences based on major at a higher graduate degree level would prove valuable and shed light on the long-term impact of one's degree choice. Additionally, analysis of differing majors' salaries at comparable jobs or positions would be pertinent to further investigation.

References

Akbari, A. & Aydede, Y. (2015). Economic benefits of studying economics in Canada: a comparison of wages of economics majors with wages in other fields of study, Circa 2005. *Canadian Journal of Higher Education*.

Andrews, R., Imberman, S., Lovenheim, M., & Stange, K. (2022) The returns to college major choice: average and distributional effects, career trajectories, and earnings variability. *NBER Working Paper No. 30331, National Bureau of Economic Research*.

Andrews, R., Imberman, S., & Lovenheim, M. (2017). Risky business? The effect of majoring in business on earnings and educational attainment (NBER Working Paper No. 23575). *National Bureau of Economic Research*.

Black, D. A., Sanders, S., & Taylor, L. (2003). The economic reward for studying economics. *Economic Inquiry, 41*(3), 365-377.

Bleemer, Z., & Mehta, A. (2022). Will studying economics make you rich? A regression discontinuity analysis of the returns to college major. *American Economic Journal: Applied Economics, 14*(2), 1–22.

Carnevale, A. P., Cheah, B., & Hanson, A. R. (2015). The economic value of college majors. *Georgetown University Center on Education and the Workforce*.

Carnevale, A. P., Cheah, B., & Wenzinger, E. (2021). The college payoff: more education doesn't always mean more earnings. *Georgetown University Center on Education and the Workforce*.

Chan, R. Y. (2016). Understanding the purpose of higher education: An analysis of the economic and social benefits for completing a college degree. *Journal of Education Policy, Planning and Administration, 6*(5), 1-40.

Korhonen, V. (2023, October 6). *Educational attainment in the U.S.* 1960-2022. Statista. https://www.statista.com/statistics/184260/educational-attainment-in-the-us/

Wolla, S. A., Vandenbroucke, G., & Tucker, C. (2023, September). *Is college still worth the high price? Weighing costs and benefits of investing in human capital*. Federal Reserve Bank of St. Louis.

Illuminating Pathways

30 YEARS OF EXCELLENCE

Extended Literature Reviews Summaries

Whether or not you reach your goals in life depends entirely on how well you prepare for them and how badly you want them.
- Ronald E. McNair

From Public Housing to Chasing Profits: How Economic Incentives Replaced the Public Mission of Affordable Housing in America

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Introduction

Historical Overview: Divestment from Public Housing

Federal involvement in public housing began with the U.S. Housing Act of 1937 and expanded through the Housing Act of 1949, establishing a commitment to providing affordable housing through federally funded, locally managed developments. However, starting in the 1970s, public housing came under criticism for contributing to poverty concentration, racial segregation, and decay (Vale & Freemark, 2012). These criticisms gained traction in the 1980s during the Reagan administration, which pushed for market-based solutions and reduced government intervention.

The shift away from public housing was formalized with programs like HOPE VI in the 1990s, which aimed to replace deteriorating developments with mixed-income communities but often led to a net loss of deeply affordable units (Popkin et al., 2009). As support for traditional public housing declined, federal policy turned to privatized solutions like Housing Choice Vouchers and the Low-Income Housing Tax Credit (LIHTC). This marked a philosophical shift, treating housing affordability as a market issue rather than a public obligation (Goetz, 2012). Critics argue this market-driven approach prioritizes redevelopment and profit over equitable access and long-term affordability.

Rise of Public-Private Models and Nonprofit Development

The federal government began moving away from directly providing housing in the 1960s, with President Lyndon B. Johnson urging private industry to play a greater role. This shift culminated in the creation of the Low-Income Housing Tax Credit (LIHTC) in 1986, which incentivizes private investment in affordable housing by offering tax breaks. While LIHTC has helped create millions of units, it often excludes the poorest households and raises concerns about long-term affordability once rent restrictions expire (DiPasquale, 1999).

As federal involvement declined, local governments and nonprofit organizations stepped in to fill the gap. Nonprofits, especially Community Development Corporations (CDCs), focus on reinvesting in communities, balancing financial sustainability with resident needs. These groups often use a mix of

funding sources to build and maintain affordable housing (Bratt, 2012). However, despite their crucial role, nonprofits face financial limitations that restrict their impact. Together, these developments reflect a hybrid housing policy model that blends public goals with private and civic sector participation.

Urban Economics Framework

Urban economics helps explain why the private market struggles to meet affordable housing needs. Developers lack financial incentives to build low-income units due to high costs and low returns, illustrating a classic market failure (Quigley & Raphael, 2004). Government intervention, through subsidies or mandates, is essential to fill this gap.

Zoning policies also contribute to scarcity. Exclusionary practices and Not in My Back Yard (NIMBY) attitudes limit where affordable housing can be built, driving up land costs and reinforcing segregation (Hankinson, 2018). Economists argue affordable housing is a merit good that benefits society, especially children, by improving family stability and well-being. These social gains make a strong case for public investment.

Finally, the concept of spatial mismatch highlights how affordable housing is often located far from jobs and services, increasing transportation burdens and limiting access to opportunities (Kain, 1968). Solving this requires placing affordable units in resource-rich areas, a challenge shaped by both economic and political barriers.

Conclusion and Implications for Policy and Practice

The U.S. affordable housing landscape has shifted from direct federal provision to reliance on market-based tools like LIHTC and increased involvement from nonprofits and local governments. Guided by urban economics, this literature review identifies core issues including market failure, exclusionary zoning, and spatial mismatch, as barriers to housing access for low-income communities.

Current models reflect a tension between economic efficiency and the moral obligation to treat housing as a public good. While incentive-based programs attract private investment, they often fall short on equity, permanence, and community empowerment. The fragmented system of housing provision has led to uneven outcomes.

Understanding the financial, regulatory, and structural barriers is essential to expanding the reach of community-based housing models like community land trusts, limited-equity cooperatives, and resident-led initiatives. Research should explore creative financing strategies, including blended capital stacks, social impact investments, philanthropic support, and policy reforms that reduce land acquisition barriers, streamline zoning processes, and secure long-term affordability.

Bridging these approaches will require new policy tools and a renewed commitment to housing as a foundation for opportunity, dignity, and inclusive economic growth. Looking ahead, research should focus on community perspectives by conducting a housing needs and preferences survey targeted at renters seeking affordable housing. The proposed study would explore which housing types, features, and amenities are most valued by renters, particularly those from historically underserved populations. The goal is to generate data that can inform more resident-centered development practices and help policymakers, planners, and nonprofit developers align new housing projects with actual community priorities. The survey will include both quantitative and qualitative components to capture a nuanced understanding of affordability beyond rent levels, examining how elements such as transportation access, unit size, green space, and onsite services affect perceived housing quality and long-term stability. By centering the voices of renters, this research seeks to support more equitable and effective housing solutions that reflect the lived experiences of those most impacted by the affordability crisis.

References

Bratt, R. (2012). The quadruple bottom line and nonprofit housing organizations in the United States. *Housing Studies, 27*(4), 438-456. https://doi.org/10.1080/02673037.2012.677016

Dipasquale, D. (1999). Why don't we know more about housing supply? *Journal of Real Estate Finance and Economics, 18*(1), 9-23. https://doi.org/10.1023/A:1007729227419

Goetz, E. G. (2012). The transformation of public housing policy, 1985-2011. J*ournal of the American Planning Association, 78*(4), 452-463. https://doi.org/10.1080/01944363.2012.737983

Hankinson, M. (2018). When do renters behave like homeowners? high rent, price anxiety, and NIMBYism. *American Political Science Review, 112*(3), 473-493. https://doi.org/10.1017/S0003055418000035

Kain, J. F. (2004). A pioneer's perspective on the spatial mismatch literature. *Urban Studies (Edinburgh, Scotland), 41*(1), 7-32. https://doi.org/10.1080/0042098032000155669

Popkin, S. J., Levy, D. K., & Buron, L. (2009). Has Hope VI transformed residents' lives? New evidence from the Hope VI panel study. Housing Studies, 24(4), 477–502. https://doi.org/10.1080/02673030902938371

Quigley, J. M., & Raphael, S. (2004). Is housing unaffordable? Why isn't it more affordable? *Journal of Economic Perspectives, 18*(1), 191-214. https://doi.org/10.1257/089533004773563494

Vale, L. J., & Freemark, Y. (2012). From public housing to public-private housing. *Journal of the American Planning Association, 78*(4), 379-402. https://doi.org/10.1080/01944363.2012.737985

True courage comes in enduring, persevering, the preparation and believing in oneself.
- Ronald E. McNair

First Generation Latine College Students: Navigating Intersectional Identities on Campus

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Introduction

The definition of a first-generation (FG) college student is a person whose parents have not completed a four-year degree. Many FG students, particularly those from Latine backgrounds, have limited exposure to higher education and lack social capital that continuing generation students have (Payne et al., 2023). The Latine population represents the most significant minority within the U.S., yet only 13% have attained a four-year degree (Storlie et al., 2016). With 44% of Latine students being FG, many only think about college during their final years of high school (Excelencia in Education, 2019). These students often come from low-income households and face additional cultural expectations that can both support and pressure them in their academic journey. Navigating higher education can be challenging, especially for those unfamiliar with the campus system and its norms. In the case of FG Latine students, they are at a unique disadvantage as they do not have insider knowledge or family guidance, and can feel overwhelmed or disconnected, which impacts their persistence towards success. Studies show that 71% of FG students are likely to leave college during their first year compared to their non-first-generation peers (Pratt et al., 2017). Universities must adopt inclusive practices and provide support tailored to the needs of FG students. This literature review explores how cultural and familial influences, academic navigation, and institutional support systems affect the college experiences of FG Latine students.

Cultural/ Family background

FG Latine college students often navigate the duality of pursuing personal aspirations while honoring family obligations and values shaped by their cultural expectations. Within numerous Latine households, the idea of interdependence is strong as family members share responsibilities and support each other, even if that means putting educational goals on hold (Sánchez et al., 2010). While this cultural identity can serve as an emotional and motivational strength, it also carries financial and psychological weight. Many FG students come from low-income backgrounds and face intense pressure to succeed, not just for themselves, but for their families (Pratt et al., 2017). These students often find themselves navigating a cultural paradox: college demands independence, yet their upbringing values family-centered roles and expectations (Covarrubias &

Valle, 2023). A recurring theme in this review is the push-and-pull between soft independence striving for personal growth while maintaining close family ties and traditional interdependence. This conflict of cultural identity can fuel inner conflict, stress, and self-doubt. Family achievement guilt adds another layer to this struggle. Students may feel undeserving or uneasy about surpassing their family's educational or economic status (Covarrubias & Fryberg, 2015). It is common for parents to frame academic success as a way of repaying their sacrifices, which can motivate students, but can also stir up guilt and anxiety (Enriquez, 2011). Despite these challenges, reframing academic milestones as collective achievements can help students cope with stress and stay aligned with their goals (Covarrubias & Fryberg, 2015).

Navigating the Higher Education Setting

FG Latine college students often face academic challenges when transitioning into higher education; they frequently approach this transition with a high degree of self-reliance, often turning to digital resources before seeking help from peers, teaching assistants, or professors (Payne et al., 2023). This preference for independent problem-solving reflects the valuing of autonomy, which may stem from the idea that seeking help is a sign of weakness. As a result, FG Latine students can miss opportunities for enhanced academic support and guidance. Correspondingly, they face barriers in accessing internships and career preparation resources due to a lack of social capital and early exposure to career pathways (Nichols & Valle, 2024). While continuing-generation students often have the benefit of utilizing family networks, FG Latine students tend to pursue unrelated jobs out of necessity, which limits career alignment. The lack of structured career preparation further disadvantages FG Latine students in building professional networks. Therefore, institutions must develop targeted support systems and inclusive policies that connect FG Latine students to both academic help and career development opportunities.

Higher Education Setting Supports

Higher education institutions play a significant role in supporting FG Latine students through inclusive programs, mentorship, culturally responsive teaching, and targeted transition initiatives. First-generation support programs and Hispanic-Serving Institutions (HSIs) help foster college access and persistence by offering mentoring, tutoring, and family engagement opportunities that build social capital and a college-going identity (Saunders & Serna, 2004; Nuñez & Kim, 2012). Nevertheless, the graduation gap persists, highlighting the need for more effective, culturally grounded strategies. Mentoring and advising models are particularly impactful for FG Latine students who may be unfamiliar with college systems or norms, providing both academic guidance and emotional support, reducing isolation and increasing confidence (William & Ferrari, 2015). Culturally responsive pedagogy further strengthens the identity of FG Latine students, enhancing engagement through relatable course content and ensuring that faculty representation reflects the diversity of students. Bridge programs and summer transition initiatives show promise in easing the college transition and building social networks, although research indicates mixed outcomes in academic performance (Gutzwiler, 2020). Ultimately, institutions must evaluate and refine these initiatives to better meet the unique needs of FG Latine students and improve long-term retention and success.

Discussion

This extended literature review demonstrates that FG Latine college students face distinct and layered challenges that set back their academic success. Most FG students come from low-income households and lack the social capital to compete with continuing-generation peers that have the familial connections for the college experience, resulting in a competitive disadvantage (Payne et al., 2023; Pratt et al., 2017). In addition to financial insecurity, they must navigate the complexities of unfamiliar academic systems while balancing family obligations and cultural expectations (Sánchez et al., 2010; Covarrubias & Fryberg, 2015). Within Latine families, cultural values especially around interdependence and achievement can serve as both sources of motivation and internal conflict. Students frequently report feelings of guilt or pressure tied to surpassing their family's educational accomplishments, even as family support inspires them to persist (Covarrubias & Valle, 2023; Enriquez, 2011).

Another significant finding centers on how FG Latine students seek academic help. Many delay seeking

support from faculty and instead turn to online tools or peers, often due to fear of being perceived as incapable or underprepared (Payne et al., 2023). In addition, they encounter disadvantages in securing internships, mentorship, and career preparation opportunities compared to their continuing-generation peers, primarily due to a lack of early access and institutional connections (Nichols & Valle, 2024). Although Hispanic-Serving Institutions (HSIs) and FG specific programs have expanded, a persistent graduation gap remains, indicating these resources may not be reaching all students effectively (Nuñez & Kim, 2012). Culturally responsive strategies, such as inclusive teaching practices, diverse faculty representation, and summer bridge initiatives, have shown promise, though studies report mixed outcomes, underscoring the need for more specialized interventions (Williams & Ferrari, 2015; Gutzwiler, 2020).

These findings underscore the importance of developing targeted, culturally sensitive support systems to enhance retention and degree completion for FG Latine students. At Wichita State University, nearly half of the students identify as first-generation, and the institution has been recognized as an emerging HSI (Wichita State News, 2023). The project's next step, to capitalize on this momentum, is to hold focus groups with FG Latine students to determine what services on campus they find most useful, what obstacles they encounter, and what motivates them to persevere. To ensure a diverse range of viewpoints, students from various academic fields will be selected. All focus group conversations will be recorded and analyzed through thematic classification. Results may inform future initiatives and enhance institutional support for FG Latine students.

References

Covarrubias, R., & Fryberg, S. A. (2015). Movin' on up (to college): First-generation college students' experiences with family achievement guilt. *Cultural Diversity & Ethnic Minority Psychology, 21*(3), 420–429.

Covarrubias, R., & Valle, I. (2023). In the in-between: Low-income Latinx students' sensemaking of paradoxes of independence and interdependence. *Personality and Social Psychology Bulletin, 51*(1), 17–32.

Enriquez, L. E. (2011). "Because we feel the pressure and we also feel the support": Examining the educational success of undocumented immigrant Latina/o students. *Harvard Educational Review, 81*(3), 476–500.

Excelencia in Education. (2019, April). *Latinos in higher education: Compilation of fast facts.* Washington, DC: Excelencia in Education. https://www.edexcelencia.org/research/publications/latinos-higher-education-compilation-fast-facts

Gutzwiler, A. D. (2020). *Influence of summer bridge programs on first-generation Latino students' academic success*. Walden University. https://scholarworks.waldenu.edu/dissertations/8289/

Nichols, L., & Valle, M. (2024). Employment and the structure of colleges as barriers to college match and degree completion for Latinx first-generation college students. *Journal of Latinos and Education, 23*(4), 1472–1488.

Nuñez, A.-M., & Kim, D. (2012). Building a multicontextual model of Latino college enrollment: Student, school, and state-level effects. *The Review of Higher Education, 35*(2), 237–263.

Payne, T., Muenks, K., & Aguayo, E. (2023). "Just because I am first gen doesn't mean I'm not asking for help": A thematic analysis of first-generation college students' academic help-seeking behaviors. *Journal of Diversity in Higher Education, 16*(6), 792–803.

Pratt, I. S., Harwood, H. B., Cavazos, J. T., & Ditzfeld, C. P. (2017). Should I stay or should I go? Retention in first-generation college students. *Journal of College Student Retention: Research, Theory & Practice, 21*(1), 105–118.

Sánchez, B., Esparza, P., Colón, Y., & Davis, K. E. (2010). Tryin' to make it during the transition from high school: The role of family obligation attitudes and economic context for Latino-emerging adults. *Journal of Adolescent Research, 25*(6), 858–884.

Saunders, M., & Serna, I. (2004). Making college happen: The college experiences of first-generation Latino students. *Journal of Hispanic Higher Education, 3*(2), 146–163.

Storlie, C. A., Mostade, S. J., & Duenyas, D. (2016). Cultural trailblazers: Exploring the career development of Latina first-generation college students. *The Career Development Quarterly, 64*(4), 304–317.

Williams, S. M., & Ferrari, J. R. (2015). Identification among first-generation citizen students and first-generation college students: An exploration of school sense of community. *Journal of Community Psychology, 43*(3), 377–387.

Wichita State News. (2023, September 27). *Wichita State, WSU Tech celebrate highest historical enrollments*. Wichita State University. https://www.wichita.edu/about/wsunews/news/2023/09-sept/enrollment_1.php

Do not let the world's adversity either stifle your enthusiasm, nor blind your vision. The struggle towards excellence must ever be conducted on the high plains of self-confidence, a sense of purpose, and positive thought.
- Ronald E. McNair

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