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Evaluation of the biopsychosocial model of health among emerging adults

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Abstract

Purpose United Nations SDG 3 highlights the need for healthy life and promotes mental well-being at all ages. Given the growing significance of mental health and its declining status among emerging adults, it is imperative to reevaluate the biopsychosocial (BPS) model.

Methods A cross-sectional research design was employed to analyse biological, social, and psychological components of health. The biological component was assessed through the Reaction Time test (Psychopy Version 2024.2.5). Resilience, personality, and overall mental health in the psychological domain were assessed through the Brief Resilience Scale (BRS), Behaviour Inhibition and Behaviour Activation System (BIS-BAS) Scale, and Mental Health Continuum (MHC) Scale, respectively. The social component was assessed through the Multidimensional Scale for Perceived Social Support (MSPSS). Through convenience sampling, 333 private university students (115 males and 218 females) with a mean age of (20.3 + 1.8) years were recruited for the study.

Results The results of this study indicated no associations between the biological and the psychological components, but the biological variable was associated with the family component of perceived social support ($r_s = -0.155, p = 0.004$). There were also associations between the psychological and social components of the BPS model (MSPSS with MHC ($r_s = 0.37, p < 0.001$) and BRS ($r_s = 0.19, p < 0.001$). Hierarchical multiple regression analysis showed that only BAS Drive and BAS Fun Seeking were predictors of Reaction Time (RT) ($f^2 \approx 0.06$). This could be because (RT) is a response based on activation, and the task did not reward the individual.

Conclusion The findings indicate the need to develop individualised interventions and healthcare plans that enhance wellness among emerging adults, thereby contributing to SDG 3: Good Health & Well-being.

Keywords Reaction time, Biopsychosocial model of health, Well-being, Emerging adults, Social support

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Introduction

The mental health and well-being of emerging adults gained scholarly attention during the COVID-19 pandemic. Aligning with the United Nations Sustainable Development Goal 3 (SDG 3), which prioritises healthy lives and promotes mental well-being at all ages, addresses the psychological needs of this age group [1]. Emerging adulthood, typically defined as the developmental period from 18 to 25 years, is characterised by major life transitions such as completing education, entering the workforce, establishing new social relationships, and gaining autonomy [2, 3]. This transitional period renders individuals vulnerable to mental health challenges [4], especially when exacerbated by large-scale stressors such as a global pandemic.

Research studies [5, 6] indicate that the mental health of youth is disproportionately affected by the COVID-19 Pandemic as compared to older age groups. In India, emerging adults have reported a marked impact on various dimensions of their personal, social, and professional lives. A nationwide survey found that around one in seven individuals aged 15 to 24 years experienced symptoms of depression or anhedonia during the pandemic [7]. Regional North Indian data echoes these findings, revealing that nearly half of the participants reported pandemic-related disruptions to family life (48.4%), caregiving responsibilities (49.4%), and physical health (42.6%) [8]. Moreover, gender differences in mental health vulnerability were observed, with female emerging adults at a higher risk for suicide. In contrast, their male counterparts were found to pose a higher threat towards their friends and family because of increased aggression levels, thereby deviating from societal norms [9].

The Biopsychosocial (BPS) framework is comprehensive that effectively illustrates the interconnections among biological, psychological, and social factors that shape health outcomes [10]. This model captures the complexity of human health and reinforces the necessity of a holistic approach in understanding and addressing health challenges [11, 12]. The BPS model has been widely applied in clinical, developmental, and public health contexts to understand illness onset, progression, and treatment adherence [13]. For young adults, this model offers a nuanced lens [11] to examine how physiological vulnerabilities, cognitive-emotional functioning, and environmental influences converge to shape mental and physical health outcomes [14, 15]. Cognition and emotional experiences, such as knowledge acquisition and social-information processing methods, mediate the relationship between life experiences and conduct problems [16].

The relevance of the BPS model to the Indian context becomes particularly evident when considering the unique socio-cultural and economic dynamics that shape

emerging adulthood in India [12, 17, 18]. The transition from education to employment is often fraught with uncertainty, and individuals frequently encounter challenges in coping with increased responsibilities, familial expectations, and professional demands [4, 19]. These factors contribute to heightened psychological distress, often compounded by the lack of accessible mental health resources and the stigma surrounding help-seeking behaviours [19].

Social support, a key component of the BPS framework, plays a vital protective role during transitions [20]. emphasised that perceived social support enhances resilience and aids self-management behaviours by instilling hope and mitigating negative perceptions. Additionally, supportive family structures and quality parent-child relationships have been linked to improved psychological outcomes [21]. Despite these findings, the mental health needs of youth, especially within collectivist societies like India, have received limited empirical attention [22]. A profound exploration is essential during life's transitions and the rapid personal growth characteristic of emerging adulthood [23]. Given that nearly two-thirds of all diagnosed mental disorders become noticeable before the age of 25 years [24, 25], there is a need to understand this age group through a comprehensive and multidimensional framework. The surge in mental health challenges demands a re-evaluation of existing frameworks to comprehend the intricacies of their psychological experiences. The dynamic challenges posed by the declining mental health status among emerging adults make a comprehensive examination of the BPS model paramount to inform targeted interventions and promote holistic well-being.

Theoretical relevance and practical applicability were considered as guiding factors in the selection of the psychological, social, and biological variables that align with the BPS model. The Mental Health Continuum–Short Form (MHC-SF) and Brief Resilience Scale (BRS), and Behavioural Inhibition System/Behavioural Activation System scales (BIS/BAS), are all psychometrically validated instruments widely used to assess mental well-being, personality, and resilience of individuals. These have been employed in previous research to capture essential facets related to the psychological functioning in humans [26–28], and hence are considered as measures of psychological variables in accordance with the BPS model. The Multidimensional Scale of Perceived Social Support (MSPSS) captured the social support of individuals and was hence considered as a measure of the social variable in the BPS model [29]. To represent the biological domain, Reaction Time (RT) was used as an indicator of neurocognitive processing speed and executive functioning, which are considered biologically grounded processes linked to the effectiveness of the

central nervous system. RT provides a proven, non-invasive, and economic way to estimate biological functioning, especially when it comes to executive control and cognitive performance, which is also consistent with the empirical data that supports RT to be a meaningful indicator of the biological efficiency [30]. Thus, it was considered to be a measure of the biological variable in the BPS model.

The current study investigates the interaction between the biological, social, and psychological components (BPS model) and their associations with emerging adults' mental health in India through self-report scales and behavioural assessments. The study employs four validated psychological instruments: the MHC-SF [26], which assesses emotional, psychological, and social well-being; the BRS [27], which captures the ability to bounce back from stress; the MSPSS [29], which evaluates the perceived adequacy of support from family, friends, and significant others; and the BIS/BAS [28], which assess individual differences in motivation and emotional reactivity. In addition, an RT task was administered using PsychoPy software (Version 2024.2.5) [30] to measure cognitive processing speed, a relevant biological marker associated with mental health functioning.

Research methodology

Research design

This study adopts a quantitative methodology employing a cross-sectional research design to comprehensively investigate the BPS model in the context of mental health among emerging adults. A cross-sectional design allows for the simultaneous examination of biological, psychological, and social factors, offering a snapshot of their interplay within a specific timeframe.

Participants

The study included 333 emerging adults (115 males and 218 females), aged between 18 and 25 years (mean age = 20.3 ± 1.8), recruited from private universities in urban regions of India. The mean age of females is 20.4 years ($SD \pm 1.80$), while that of males is 20.3 years ($SD \pm 1.79$). This demographic was chosen to capture the unique challenges and experiences of individuals transitioning from adolescence to adulthood. Convenience sampling was used to select the sample population.

Instruments

To assess the three dimensions of the BPS model, a battery of instruments was employed:

Biological dimension

Reaction time (RT) test In assessing participants' reaction time, a specialised RT test was employed to gauge the promptness of their responses to visual stimuli. The test

was designed and implemented using PsychoPy Software Version 2024.2.5. The RT test comprised three distinct geometric shapes – Plus (+), Square (□) and Cross (X). The task was to press the 'C' key if a plus (+) sign appeared on the screen, the 'V' key if a square (□) sign appeared on the screen, and the 'B' key if a cross (X) sign appeared on the screen. A total of 6 trials, 2 for each condition, were provided to the participants. Each stimulus was displayed for 10 seconds with no gap between stimuli. Once the participants react to a stimulus, the next stimulus is displayed immediately or after 3 seconds if missed. The overall time taken by each participant to complete the task was around 1 to 2 minutes (including instructions) [30]. A total of 6 trials were considered as the reliability coefficients for six trial RT was found to be very high [31] and to minimise learning effects, thus making only the initial few trials important [32].

Psychological dimension

Mental health continuum short form (MHC-SF) The MHC-SF is a 14-item self-reported measure of mental health, investigating the respondent's Emotional Well-Being (EWB) (3 items), Social Well-Being (SWB) (5 items), and Psychological Well-Being (PWB) (6 items). Participants responded on a 6-point Likert scale, ranging from 0 (Never) to 5 (Everyday). Higher scores would indicate more positive mental health [26]. The Cronbach's alpha was 0.73 [refer to Table 1].

Behavioural inhibition system-behavioural activation system (BIS-BAS) The BIS/BAS scale is a 24-item behavioural inhibition system (BIS) and behavioural activation system (BAS), which is a purpose-driven measure of avoidance and approach motivation, respectively [29]. 13 items reflect the approach and are divided into three aspects: drive, pleasure-seeking, and sensitivity to reward. Seven items reflect avoidance. There are four filler items. Respondents answered using a four-point Likert-type scale ranging from 1 (very false) to 4 (very true) [29]. The Cronbach's alpha was 0.78 [refer to Table 1].

Brief resilience scale (BRS) The scale has six items. Items 1, 3, and 5 are positively worded, and items 2, 4, and 6 are negatively worded. Participants indicated their response on a Likert Scale, which is 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree [27]. The Cronbach's alpha was 0.73 [refer to Table 1].

Social dimension

Multidimensional scale of perceived social support (MSPSS) The MSPSS is a brief, easy-to-administer self-report questionnaire that measures an individual's perception of social support from three sources: Significant Others (SO), Family (FA) and Friends (FR). It consists of

Table 1 Spearman's Rank-Order correlation coefficients for all the factors assessed

Spearman's rank-order correlation Coefficients (rs)	Mental Health Continuum (MHC)			Brief Resilience Scale (BRS)		Behavioural Inhibition and Activation Systems (BIS-BAS)				Reaction Time (RT)	Multidimensional Scale of Perceived Social Support (MSPSS)				
	Emotional WB	Social WB	Psychological WB	Total MHC	Total BRS	BAS Drive	BAS Seeking	BAS Fun	BAS Reward Responsiveness	Total BIS	Average RT	Significant Others	Family	Friends	Total MSPSS
Mental Health Continuum (MHC)	0.77														
	0.622**	0.75													
Psychological WB	0.638**	0.667**	0.74												
Total MHC	0.813**	0.888**	0.900**	0.73											
Brief Resilience Scale (BRS)	0.305**	0.340**	0.337**	0.367**	0.73										
Behavioural Inhibition and Activation Systems (BIS-BAS)															
	-0.192**	-0.118*	-0.244**	-0.211**	-0.224**	0.77									
BAS Drive	-0.062	-0.037	-0.041	-0.057	-0.126*	0.435**	0.78								
BAS Fun Seeking															
BAS Reward Responsiveness	-0.108*	-0.008	-0.084	-0.074	0.048	0.369**	0.435**	0.78							
BIS	0.253**	0.264**	0.301**	0.309**	0.344**	0.013	0.118*	0.333**	0.78						
Average RT	-0.068	-0.073	-0.059	-0.074	-0.07	-0.097	0.025	-0.058	-0.026						
Multidimensional Scale of Perceived Social Support (MSPSS)	0.268**	0.204	0.289**	0.284**	0.150**	-0.051	-0.06	-0.159**	-0.026	0.77					
Family	0.232**	0.186**	0.308**	0.278**	0.163**	-0.094	-0.05	-0.199**	0.041		-0.155**	0.445**	0.73		
Friends	0.219**	0.260**	0.272**	0.287**	0.144**	-0.173**	-0.210**	-0.228**	0.005		-0.01	0.550**	0.428**	0.74	
Total MSPSS	0.334**	0.293**	0.375**	0.377**	0.197**	-0.125*	-0.127*	-0.229**	0.023		-0.083	0.822**	0.774**	0.788**	0.74

Note. This table represents the Spearman's rank-order correlation Coefficients for all the variables. Cronbach's alpha are indicated in bold on the diagonal. ** $p < 0.001$ (two-tailed); * $p < 0.05$ (two-tailed); WB = Well Being

12 items rated on a seven-point Likert-type scale with scores ranging from 'very strongly disagree [1]' to 'very strongly agree [7]' [28]. The Cronbach's alpha was 0.74 [refer to Table 1].

Ethical considerations

The study was not funded by any institutional or external funding body. The study involves human participants. All procedures were in accordance with the ethical standards of the institutional and national research committees and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from each participant, emphasising voluntary participation and the right to withdraw at any stage. All the data gathered ensured that the anonymity and confidentiality of the participants were maintained. Data collection occurred in a quiet, well-lit room within the university premises, where external distractions such as noise and interruptions were minimised to maintain a controlled environment. The environment was controlled for the entire study, including the administration of the questionnaires and the Visual Reaction Time (VRT) behavioural task to ensure accuracy and consistency in responses. Special controls were established to maintain appropriate lighting in the room where the VRT was undertaken. The data gathered is stored in password-protected folders in the authors' laptops and will be deleted after 10 years in accordance with the APA guidelines. During this span of 10 years, the data will be used for research and publication purposes only. The study was conducted following the required ethical protocols approved by the Research Review Ethics Board (RERB) of O.P. Jindal Global University (JGU) [RERB Approval No. RERB/2025/210].

Procedure

Participants completed all study components using soft copies of the questionnaires presented on laptops provided and owned by the researchers. These were filled out in the presence of the researchers to ensure adherence to instructions and for easy addressing of any queries. The order of administration was standardised for all participants. First, participants were seated comfortably and briefed on the study. Then, they completed the self-report questionnaires, which assessed psychological and social variables. Following this, the participants filled out the questionnaires and completed the behavioural task for VRT. It is crucial to note that the psychological and social components were assessed using self-reported questionnaires, whereas the biological component was assessed using a behavioural task.

Results and analysis

Quantitative data were subjected to analysis using [33] SPSS Statistics Version 30 [29]. The normality of the sample was checked using the Kolmogorov-Smirnov test. Kolmogorov-Smirnov's significance was not more than 0.05 for any of the variables and their dimensions assessed, when considering the entire sample ($N = 333$; refer to Table 2) [34]. However, when the sample was divided into males and females, only the total MHC of females ($p = 0.055$) was normal. In case of males, only social well-being ($p = 0.200$), psychological well-being ($p = 0.200$), total MHC ($p = 0.200$), and BRS ($p = 0.200$) were found to be normal. Therefore, since not all the variables were normally distributed, non-parametric analyses were performed at a 95% significance level [see Table 2].

Data were analysed using descriptive statistics, including means and standard deviations for each variable and their dimensions. Since the data was not normally distributed, the correlation was calculated using Spearman's rank-order correlation, and the gender differences were calculated using the Mann-Whitney U test. Hierarchical Multiple Regression analysis was performed with RT as the dependent variable (DV) to check which independent variable (IV) predicts the DV. Finally, the Mann-Whitney U test was conducted to explore the differences in parameters, if any, between males and females.

Preliminary analysis

The biological variable, average RT, exhibited by males ($M = 1.56$ s; $SD = 1.16$) and females ($M = 1.3$ s; $SD = 0.988$) were similar. This showed that the participants were quick to react irrespective of their gender. The social variable scores, MSPSS and its significant others sub-dimension, were higher in females (MSPSS: $M = 61.9$; $SD = 15$; significant others: $M = 20.4$; $SD = 6.33$), but the friends and family sub-dimensions were higher in males (friends: $M = 21.3$; $SD = 5.3$; family: $M = 20.7$; $SD = 5.68$). The overall well-being and its sub-dimensions of males were higher than those of females (MHC males: $M = 44.1$; $SD = 11.6$). The resilience was also higher in males (BRS males: $M = 3.39$; $SD = 0.776$). The behavioural inhibition was found to be higher in males (BIS males: $M = 15.6$; $SD = 3.71$), while the behavioural activation was found to be higher in females (BAS Drive females: $M = 8.83$; $SD = 2.71$; BAS Fun Seeking females: $M = 7.99$; $SD = 2.71$; BAS Reward Responsiveness females: $M = 8.13$; $SD = 3.03$), [Table 2].

Spearman's rank-order correlation analysis

A Spearman's rank-order correlation analysis was performed between all the variables and their sub-dimensions [Table 2]. According to the correlation analysis, the social variable (MSPSS) had significant moderate and low positive associations with two psychological variables

Table 2 Descriptives of the population parameters

Descriptives	Mean	Standard Deviation			Kolmogorov-Smirnov Statistic			Kolmogorov-Smirnov Statistic <i>p</i>		
	Total	Female	Male	Total	Female	Male	Total	Female	Males	Total
Mental Health Continuum (MHC)										
Emotional Well Being	8.82	8.37	9.67	3.216	3.16	3.17	0.103	0.089	0.132	<0.001
Social Well Being	11.98	11	13.9	5.394	5.3	5.09	0.056	0.064	0.071	0.015
Psychological Well Being	18.43	17.3	20.5	5.979	6.13	5.08	0.093	0.104	0.068	<0.001
Total MHC	39.2	36.7	44.1	12.8	12.7	11.6	0.064	0.060	0.063	0.002
Brief Resilience Scale (BRS)	3.17	3.05	3.39	0.717	0.657	0.776	0.071	0.085	0.066	<0.001
Behavioural Inhibition and Activation Systems (BIS-BAS)										
BAS Drive	8.5	8.83	7.86	2.7	2.71	2.58	0.114	0.093	0.148	<0.001
BAS Fun Seeking	7.8	7.99	7.44	2.49	2.58	2.26	0.120	0.122	0.134	<0.001
BAS Reward Responsiveness	8.1	8.13	8.04	2.92	3.03	2.71	0.156	0.168	0.146	<0.001
BIS	14.2	13.4	15.6	3.92	3.82	3.71	0.081	0.111	0.123	<0.001
Reaction Time (RT)	1.39	1.3	1.56	1.06	0.988	1.16	0.167	0.159	0.189	<0.001
Multidimensional Scale of Perceived Social Support (MSPSS)	20	20.4	19.3	6.56	6.33	6.96	0.119	0.116	0.125	<0.001
Significant Others	20.7	20.6	20.7	6.21	6.48	5.68	0.131	0.139	0.117	<0.001
Family	21.1	20.9	21.3	5.75	5.98	5.3	0.122	0.142	0.104	<0.001
Friends	61.8	61.9	61.4	14.9	15	14.6	0.072	0.071	0.100	0.004
Total MSPSS										0.006

[MHC ($rs = 0.37, p < 0.001$) and BRS ($rs = 0.19, p < 0.001$)] while having significant low negative associations with the BAS psychological variables [BAS Drive ($rs = -0.12, p = 0.022$), BAS Fun Seeking ($rs = -0.13, p = 0.021$), and BAS Reward Responsiveness ($rs = -0.23, p < 0.001$)]. However, no significant associations were found with the biological variable (RT; $rs = -0.08, p = 0.132$). It was noted that the biological variable (RT) did not correlate significantly with any of the variables other than the family sub-dimension of MSPSS, which showed a significantly low association ($rs = -0.155, p = 0.004$). The result implies that when individuals perceive social support, their psychological health will be good and that social support does not affect their physical health.

Hierarchical multiple regression analysis

Further, a hierarchical multiple regression analysis was conducted with RT (biological variable) as the DV, and the psychological and social variables were considered IVs. This was done to estimate the relationships between the social and psychological dimensions with the biological dimension. [Table 3] explain the three models taken into consideration. According to the hierarchical multiple regression analysis, only BAS Drive and BAS Fun Seeking were significant contributors to the models, implying that they are significant predictors of the DV, RT, $R^2 = 0.059$, $F(11,321) = 1.814, p < 0.05$. This implies that the overall model explained only 5.9% of the DV (RT) variance, indicating a small effect size ($f^2 \approx 0.06$) and limited explanatory power. Therefore, it is a weak, acceptable model. Although two variables were significant, given the low R^2 , their practical significance may be limited. VIF values ranged from 1.0 to 2.29, indicating no collinearity issues [35] [refer to Table 3].

Gender differences

Finally, the Mann-Whitney U test was performed to identify the difference in the scores across all parameters between males and females. As explained earlier, the biological variable (RT) also showed a difference between males and females ($p = 0.017$). Males exhibited higher reaction times than females. Surprisingly, the social variable (MSPSS) and its sub-dimensions scores' did not vary between genders ($p = 0.748$). It was observed that the psychological variables, namely, Emotional well-being, Social well-being, Psychological well-being, total MHC, BRS, BAS Drive, and BIS, exhibited by males significantly differed from the scores of females, with a significance level of <0.001 . Males scored higher in Emotional well-being, Social well-being, Psychological well-being, total MHC, BRS, and BIS, while females scored higher in BAS Drive. The other psychological variables, namely, BAS Fun Seeking and BAS Reward Responsiveness, did not

Table 3 Hierarchical multiple regression results for reaction time

Scale	Variable	B	95% CI		SE B	β	R^2	ΔR^2
			LL	UL				
Brief Resilience Scale (BRS)	Model 1	1.788 ***					0.007	0.007
	BRS	-0.125	-0.284	0.033	0.081	-0.085		
Brief Resilience Scale (BRS)	Model 2						0.034	0.026
	BRS	-0.173	-0.352	0.005	0.091	-0.118		
Behavioural Inhibition and Activation Systems (BIS-BAS)	BAS Drive	-0.057**	-0.108	-0.006	0.026	-0.146**		
	BAS Fun Seeking	0.067**	0.01	0.123	0.029	0.157**		
	BAS Reward Responsiveness	-0.027	-0.079	0.025	0.026	-0.075		
	BIS	0.012	-0.023	0.046	0.018	0.043		
Brief Resilience Scale (BRS)	Model 3						0.047	0.013
	BRS	-0.126	-0.311	0.06	0.094	-0.085		
Behavioural Inhibition and Activation Systems (BIS-BAS)	BAS Drive	-0.066**	-0.118	-0.015	0.026	-0.17**		
	BAS Fun Seeking	0.071**	0.014	0.128	0.029	0.167**		
	BAS Reward Responsiveness	-0.035	-0.087	0.018	0.027	-0.097		
	BIS	0.021	-0.015	0.057	0.018	0.078		
Mental Health Continuum (MHC)	Emotional	-0.025	-0.074	0.023	0.025	-0.077		
	Social	0.005	-0.026	0.035	0.015	0.025		
	Psychological	-0.015	-0.044	0.013	0.014	-0.086		
Brief Resilience Scale (BRS)	Model 4						0.059	1.296
	BRS	-0.105	-0.292	0.081	0.095	-0.072		
Behavioural Inhibition and Activation Systems (BIS-BAS)	BAS Drive	-0.061**	-0.113	-0.009	0.026	-0.156**		
	BAS Fun Seeking	0.078**	0.021	0.135	0.029	0.184**		
	BAS Reward Responsiveness	-0.039	-0.093	0.014	0.027	-0.109		
	BIS	0.021	-0.015	0.057	0.018	0.077		
Mental Health Continuum (MHC)	Emotional	-0.021	-0.07	0.028	0.025	-0.064		
	Social	0	-0.03	0.031	0.016	0.001		
	Psychological	-0.013	-0.041	0.016	0.015	-0.071		
Multidimensional Scale of Perceived Social Support (MSPSS)	Significant Others	-0.005	-0.027	0.017	0.011	-0.029		
	Family	-0.017	-0.039	0.004	0.011	-0.1		
	Friends	0.018	-0.007	0.043	0.013	0.1		

Note: WB = Well Being; CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit; *** $p < 0.001$; ** $p < 0.05$

show any variation in scores between males and females [see Table 1 for details].

Based on the above results, two personality components (BAS Drive and BAS Fun Seeking) estimate the biological component (RT). Perceived social support (MSPSS) was positively associated with mental health (MHC) and resilience (BRS), and negatively with all three personality components (BAS Reward Responsiveness, BAS Drive, and BAS Fun Seeking) [refer to Fig. 1 for the proposed model].

Discussion

The BPS Model [10] explains health as an interplay of the evolving social, biological, and psychological variables [36]. Within the scope of the model, one could explore the inter-relationship between these variables to suggest

and recommend initiatives from a policy, research, training and intervention perspective [37].

In the current study, males and females did not differ in RT, inferring no gender difference in response time. These results contradict past literature that showed gender differences, wherein females had higher RT in comparison to males [38, 39]. The reason for a contradictory result could be that the sample was not as specific or clinical as the ones recruited in studies in the past. The result also shows that the behaviour of females is dominated by their activation system, and the inhibition system dominates the behaviour of males. The overall mental health and resilience of males are better than that of females, which aligns with the results of [9, 40–43], particularly after COVID 19 [44] [9]. too reported that females were at a higher risk of committing suicide as compared to males.

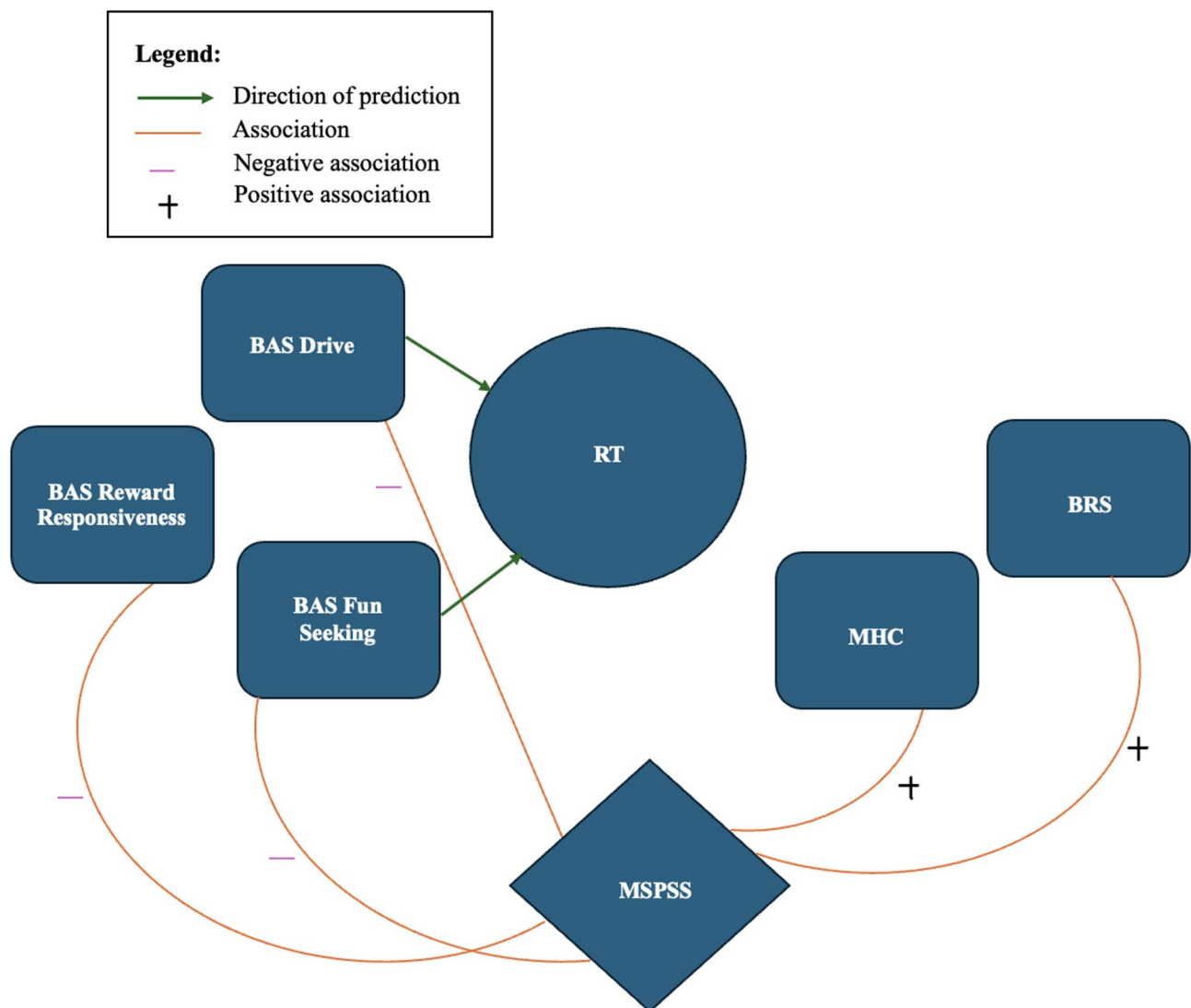


Fig. 1 Model showing positive and negative associations, and predictions between the variables and their dimensions. Note :This model is proposed by the authors based on the results obtained from the study

The prevalence of depression, anxiety, somatic disorders, sexual violence, and physical, emotional, and social distress are higher in female college students than their male counterparts [45, 46]. This emphasizes the need for designing interventions for females to help them deal with psychological, social, and emotional challenges. Gender-specific prevention strategies such as identifying risk factors, screening measures, and dealing adequately with maternity issues and intimate partner violence are equally important [47].

Social facet was positively related to the overall mental health and resilience. This aligns with previous studies [20], which found that social support plays a crucial role in self-management and reduces negative perception. For example, parental support aids in an individual's social functioning [21]. Poor social support leads to

lower mental health outcome and increased depression [48–50]. Furthermore, RT correlated positively with only the family component in the social dimension. Culturally, India fosters interdependence and cohesion, thereby recognizing the role of family, especially in cases of management of mental illness and treatment purposes [51]. Additionally, cultural heterogeneity in a community, immigration, etc., affect the biological functioning of an individual [17, 52]. Thus, adopting a culture-specific lens becomes imperative as cultural values shape and influence the outcomes and treatments of biological and psychological well-being [18]. Thus, socio-cultural aspects influence the biological, social, and psychological well-being of adults, reiterating the BPS model.

Teachers' social support and mental health interventions aided in improving biological functioning and

limited alcohol consumption among emerging adults [53]. The current study supports the above finding as there is a relationship between the social and biological facets of emerging adults, along with positive and negative associations between the psychological and social variables. Though the associations were low to moderate, significant relationships were found between the social and psychological facets.

From the hierarchical multiple regression analysis, it was seen that only BAS Drive and BAS Fun seeking were significantly associated with variations in RT [54]. found BAS predisposed individuals to experience more positive events, which could explain why BAS Drive and Fun Seeking were associated with RT. On the other hand, previous research has found that BAS reward responsiveness predicts good psychological functioning [55]. In the present study, it did not significantly relate to the biological facet. The results are in contradiction to the findings from the previous studies, which have shown the importance of interaction between the biological and psychological aspects of one's functioning in primary care doctors to adhere to the BPS model for practice [56]. Additionally biological, psychological and social factors have influenced the diagnosis and prognosis of an illness [13, 57]. This might be because the sample chosen in the current study is neurotypical, not from the clinical setup, rather comprising of the youth from the general population. Future research should therefore expand the study to diverse populations.

The model is applicable to Indian youth is evident, but weak variable associations call for further research to check its effectiveness [10]. Developing a culturally specific health and well-being model rooted in Indian social support systems is needed that incorporates an integrated approach to the three dimensions of individual functioning [12, 58].

From a multidimensional perspective, symptom and distress management are crucial for a healthy, holistic and overall development of an individual [59]. With an increased allocation of healthcare resources and a need to improve patient outcomes, the BPS model helps in improving outcomes while controlling costs [60]. A rise in stigmatized attitudes towards help-seeking curtails individuals from seeking psychological aid even in times of need [60]. Thus, interventions and a deeper societal understanding of mental and physical illness and help-seeking behaviours are crucial for facilitating mental and physical health for a smooth transition from adolescence to emerging adulthood to foster greater resilience [61].

Limitations and future research direction

The study provides insights into the interplay of biological, psychological, and social factors that shape the health of emerging adults. However, it is essential to recognise

the study's limitations. Cross-sectional design limits inferences about the cause-and-effect relationship and inferences related to the directionality of the association of the variables. Future research should adopt a longitudinal approach to gain an understanding of the temporal dynamics involved. Furthermore, convenience sampling might have selection bias, limiting the generalizability of the findings to a population. It is crucial to acknowledge biases and social desirability when relying solely on self-reported data to evaluate the psychological and social factors. RT task may not be enough to capture the biological functioning as random variances and momentary lapses might have influenced the study, thereby posing a need to delve deeper into revisiting the BPS model to include broader and objective socio-cultural and biological measures. Additionally, with the development of chronic diseases, leading to an increase in mortality rates, the BPS model needs to undergo several revisions to capture these nuances to increase its applicability in the current time [59]. Moreover, broadening the scope of research beyond university students to encompass other demographics and settings could offer a holistic view of mental health dynamics in diverse populations. By addressing these limitations, future research can further advance our understanding of the BPS model on the health and well-being of emerging adults.

Conclusion

This research recognizes the interconnectedness between the biological, psychological, and social factors within the BPS model. The model is a weak fit for Indian emerging adults, suggesting the need to develop culturally sensitive health and well-being models. The behavioural activation system, which is a significant predictor of one's biological functioning, stresses the need for more awareness of one's psychological functioning to maintain good physical health. These findings could help develop individualized interventions and health care plans that enhance the well-being of Indian emerging adults, thereby contributing to SDG 3 [62], which promotes good health & well-being.

Abbreviations

BPS	Biopsychosocial
RT	Reaction time
MHC	Mental health continuum
BRS	Brief resilience scale
MSPSS	Multidimensional scale of perceived social support
BIS-BAS	Behavioural inhibition system-behavioural activation system

Acknowledgements

The authors sincerely thank Mr. Atul Yadav and Ms. Samiksha Das, Doctoral Research Scholars, Jindal Institute of Behavioural Sciences, O.P. Jindal Global University, Sonapat, Haryana, India for their valuable contribution in data collection. The authors also extend their gratitude to the participants, students, and the department for the smooth progress of the study.

Author contributions

SP and **DI** – data collection, data analysis, manuscript writing**MJ** – Study designing, manuscript editing**TC** and **VN** – Study designing**SD** – data collection, manuscript drafting.

Funding

The study was not funded by any institutional or external funding body.

Data availability

No datasets were generated or analysed during the current study.

Declarations**Ethics and consent to participate**

The research has been conducted in an ethical and responsible manner, in compliance with all the relevant codes of experimentation and legislation. The study involves human participants and was performed in accordance with the principles stated in the Declaration of Helsinki. The study was approved by the Research and Ethics Review Board (RERB No. RERB/2025/210), O.P. Jindal Global University, Haryana, India. Informed consent was obtained from all individual participants included in the study. Name of Ethics Approval Committee. Research and Ethics Review Board (RERB No. RERB/2025/210), O.P. Jindal Global University, Haryana, India.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 11 February 2025 / Accepted: 19 September 2025

Published online: 24 October 2025

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