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EXAMINING THE IMPACT OF COGNITIVE CONTROL AND DISCRIMINATION ON MENTAL HEALTH OUTCOMES IN DIVERSE PAKISTANI AND AFGHAN COMMUNITIES

Original Article

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ABSTRACT

Background: Cognitive control plays a vital role in emotional regulation and decision-making, particularly in marginalized communities facing socio-economic disadvantages and systemic discrimination. These challenges contribute to heightened psychological stress, impacting mental health outcomes such as anxiety, depression, and PTSD. This study investigates the association between cognitive control, discrimination, and mental health outcomes in diverse Pakistani and Afghan communities, focusing on vulnerable groups including females, transgender individuals, and ethnic minorities.

Objective: To examine the relationship between cognitive control, discrimination, and mental health outcomes and identify how demographic factors like gender, education, ethnicity, and income influence psychological well-being in marginalized populations.

Methods: A quantitative cross-sectional research design was employed with 147 participants recruited through non-probability purposive sampling from marginalized communities in Pakistan and Afghanistan. Data were gathered using online surveys between March 2024 and June 2024. The Cognitive Control and Flexibility Questionnaire, Mental Health Inventory, and Everyday Discrimination Questionnaire were utilized for data collection. Statistical analyses, including descriptive statistics, correlation analysis, ANOVA, and regression analysis, were conducted to explore associations between cognitive control, discrimination, and mental health outcomes.

Results: Significant gender differences were observed in cognitive control ($p = 0.01$), with males (Mean = 139.1, SD = ±19) outperforming females (Mean = 137.5, SD = ±14.2) and transgender participants (Mean = 125.5, SD = ±17.9). Transgender individuals faced the highest discrimination levels ($p < 0.001$) and severe mental health issues. Education influenced cognitive control ($p = 0.03$) and mental health ($p = 0.01$), with participants holding bachelor's degrees exhibiting better outcomes. Ethnic disparities were significant, with Punjabis and Pashtuns experiencing higher discrimination ($p < 0.001$). Regression analysis revealed that cognitive control ($\beta = 0.37$, $p < 0.001$) and discrimination ($\beta = 0.154$, $p < 0.001$) accounted for 38% of the variance in mental health outcomes ($R^2 = 0.38$, $F(2,144) = 45.7$, $p < 0.001$).

Conclusion: The findings highlight the adverse cognitive and emotional impacts of socio-economic disadvantage and discrimination on marginalized groups. Enhanced cognitive control is linked to better mental health, whereas higher discrimination correlates with poorer outcomes. Culturally sensitive interventions are essential for improving mental health equity in these communities.

Keywords: Anxiety, Cognitive Control, Depression, Discrimination, Ethnic Groups, Mental Health, Socioeconomic Factors.

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INTRODUCTION

The intricate relationship between cognitive control and mental health outcomes in marginalized communities presents a multifaceted challenge, shaped by societal inequities, discrimination, and limited access to essential resources. Cognitive control, which encompasses an individual's ability to regulate emotions, attention, and behavior, plays a pivotal role in determining psychological resilience in the face of adversity. Marginalized populations, often defined by factors such as race, ethnicity, gender, socio-economic status, and geographic location, frequently encounter systemic barriers that exacerbate psychological stressors, resulting in disproportionate mental health burdens. According to the World Health Organization, these groups face significant challenges in accessing healthcare, which contributes to disparities in chronic disease prevalence and mortality rates. Additionally, UNICEF highlights that marginalized individuals are at heightened risk of malnutrition, limited educational opportunities, and exploitative labor conditions. These stressors cumulatively affect psychological well-being, compounding mental health issues such as anxiety, depression, and post-traumatic stress disorder (PTSD)(1, 2). In Pakistan, minorities constitute approximately 3.7% of the population, often facing restricted access to social services and enduring stigmatization that intensifies mental health challenges. Similarly, in Afghanistan, prolonged exposure to violence, ethnic discrimination, and systemic inequities contribute to high rates of psychological disorders among groups such as the Hazara. Women and girls, particularly in rural regions, face additional layers of oppression, limiting their educational and economic opportunitieshese adversities contribute to the psychological toll of marginalization, which manifests as emotional distress, impaired cognitive function, and deteriorating social well-being(3, 4).

Research suggests that persistent exposure to discrimination and social exclusion can impair cognitive control, diminishing an individual's capacity for emotional regulation and decision-making. This phenomenon is further compounded by the stereotype threat, where individuals from marginalized groups, particularly those negatively stereotyped, demonstrate diminished cognitive performance under stress. For example, ethnic minorities and refugees often exhibit heightened anxiety and impaired executive functioning due to chronic stress exposure, reinforcing disparities in mental health outcomes. Yet, paradoxically, some individuals develop heightened cognitive control as an adaptive response to systemic adversity, enhancing resilience and coping mechanisms(5, 6). The socio-economic environment plays a critical role in shaping cognitive control capacities. Research indicates that individuals from lower socio-economic backgrounds, particularly children, experience elevated stress levels due to factors such as poverty, limited educational access, and neighborhood violence, all of which require sustained cognitive effort to manage. While some may develop enhanced cognitive flexibility and attentional control as adaptive strategies, chronic exposure to stressors without adequate support can lead to cognitive overload and burnout, ultimately impairing mental health. Cultural differences also influence how cognitive control functions across various marginalized groups, highlighting the need for culturally sensitive interventions(7, 8).

Moreover, systemic biases in healthcare access and diagnosis contribute to mental health disparities. Studies reveal that racial and ethnic minority children often receive delayed diagnoses for mental health conditions, which undermines the effectiveness of early interventions. The ongoing stress of navigating discriminatory environments, coupled with socio-economic disadvantages, further compounds these disparities, contributing to chronic mental health conditions such as depression, anxiety, and PTSD. Individuals who perceive disrespect or misunderstanding from healthcare providers are less likely to seek help, perpetuating cycles of poor mental health outcomes(9, 10). Given these complexities, this study seeks to investigate how cognitive control functions within marginalized communities, exploring the extent to which discrimination, socio-economic adversity, and cultural factors shape mental health outcomes. It will also assess whether cognitive control serves as a protective factor or a vulnerability in the context of chronic stress and systemic inequities. By examining the dynamic interplay between cognitive control and mental health in Pakistani and Afghan marginalized populations, the research aims to identify specific factors contributing to psychological resilience or vulnerability. Ultimately, this investigation strives to inform culturally appropriate interventions, promoting equitable mental health care and addressing disparities in mental health outcomes among marginalized groups. The objectives of this study are threefold: to examine the intersection between cognitive control and mental health outcomes in marginalized communities, to explore potential differences in cognitive control functions among these groups, and to assess how varying levels of cognitive control influence mental health outcomes such as anxiety, depression, and general well-being(11, 12).

METHODS

This study employed a quantitative cross-sectional research design to examine the relationship between cognitive control and mental health outcomes in marginalized communities within Pakistan and Afghanistan. The research targeted individuals aged 18 years and above who belonged to underrepresented or marginalized groups. Participation was voluntary, and informed consent was obtained from all participants before data collection commenced. Individuals who were unwilling to participate or who had severe cognitive impairments or neurological disorders that could significantly interfere with their cognitive control functions were excluded from the study to maintain the validity and reliability of the results(13). The sample size was determined using the World Health Organization's sample size calculation method, with a confidence interval (CI) of 95%, an anticipated population proportion of 0.90, and an absolute precision of 0.05. Based on these parameters, the required sample size was calculated to be 147 participants. A purposive sampling technique was adopted to select individuals from marginalized communities who met the inclusion criteria, ensuring that participants adequately represented the populations under investigation(14).

Data collection was carried out using standardized, validated instruments. To assess participants' cognitive control and flexibility, the Cognitive Control and Flexibility Questionnaire (CCFQ), developed by Gabrys, Tabri, Anisman, and Matheson in 2018, was employed. This questionnaire comprises 44 items rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The total score ranges from 44 to 220, with higher scores indicating stronger cognitive control and flexibility. The tool has demonstrated high internal consistency, with a reliability coefficient of α=0.88 for cognitive control and α=0.91 for cognitive flexibility(15). To assess participants' mental health status, the Mental Health Inventory (MHI), developed by Veit and Ware in 1983, was utilized. This inventory measures psychological well-being and distress across six domains: depression, anxiety, positive affect, behavioral control, emotional ties, and life satisfaction. It consists of multiple items rated on a 6-point Likert scale, with higher scores indicating better mental health and lower scores reflecting greater distress. The MHI has demonstrated excellent internal consistency, with α=0.92 for psychological distress and α=0.96 for psychological well-being(16).

Perceived discrimination was measured using the Everyday Discrimination Questionnaire (EDQ), a nine-item scale developed by Williams et al. in 1997. The scale evaluates participants' perceptions of encountering discrimination in their daily lives, with responses rated on a 5-point Likert scale ranging from 1 (never) to 5 (always). Higher scores represent greater perceived discrimination, and the questionnaire demonstrated an internal consistency of α=0.87(17). Data collection took place between March 2024 and June 2024 through online surveys. Ethical approval for the study was granted by the Institutional Review Board (IRB) of Brain Wave Research Center (IRB-2024-0012), and all ethical considerations were strictly adhered to throughout the research process. Participants were provided with a detailed explanation of the study's objectives and procedures before completing the survey, and their informed consent was obtained digitally. As all participants were over the age of 18, no parental or guardian consent was necessary. Confidentiality and anonymity were rigorously maintained, with participants' data used solely for research purposes(15, 17).

Data analysis was conducted using SPSS version 25 to assess relationships between cognitive control, mental health outcomes, and perceived discrimination. Descriptive statistics were calculated to summarize demographic information and overall scores on each scale, while inferential statistics such as correlation analyses and regression models were applied to test the study's hypotheses. These analyses aimed to determine whether differences in cognitive control were associated with mental health outcomes and to what extent perceived discrimination influenced these variables(18).

RESULTS

The analysis revealed significant gender-based differences in cognitive control, discrimination, and mental health outcomes among participants. Males demonstrated higher cognitive control scores (Mean = 139.1, SD = ±19) compared to females (Mean = 137.54, SD = ±14.21) and transgender individuals (Mean = 125.52, SD = ±17.92), with a statistically significant difference ($p < 0.01$). Similarly, mental health scores were significantly higher for males (Mean = 139.21, SD = ±12.29) than for females (Mean = 135.72, SD = ±9.73) and transgender participants (Mean = 123.15, SD = ±11.36), highlighting disparities in mental well-being ($p < 0.01$). Transgender individuals experienced higher levels of severe mental health issues and discrimination, with mean discrimination scores of 23.52 (SD = ±9.31) compared to males (Mean = 31.95, SD = ±15.44) and females (Mean = 35.14, SD = ±13.69) ($p < 0.01$). Positive affect was also lower among transgender individuals (Mean = 32.12, SD = ±6.99), compared to males (Mean = 37.38, SD = ±7.14) and females (Mean = 35.68, SD = ±5.90) ($p < 0.01$). Age-based differences showed that middle-aged adults had marginally significant lower

cognitive control (p = 0.07) compared to young adults. Discrimination experiences were slightly higher among middle-aged adults (p = 0.01), whereas young adults reported a more consistent distribution across cognitive control levels and mental health outcomes. Marital status did not show significant differences in cognitive control, discrimination, or mental health outcomes.

Educational level showed significant associations with cognitive control ($p < 0.01$), discrimination ($p < 0.01$), and mental health outcomes ($p < 0.01$). Participants with no formal education had lower cognitive control (Mean = 122.16, SD = ±16.28) and mental health scores (Mean = 123.68, SD = ±10.62) compared to those with higher secondary education, bachelor's, or master's degrees. Those with a bachelor's degree demonstrated better mental health outcomes (Mean = 137.16, SD = ±12.62) and cognitive control (Mean = 139.81, SD = ±18.80), with lower levels of perceived discrimination (Mean = 35.35, SD = ±13.56). Income levels showed significant associations with cognitive control (p = 0.02) but no significant differences in discrimination or mental health. Participants earning less than 50,000 PKR had lower cognitive control (Mean = 132.14, SD = ±18.17) compared to those in higher income brackets. However, income did not significantly affect discrimination, anxiety, or positive affect levels.

Ethnicity-based differences highlighted significant variations across cognitive control ($p < 0.05$), discrimination ($p < 0.01$), and positive affect ($p < 0.05$). Punjabis had higher cognitive control (Mean = 140, SD = ±19) and mental health scores (Mean = 134, SD = ±14) compared to Sindhis (Mean = 121, SD = ±21 and Mean = 125, SD = ±13, respectively). Discrimination scores were significantly higher among Pashtuns (Mean = 35, SD = ±13) compared to Sindhis (Mean = 24, SD = ±12). Positive affect scores were higher among Punjabis (Mean = 37, SD = ±7) and Pashtuns (Mean = 37, SD = ±6) compared to Sindhis (Mean = 30, SD = ±7). Regression analysis demonstrated that cognitive control ($\beta = 0.37$, SE = 0.05, $p < 0.001$) and discrimination ($\beta = 0.154$, SE = 0.06, $p < 0.001$) were significant predictors of mental health outcomes, accounting for 38% of the variance in mental health ($R^2 = 0.38$). Higher cognitive control was associated with better mental health outcomes, whereas higher discrimination correlated with poorer mental health.

The analysis of variance for gender revealed significant effects on cognitive control ($F = 7.5$, $p < 0.01$, $\eta^2 = 0.01$), mental health ($F = 22.0$, $p < 0.01$, $\eta^2 = 0.23$), and discrimination ($F = 8.5$, $p < 0.01$, $\eta^2 = 0.21$). Ethnic differences showed significant variation across cognitive control ($F = 2.2$, $p < 0.05$, $\eta^2 = 0.10$), mental health ($F = 2.2$, $p < 0.05$, $\eta^2 = 0.10$), and discrimination ($F = 7.4$, $p < 0.01$, $\eta^2 = 0.27$). Education also significantly affected cognitive control ($F = 4.3$, $p < 0.01$, $\eta^2 = 0.11$) and mental health outcomes ($F = 5.6$, $p < 0.01$, $\eta^2 = 0.14$).

Table 1: Distribution of Cognitive Control, Discrimination, and Mental Health Problems by Demographic Variables

-		Cognitive Control			P	Discrimination			P	Mental Health			P
Variables	**f(%)**	**Low**	**Medium**	**High**	**p**	**Low**	**Medium**	**High**	**P**	**Mild Problem**	**Moderate Problem**	**Severe Problem**	**P**
Gender	**-**												
Male	42(28)	10	14	18	0.01	13	15	14	0.00	9	13	22	0.00
Female	72(49)	19	30	23		21	18	33		18	31	23	
Transgender	33(22)	16	14	3		19	13	1		23	9	1	
Age	-												
Middle Adults	13(9)	5	5	4	0.07	8	3	2	0.01	4	8	1	0.06
Young Adults	134(91)	40	53	41		45	43	46		46	43	45	
Marital Status													
Single	111(75)	34	43	14	0.93	39	36	36	0.86	41	36	34	0.33

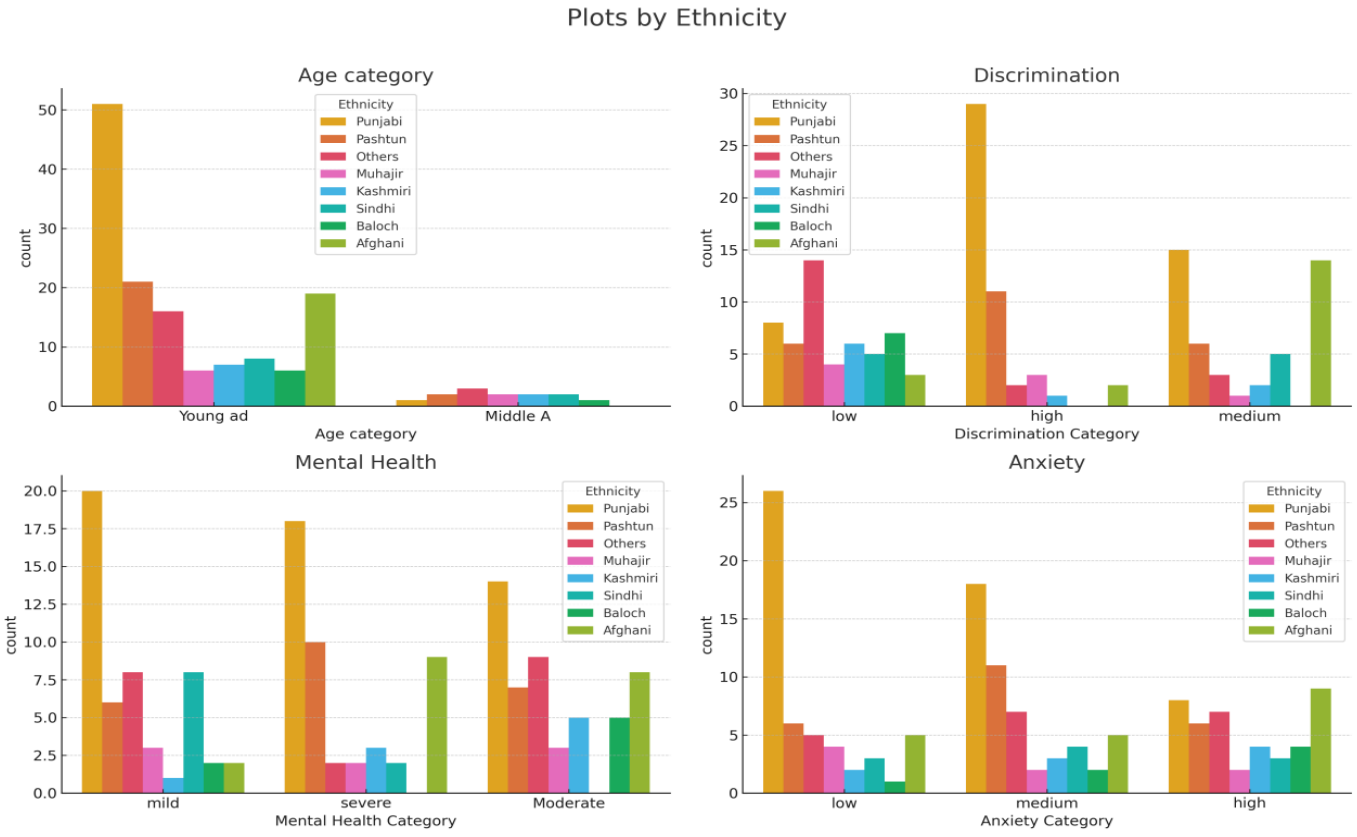
-		Cognitive Control			P	Discrimination				Mental Health			
Variables	**f(%)**	**Low**	**Medium**	**High**	**p**	**Low**	**Medium**	**High**	**P**	**Mild Problem**	**Moderate Problem**	**Severe Problem**	**P**
Married	36(25)	11	15	10		14	10	12		9	15	12	
Education													
No formal education	19(12.9)	10	8	1	0.03	13	6	0	0.00	12	7	0	0.01
Higher secondary school	36(24.5)	15	14	7		10	11	15		16	11	9	
Bachelor	63(42)	12	25	26		16	20	26		16	20	27	
Master	21(14)	5	9	7		7	28	6		4	9	8	
Above	8(5)	3	2	3		7	1	0		2	4	2	
Family Income													
<50000PKR	65(44.9)	19	34	12	0.02	28	21	18	0.77	29	20	16	0.17
50000-100000PKR	66(44.2)	21	21	24		21	21	24		16	25	25	
>100000PKR	16(9)	5	3	8		6	4	6	5		6	5	
Resident													
Urban	120(81)	36	48	26	0.93	43	37	40	0.93	38	42	40	0.37
Rural	27(19)	9	10	8		10	9	8		12	9	6	
Ethnicity													
Punjabi	52(35)	16	13	23	0.07	8	15	29	0.00	20	14	18	0.00
Sindhi	10(6)	6	3	1		5	5	0		8	0	2	
Pashtun	23(15)	5	9	9		6	6	11		6	7	10	
Bloch	7(4)	2	4	1		7	1	0		2	5	0	
Muhajjir	8(4)	4	2	2		4	0	3		3	3	2	
Afghan	19(12)	5	10	4		3	14	2		2	8	9	
Kashmiri	9(9)	2	5	2		6	2	1		1	5	3	
Others	19(12)	5	12	2		14	1	2		8	9	2	
Religion													
Islam	135(91)	38	55	42	0.38	45	43	47	0.26	44	46	45	0.72
Hinduism	2(2)	1	1	0		2	0	0		1	1	0	
Christian	8(5)	5	1	2		5	2	1		4	4	1	
Others	2(2)	1	1	0		1	1	0		1	1	0	

f= frequency, %= percentage, p=significance

Table 2: Ethnicity-based Variations in Psychological Measures using ANOVA.

Variables	Punjabi	Sindhi	Pashtun	Baloch	Muhajir	Afghan	Kashmiri	Other	F(2,144)	η^2
-	Mean(±SD)	Mean(±SD)	Mean(±SD)	Mean(±SD)	Mean(±SD)	Mean(±SD)	Mean(±SD)	Mean(±SD)	-	-
Cognitive Control	140 (±19)	121 (±21)	139 (±16)	131 (±10)	133 (±24)	134 (±8)	137 (±11)	129 (±16)	2.2*	0.10
Mental Health	134 (±14)	125 (±13)	138 (±14)	131 (±8)	133 (±8)	139 (±10)	137 (±7)	129 (±11)	2.2*	0.10
Discrimination	39 (±12)	24 (±12)	35 (±13)	16 (±3)	29 (±16)	31 (±11)	23 (±13)	22 (±12)	7.4*	0.27
Anxiety	20 (±4)	21 (±5)	22 (±4)	23 (±4)	20 (±4)	23 (±5)	23 (±3)	22 (±4)	2.4*	0.10
Depression	38 (±5)	40 (±7)	39 (±5)	42 (±6)	38 (±4)	41 (±5)	41 (±3)	38 (±4)	2.0*	0.09
Emotional Control	23 (±4)	25 (±6)	25 (±5)	27 (±4)	26 (±3)	25 (±4)	28 (±4)	26 (±4)	3.0*	0.13
Positive affect	37 (±7)	30 (±7)	37 (±6)	30 (±8)	34 (±5)	37 (±5)	33 (±6)	33 (±7)	3.4*	0.15

η^2=effect size, **=p<0.01



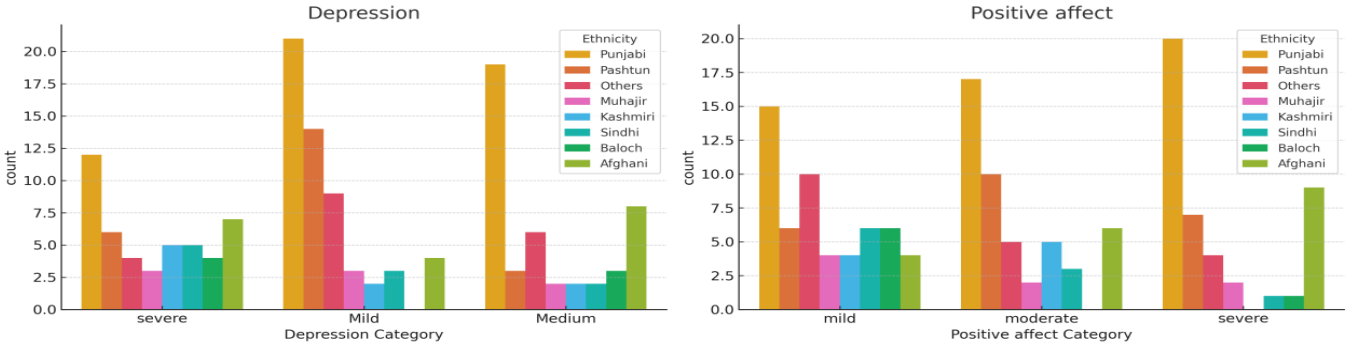


Figure 1 Distribution of Age, Discrimination, Mental Health, Anxiety, Depression, and Positive Affect by Ethnicity

Table 3: Gender-Based Variations in Psychological Measures using ANOVA.

Variable	Male	Female	Transgender	F(2,144)	η²
-	Mean(±SD)	Mean(±SD)	Mean(±SD)	-	-
Cognitive Control	139.1(±19)	137.54 (±14.21)	125.52 (±17.92)	7.5**	0.01
Mental Health	139.21 (±12.29)	135.72 (±9.73)	123.15 (±11.36)	22.0**	0.23
Discrimination	31.95 (±15.44)	35.14 (±13.69)	23.52 (±9.31)	8.5**	0.21
Anxiety	22.36 (±4.36)	21.15 (±3.67)	20.52 (±4.47)	2.0	0.04
Depression	39.43 (±4.79)	39.00 (±4.21)	38.03 (±6.58)	0.75	0.02
Emotional Control	24.81 (±5.23)	24.49 (±4.13)	24.52 (±4.73)	0.71	0.00
Positive affect	37.38 (±7.14)	35.68 (±5.90)	32.12 (±6.99)	6.5**	0.12

η²=effect size, **=p<0.01

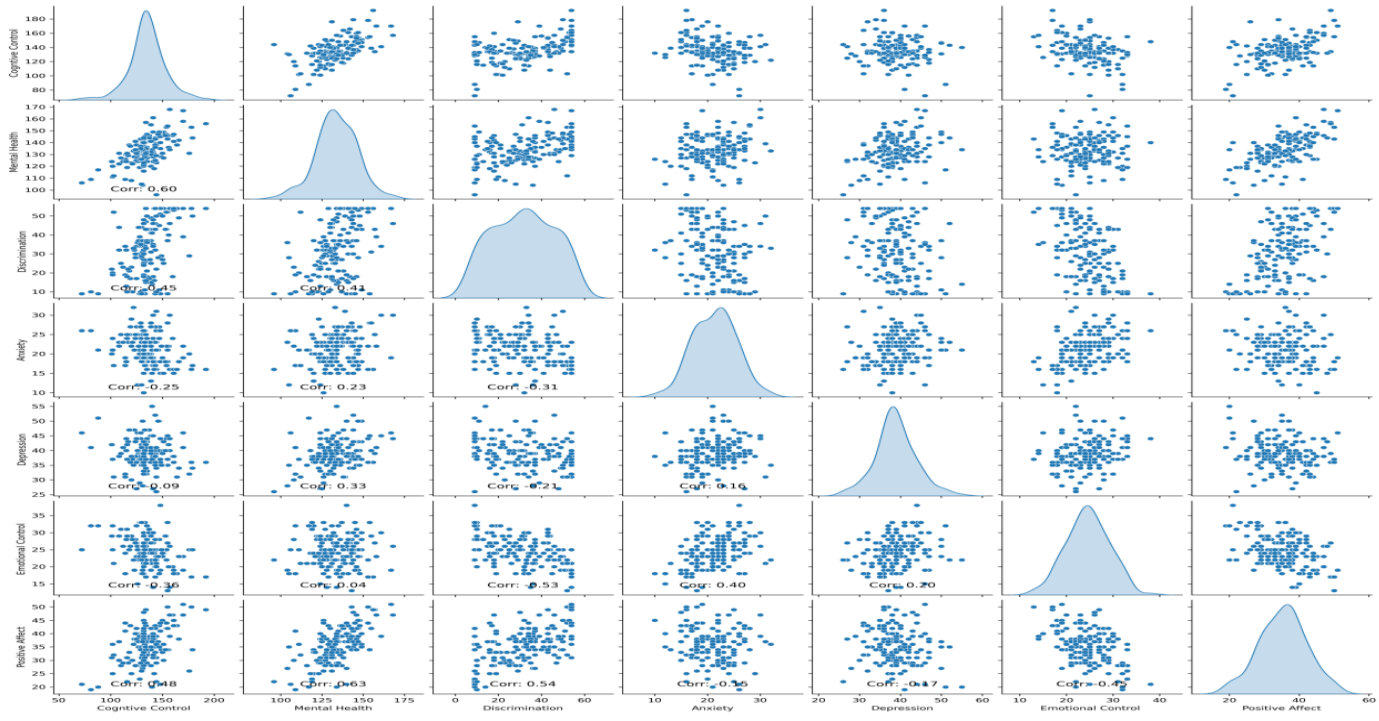


Figure 2 Graphical Presentation of Correlation Matrix (Muddsar Hameed)

Table 4: Education Level Base Variations in Psychological Measures using ANOVA

Variables	No Formal Education	Higher secondary education	Bachelor's degree	Master's degree	Above	F(2,144)	η^2
-	Mean(±SD)	Mean(±SD)	Mean(±SD)	Mean(±SD)	Mean(±SD)	-	-
Cognitive Control	122.16 (±16.28)	133.17 (±13.54)	139.81 (±18.80)	137.24 (±11.48)	136.13 (±21.58)	4.3**	0.11
Mental Health	123.68 (±10.62)	131.86 (±11.27)	137.16 (±12.62)	137.19 (±10.02)	133.00 (±11.20)	5.6**	0.14
Discrimination	21.53 (±9.27)	34.47 (±12.63)	35.35 (±13.56)	31.05 (±15.29)	14.88 (±7.04)	8.0**	0.19
Anxiety	19.79 (±4.53)	21.50 (±3.61)	20.92 (±3.85)	22.86 (±4.77)	23.88 (±3.56)	2.4**	0.06
Depression	38.84 (±6.20)	38.14 (±6.17)	39.14 (±4.08)	39.29 (±4.24)	39.63 (±4.93)	0.31**	0.01
Emotional Control	26.16 (±4.91)	24.08 (±4.70)	24.24 (±4.04)	23.29 (±4.56)	29.25 (±4.46)	3.4**	0.09
Positive affect	31.47 (±6.99)	34.86 (±6.01)	36.59 (±6.95)	37.57 (±5.04)	31.50 (±7.43)	3.6**	0.09

η^2=effect size, **=$p<0.01$

DISCUSSION

This study investigated the intersection of cognitive control and mental health outcomes within marginalized communities, with a particular focus on socio-economic disadvantages and systemic discrimination in Pakistan and Afghanistan. The findings reveal that socio-economic adversity and discrimination are significantly associated with heightened levels of anxiety, depression, and PTSD among marginalized individuals. These results align with existing research suggesting that structural inequalities exacerbate psychological distress by limiting individuals' access to resources and supportive environments. Nevertheless, some participants demonstrated resilience and adaptive cognitive control mechanisms, enabling them to manage emotional distress effectively despite external adversities(19, 20). Gender differences emerged as a significant determinant of cognitive control and mental health outcomes. Males exhibited higher cognitive control levels; a finding consistent with previous research indicating better inhibitory control among males ($p = 0.01$). Females, on the other hand, reported higher levels of discrimination and moderate to severe mental health problems ($p = 0.00$), supporting the notion that women face heightened vulnerability to mental health issues as a result of systemic discrimination. Transgender participants exhibited significantly lower cognitive control and more severe mental health outcomes, reflecting the disproportionate challenges faced by this group due to minority stress and social exclusion. This aligns with prior research highlighting the elevated psychological burdens experienced by transgender individuals due to pervasive stigmatization and discrimination(21, 22).

Age-related differences suggested that middle-aged adults experienced marginally lower cognitive control and higher discrimination than young adults, indicating that age-related increases in perceived social exclusion could contribute to poorer mental health outcomes. Interestingly, marital status did not yield significant differences across cognitive control, discrimination, or mental health outcomes, suggesting that relationship status may not universally buffer psychological distress within marginalized populations. These findings diverge from some studies that highlight marital support as protective for mental health, emphasizing the need for context-specific interpretations in socially disadvantaged populations(23, 24). Educational attainment showed a clear association with cognitive control and mental health outcomes. Participants with no formal education demonstrated significantly lower cognitive control and reported higher levels of discrimination and psychological distress. In contrast, individuals with higher secondary education or bachelor's degrees exhibited stronger cognitive control and fewer mental health issues, supporting the notion that education enhances cognitive capacity, emotional regulation, and resilience. Interestingly, discrimination scores were higher among participants with higher education levels, potentially reflecting greater social awareness of injustice and systemic inequality(25, 26).

Income levels were significantly related to cognitive control, with lower-income participants showing diminished capacity for cognitive regulation ($p = 0.02$). However, income did not significantly impact discrimination or mental health scores, suggesting that socio-economic status alone does not fully explain psychological disparities. This finding contrasts with existing research that often links low income with adverse mental health outcomes, indicating that in marginalized groups, other factors, such as systemic discrimination, may exert a more profound influence than income alone(27, 28). Ethnic differences were particularly pronounced in the context of discrimination and mental health outcomes. Participants from Punjabi and Pashtun backgrounds reported higher discrimination levels and poorer mental health outcomes, while Afghan participants demonstrated better overall mental health. These disparities may reflect long-standing ethnic tensions and socio-political dynamics within the region. Interestingly, religion did not significantly influence cognitive control, discrimination, or mental health, suggesting that shared experiences of marginalization across religious affiliations may overshadow the potential protective effects of religious community support(29, 30). The positive correlation between cognitive control and mental health highlights the crucial role of cognitive regulation in mitigating psychological distress. Participants with higher cognitive control exhibited better mental health outcomes and greater positive affect, affirming previous research linking executive functions with improved emotional well-being. Discrimination was strongly correlated with anxiety and depression, reinforcing the notion that systemic exclusion serves as a chronic stressor contributing to psychological disorders. Notably, the regression analysis revealed that cognitive control and discrimination together accounted for 38% of the variance in mental health outcomes, underscoring their combined influence on psychological well-being(31, 32). The results also revealed substantial differences in mental health outcomes between male, female, and transgender participants, with transgender individuals reporting the highest levels of psychological distress and discrimination. These disparities highlight the urgent need for targeted mental health interventions and anti-discrimination policies that specifically address the unique challenges faced by gender minorities. Ethnic disparities further emphasize the importance of culturally sensitive approaches to mental health care, particularly for communities with a history of systemic exclusion(32).

The study's findings regarding family income diverged from commonly held assumptions, revealing no significant relationship between income and mental health outcomes. This suggests that in marginalized communities, experiences of discrimination and social exclusion may exert a more profound influence on psychological well-being than economic status alone. Education level, however, remained a significant predictor of cognitive control, mental health, and positive affect, indicating that educational attainment can serve as a protective factor by enhancing emotional regulation and resilience(5). This study's cross-sectional design limits the ability to infer causality between cognitive control, discrimination, and mental health outcomes. Self-reported data, while valuable for capturing subjective experiences, may also introduce biases related to social desirability or inaccurate recollection. Additionally, the focus on specific marginalized groups within Pakistan and Afghanistan restricts the generalizability of the findings to broader populations. Future research should consider longitudinal designs to assess changes in cognitive control and mental health over time, particularly in response to interventions aimed at reducing discrimination and enhancing resilience(12). Despite these limitations, the study offers important insights into the psychological effects of systemic discrimination and socio-economic adversity. The results underscore the need for culturally competent mental health interventions tailored to address the unique challenges faced by marginalized communities, particularly transgender individuals and ethnic minorities. Moreover, enhancing educational opportunities and promoting policies that reduce discrimination could foster greater cognitive control and resilience, ultimately improving mental health outcomes(20). The findings highlight the complex interplay between cognitive control, systemic discrimination, and mental health in marginalized communities. Addressing both cognitive and structural factors is essential for promoting psychological well-being and reducing health disparities in disadvantaged populations. Future research should explore intervention strategies aimed at enhancing cognitive control while simultaneously combating systemic discrimination to foster equitable mental health outcomes.

CONCLUSION

This study highlights the complex relationship between cognitive control and mental health outcomes in marginalized communities, emphasizing how socio-economic disadvantages and systemic discrimination contribute to heightened levels of anxiety, depression, and PTSD. While many individuals struggle under these pressures, the findings also reveal that some develop resilience and adaptive coping mechanisms that enhance emotional regulation and problem-solving skills. These insights underscore the dual nature of adversity, which can both hinder and strengthen cognitive functioning. Despite its limitations, including reliance on self-reported data and a focus on specific communities within Pakistan and Afghanistan, the research offers valuable implications for developing culturally sensitive mental health interventions. By addressing both the psychological impacts of marginalization and fostering resilience, targeted interventions can help promote mental health equity and improve overall well-being for marginalized populations. Future research should explore these dynamics across a broader range of groups, using longitudinal approaches to better understand the long-term effects of discrimination and cognitive adaptation.

AUTHOR CONTRIBUTIONS

Author	Contribution
Syed Gufran Sadiq Zaidi	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
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Zainab Salahuddin	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
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Meerab Riaz	Contributed to study concept and Data collection Has given Final Approval of the version to be published
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REFERENCES

1. Ahmad S, Ammar K, Ahmed MR, Aqeel SN. Policies and Practices of Human Rights Education at Higher Education Institutions in Sindh. Qlantic Journal of Social Sciences and Humanities. 2024;5(2):254-69.

2. Wolbring G, Nguyen A. Equity/equality, diversity and inclusion, and other EDI phrases and EDI policy frameworks: A scoping review. Trends in Higher Education. 2023;2(1):168-237.

3. Puckett JA, Dyar C, Maroney MR, Mustanski B, Newcomb ME. Daily experiences of minority stress and mental health in transgender and gender-diverse individuals. Journal of Psychopathology and Clinical Science. 2023;132(3):340.

4. Fisher CB, Tao X, Yip T. The effects of COVID-19 victimization distress and racial bias on mental health among AIAN, Asian, Black, and Latinx young adults. Cultural diversity & ethnic minority psychology. 2023;29(2):119.

5. Thornicroft G, Sunkel C, Aliev AA, Baker S, Brohan E, El Chammay R, et al. The Lancet Commission on ending stigma and discrimination in mental health. The Lancet. 2022;400(10361):1438-80.

6. Smith EP, Yzaguirre MM, Dwanyen L, Wieling E. Culturally relevant parenting approaches among African American and Latinx children and families: Toward resilient, strengths-based, trauma-informed practices. Adversity and Resilience Science. 2022;3(3):209-24.

7. Kite ME, Whitley Jr BE, Wagner LS. Psychology of prejudice and discrimination: Routledge; 2022.

8. Brandt L, Liu S, Heim C, Heinz A. The effects of social isolation stress and discrimination on mental health. Translational psychiatry. 2022;12(1):398.

9. Arday J. No one can see me cry: Understanding mental health issues for Black and minority ethnic staff in higher education. Higher Education. 2022;83(1):79-102.

10. Zahodne LB, Sharifian N, Kraal AZ, Zaheed AB, Sol K, Morris EP, et al. Socioeconomic and psychosocial mechanisms underlying racial/ethnic disparities in cognition among older adults. Neuropsychology. 2021;35(3):265.

11. Wu Z, Schimmele CM. Perceived religious discrimination and mental health. Ethnicity & Health. 2021;26(7):963-80.

12. Williams MT, Davis AK, Xin Y, Sepeda ND, Grigas PC, Sinnott S, et al. People of color in North America report improvements in racial trauma and mental health symptoms following psychedelic experiences. Drugs: Education, Prevention and Policy. 2021;28(3):215-26.

13. Wang L, Lin H-C, Wong YJ. Perceived racial discrimination on the change of suicide risk among ethnic minorities in the United States. Ethnicity & Health. 2021;26(5):631-45.

14. Stinson EA, Sullivan RM, Peteet BJ, Tapert SF, Baker FC, Breslin FJ, et al. Longitudinal impact of childhood adversity on early adolescent mental health during the COVID-19 pandemic in the ABCD study cohort: does race or ethnicity moderate findings? Biological psychiatry global open science. 2021;1(4):324-35.

15. Nagata JM, Ganson KT, Sajjad OM, Benabou SE, Bibbins-Domingo K. Prevalence of perceived racism and discrimination among us children aged 10 and 11 years: the Adolescent Brain Cognitive Development (ABCD) study. JAMA pediatrics. 2021;175(8):861-3.

16. Fani N, Carter SE, Harnett NG, Ressler KJ, Bradley B. Association of racial discrimination with neural response to threat in Black women in the US exposed to trauma. JAMA psychiatry. 2021;78(9):1005-12.

17. Mekawi Y, Carter S, Brown B, Martinez de Andino A, Fani N, Michopoulos V, et al. Interpersonal trauma and posttraumatic stress disorder among black women: does racial discrimination matter? Journal of Trauma & Dissociation. 2021;22(2):154-69.

18. Diaz A, Baweja R, Bonatakis JK, Baweja R. Global health disparities in vulnerable populations of psychiatric patients during the COVID-19 pandemic. World Journal of Psychiatry. 2021;11(4):94.

19. Chang CJ, Kellerman JK, Fehling KB, Feinstein BA, Selby EA. The roles of discrimination and social support in the associations between outness and mental health outcomes among sexual minorities. American Journal of Orthopsychiatry. 2021;91(5):607.

20. Bernard DL, Calhoun CD, Banks DE, Halliday CA, Hughes-Halbert C, Danielson CK. Making the “C-ACE” for a culturally-informed adverse childhood experiences framework to understand the pervasive mental health impact of racism on Black youth. Journal of Child & Adolescent Trauma. 2021;14:233-47.

21. Afek A, Ben-Avraham R, Davidov A, Berezin Cohen N, Ben Yehuda A, Gilboa Y, et al. Psychological resilience, mental health, and inhibitory control among youth and young adults under stress. Frontiers in Psychiatry. 2021;11:608588.

22. Ziersch A, Due C, Walsh M. Discrimination: A health hazard for people from refugee and asylum-seeking backgrounds resettled in Australia. BMC public health. 2020;20:1-14.

23. Zahodne LB, Morris EP, Sharifian N, Zaheed AB, Kraal AZ, Sol K. Everyday discrimination and subsequent cognitive abilities across five domains. Neuropsychology. 2020;34(7):783.

24. Woulfe JM, Goodman LA. Weaponized oppression: Identity abuse and mental health in the lesbian, gay, bisexual, transgender, and queer community. Psychology of violence. 2020;10(1):100.

25. Vargas SM, Huey Jr SJ, Miranda J. A critical review of current evidence on multiple types of discrimination and mental health. American Journal of Orthopsychiatry. 2020;90(3):374.

26. Valente PK, Schrimshaw EW, Dolezal C, LeBlanc AJ, Singh AA, Bockting WO. Stigmatization, resilience, and mental health among a diverse community sample of transgender and gender nonbinary individuals in the US. Archives of Sexual Behavior. 2020;49(7):2649-60.

27. Swann G, Stephens J, Newcomb ME, Whitton SW. Effects of sexual/gender minority-and race-based enacted stigma on mental health and substance use in female assigned at birth sexual minority youth. Cultural Diversity & Ethnic Minority Psychology. 2020;26(2):239.

28. Purtle J, Nelson KL, Counts NZ, Yudell M. Population-based approaches to mental health: history, strategies, and evidence. Annual Review of Public Health. 2020;41(1):201-21.

29. Pachankis JE, Mahon CP, Jackson SD, Fetzner BK, Bränström R. Sexual orientation concealment and mental health: A conceptual and meta-analytic review. Psychological bulletin. 2020;146(10):831.

30. Pachankis JE, Clark KA, Burton CL, Hughto JMW, Bränström R, Keene DE. Sex, status, competition, and exclusion: Intraminority stress from within the gay community and gay and bisexual men's mental health. Journal of personality and social psychology. 2020;119(3):713.

31. Kattari SK. Ableist microaggressions and the mental health of disabled adults. Community Mental Health Journal. 2020;56(6):1170-9.

32. Gifuni AJ, Perret LC, Lacourse E, Geoffroy M-C, Mbekou V, Jollant F, et al. Decision-making and cognitive control in adolescent suicidal behaviors: a qualitative systematic review of the literature. European Child & Adolescent Psychiatry. 2020:1-17.

