


Arousability, Personality, and Decision-Making Ability in Dissociative Disorder

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ABSTRACT

Background: There is a gap in understanding the pathogenesis of dissociative conversion disorder (DCD), despite the disorder having a strong historical root. The role of personality and neurocognitive factors are now highlighted; however, inconsistencies are reported. This study explores the personality disposition, arousability, and decision-making ability of patients with DCD, in reference to a healthy control group (HCG).

Methods: In this cross-sectional study, the sample comprised ten adult psychiatric patients with DCD. Ten participants of the HCG were matched according to age, gender, education, economic status, domicile, religious background, and handedness. The study assessed personality disposition with Temperament and Character Inventory, arousability with reaction time task, and decision-making ability with the Iowa Gambling Task (IGT PEBL version).

Results: The DCD group differed significantly on personality disposition related to both temperament and character. There was also evidence of easy arousability and frustration along with deficit in executive function related to decision-making ability.

Conclusion: This study highlights the presence of both temperamental and characterological factors associated with DCD. Moreover, this study identifies the role of cognitive arousability and decision-making or feedback utilization ability in the psychopathology of DCD.

Keywords: Hysteria, conversion reaction, cognitive arousability, reaction time, decision making

Key Messages: The study reports dissociative disorder from a psychobiological disposition and neuropsychological perspective. Dysregulation of the cortical regulatory system may have a role of in dissociative conversion disorder's pathogenesis. There is a need to review the old model of hysteria with current developments in the neuropsychological understanding of psychopathology.

There is limited understanding of how psychological stress or conflict can convert into functional or unexplained physical symptoms. Despite the advancement of cognitive sciences, empirical research on this area has lagged behind theoretical assumptions.¹ Freud's psychodynamic explanation of "konversion,"² that is, the role of

unconscious conflict as a cause of dissociative conversion disorder (DCD), is prevalent and even part of the diagnostic systems, such as *DSM-IV*³ and *ICD-10*.⁴ However, *DSM-5* has considered a critical and objective stand by pointing out that trauma or psychological stress or confusion might be in close relationship with dissociative disorders.⁵

In their classical monograph, *Studies on Hysteria*, Breuer and Freud speculated possible neurological mechanisms of hysterical conversion.² Other researchers have proposed the dysregulation of two cortical regularity systems, arousal, and activation; dysregulation of those might be highly relevant in the context of dissociation.⁶ Studies are contradictory related to arousability and dissociation; some studies have observed suppressed autonomic reactivity, whereas others have reported no evidence of suppression of autonomic responses in individuals with high dissociation.⁷⁻¹⁰ Moreover, these studies are mostly on the associated dissociation in patients suffering from post-traumatic stress disorder.

Dissociative tendencies are related to personality factors, such as hypnotizability,

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fantasy proneness, openness to experience, and absorption capacity¹¹; however, dimensions of temperament and character, part of the stable personality factors, are less explored and have yielded contradictory findings. A study concluded that dissociative symptoms are predicted by only characterological traits that are shaped by environmental factors.¹² However, in a recent study, both temperament and character traits were observed to be associated.¹³

Recent studies have identified various neurophysiological and neuropsychological factors associated with DCD, including the role of executive control dysregulation.¹⁴⁻¹⁵ Researchers have also highlighted possible connections between the amygdala and orbitofrontal cortex (OFC) to process emotional stressors in dissociative symptoms.¹⁶ The connections between OFC and amygdala are necessary for making an effective decision with proper utilization of outcome-related feedback in terms of reward and punishment, as there is a role of these connections in processing emotional and social stimuli.¹⁷ This link may be understood as dissociative symptoms are generally elicited in daily interpersonal interactions that threaten physical and emotional safety or elicit a higher level of arousal and anxiety due to the patients' interpretation of the threat.^{18,19} Identification of this feedback utilization or decision-making ability might add to the understanding of the pathogenesis of DCD. Studies have reported that cortical arousal, some personality traits, and decision-making process are highly related through a common pathway²⁰; however, their role in explaining the pathogenesis of pure DCD patients is not well explored. Moreover, there are inconsistencies in the findings as reviewed above. The present study explores the personality disposition, arousability, and decision-making ability of the patients having DCD in reference to the healthy control group (HCG).

Materials and Methods

Study Design and Sample

The study had the approval of the Ethical Committee for Research of University of Calcutta. It was a cross-sectional comparative study following the purposive sampling method. The sample comprised

two groups. A clinical sample of patients ($N_1 = 10$) who met the criteria for DCD as per ICD-10 during the recruitment for the study was included. All the patients were taken from the outpatient departments of psychiatry and clinical psychology of a state-government-run medical college. Individuals with less than 8 years of education, chronic medical illness, significant head injury, epilepsy, other major psychiatric disorders except mild depressive episodes, pervasive developmental disorder, or intellectual disability were excluded. The HCG was taken from the family members visiting the hospital general outpatient unit of the same medical college ($N_2 = 10$), matched with the clinical group in accordance with the age (maximum 2 years variation), sex, educational qualification, economic condition, religion, and handedness. Exclusion criteria of the clinical group were equally applicable for the HCG. In addition, HCG was administered the General Health Questionnaire-28 (GHQ-28)²¹ and Iowa Personality Disorder Screen (IPDS)²² to rule out any current psychopathology and personality disorders. Both the groups were considered for participation in the study only after getting written informed consent for this study.

Materials

Both the groups were assessed on the following psychological tools.

Temperament and Character Inventory (TCI): This self-administered 240-item tool measures the dimensional psychobiological model of personality and is constructed to assess seven basic dimensions of personality traits. All the items were translated into the regional language following the appropriate method of translation. The scale identifies four temperaments (novelty seeking [NS], harm avoidance [HA], reward dependence [RD], and persistence [P]) and three characters (self-directedness [SD], cooperativeness [C], and self-transcendence [ST]). *Temperaments* are the automatic emotional responses to experience, moderately heritable, and relatively stable throughout life. *Characters* are the self-concepts and individual differences in goals and values. They are moderately heritable and moderately influenced by sociocultural learning. The test has acceptable reliability and validity both

for the general and psychiatric population.²³

Responsys: It is a software used to measure reaction time (RT) that is considered a function of arousability and anxiety. In the present experiment, the visual stimulus was used (glowing of a light) with variation in the fore period. Fore period is the time gap between the start signal and the onset of the stimulus. Fore period is the preparatory time for the organism to respond in a given manner. The software itself shows whether the participant has responded correctly or responded before the actual onset of the stimulus.²⁴ An optimum fore period is known to be 1.5 s. A delayed RT indicates the sensorial type or ability to delay gratification, and a premature response indicates impulsivity.²⁵

*Iowa Gambling Task (IGT, PEBL version)*²⁶: This is a computerized task used to understand the learning and choice processes underlying decision-making under uncertainty. The participants need to choose one out of four card decks, named A, B, C, and D. The participant can win or lose money with each card. Two of the decks of cards, decks A' and B', produce high immediate gains; however, in the long run, they will take more money than they give and are therefore considered to be the disadvantageous decks. The other two decks, decks C' and D', are considered advantageous, as they result in small immediate gains but will yield more money than they take in the long run. Net scores are calculated by subtracting the number of disadvantageous choices (decks A' and B') from the number of advantageous choices (decks C' and D') for each block. There are 5 blocks of 20 trials for each, and the first block is not considered in the scoring. Higher net scores signify better performance on the task. IGT is the most common paradigm used to measure decision-making ability and a valid instrument to assess frontal lobe dysfunction.²⁷

Procedure

After the selection of the clinical group, all the participants were briefed about the study. Total of 18 patients was initially screened; however, 8 were dropped due to less education, comorbidities, and difficulty participating in the tests because of symptoms. Similarly, 13

participants for HCG were screened after matching, but three had to be dropped due to their unwillingness to continue with the entire assessment process. Tests were administered individually in the sequence mentioned in the material section.

Statistics

Mean and standard deviation were calculated. Keeping in mind the sample size and its distribution, nonparametric statistics were run using SPSS for Windows, version 16. Cohen's *d* calculation was done for estimation of effect size for significant results.

Results

All the participants were female, right-handed, and from lower economic and rural background. In both groups, 60% of the participants were from the Muslim religion.

Table 1 further indicates that the groups did not differ significantly with respect to age, education, or marital status.

It is evident (**Table 2**) that the Mann-Whitney *U* test detected significantly higher temperamental disposition of NS, HA, and RD and characterological disposition of ST in DDG, compared to that of the HCG, along with significantly low *P* and *SD*. The effect size for all the significant analysis was found to exceed Cohen's convention for a large effect ($d = 0.80$). On the RT task, compared to the HCG, the DDG scored significantly higher, with a large effect size, indicating their slower RT when they performed with the fore period duration of 2 s and 3 s. The gambling decision-making function in DDG was significantly poor than that in HCG at sets 3 and 5, indicating that DDG is having difficulty focusing on maximizing the long-term profit. These differences also represented a large effect size.

On repeated measures, though Friedman analysis revealed significantly different RT across all the three fore periods (1 s, 2 s, and 3 s) in DDG ($\chi^2 = 7.20$, $Df = 2$, $P = 0.027$), such a difference was not noted for HCG ($\chi^2 = 2.60$, $Df = 2$, $P = 0.273$). The DDG showed more delayed RT with the prolongation of the fore period time (**Figure 1**).

Repeated measures analysis with Kruskal-Wallis one-way analysis of variance did not reveal any significant gain in feedback utilization to make a

TABLE 1.

Comparison of DDG and HCG on Sociodemographic Variables

| | DDG Mean \pm SD/n(%) | HCG Mean \pm SD/n(%) | U/ χ^2 Score | P Value |
|----------------|---------------------------|---------------------------|-------------------|---------|
| Age | 25.60 \pm 7.50 | 26.50 \pm 7.84 | 46.00 | 0.78 |
| Education | 11.00 \pm 1.49 | 10.60 \pm 1.07 | 42.00 | 0.53 |
| Marital Status | | | | |
| Married | 7 (70%) | 6 (60%) | 0.22 | 0.64 |
| Single | 3 (30%) | 4 (40%) | | |

DDG: dissociative disorder group, HCG: healthy control group, U: Mann-Whitney U, χ^2 : chi-square, SD: standard deviation.

Significant values are highlighted in bold.

TABLE 2.

Comparison of DDG and HCG on Dispositional, RT, and Decision-Making Ability Variables

| Variables | DDG ($N_1 = 10$) | HCG ($N_2 = 10$) | Mann-Whitney U | P Value | d_{Cohen} |
|----------------------------|--------------------|--------------------|----------------|------------------|-------------|
| | Mean \pm SD | Mean \pm SD | | | |
| Dispositional | | | | | |
| Novelty seeking (NS) | 56.50 \pm 26.67 | 28.10 \pm 21.52 | 21.00 | 0.027 | 1.13 |
| Harm avoidance (HA) | 80.90 \pm 20.46 | 32.40 \pm 23.97 | 7.50 | 0.001 | 2.07 |
| Reward dependence (RD) | 36.00 \pm 13.90 | 23.20 \pm 14.23 | 20.00 | 0.021 | 1.18 |
| Persistence (P) | 39.90 \pm 27.78 | 65.30 \pm 25.49 | 24.50 | 0.050 | 0.96 |
| Self-directedness (SD) | 6.00 \pm 10.28 | 62.50 \pm 17.03 | 1.50 | <0.001 | 2.86 |
| Cooperativeness (C) | 21.80 \pm 14.26 | 15.30 \pm 17.31 | 32.00 | 0.171 | – |
| Self-transcendence (ST) | 66.30 \pm 26.12 | 30.50 \pm 27.83 | 15.00 | 0.008 | 1.47 |
| RT fore period | | | | | |
| 1 s | 0.90 \pm 0.35 | 0.69 \pm 0.23 | 31.00 | 0.151 | – |
| 2 s | 0.92 \pm 0.41 | 0.62 \pm 0.18 | 22.00 | 0.034 | 1.08 |
| 3 s | 1.18 \pm 0.51 | 0.59 \pm 0.17 | 13.00 | 0.005 | 1.60 |
| Net score of gambling task | | | | | |
| Set 2 | 2.60 \pm 2.83 | 1.80 \pm 4.26 | 40.50 | 0.459 | – |
| Set 3 | 2.90 \pm 3.90 | 7.4 \pm 7.06 | 24.50 | 0.050 | 0.96 |
| Set 4 | 3.20 \pm 4.92 | 8.20 \pm 7.08 | 27.50 | 0.086 | – |
| Set 5 | 1.00 \pm 3.29 | 7.20 \pm 5.34 | 15.50 | 0.008 | 1.46 |

DDG: dissociative disorder group, HCG: healthy control group, RT: reaction time.

complex decision with the feedback of incentive or threat in DDG ($\chi^2 = 3.97$, $Df = 3$, $P = 0.27$). However, the gain was significant ($\chi^2 = 9.21$, $Df = 3$, $P = 0.03$) for the HCG, as depicted in **Figure 2**.

Spearman rank-order correlation coefficient was calculated to observe the relationship amongst the variables. **Table 3** indicates a significant negative correlation between the NS and the total gain in IGT in DDG. In contrast, the correlation was significantly positive between the RD and the total gain in IGT in DDG.

Discussion

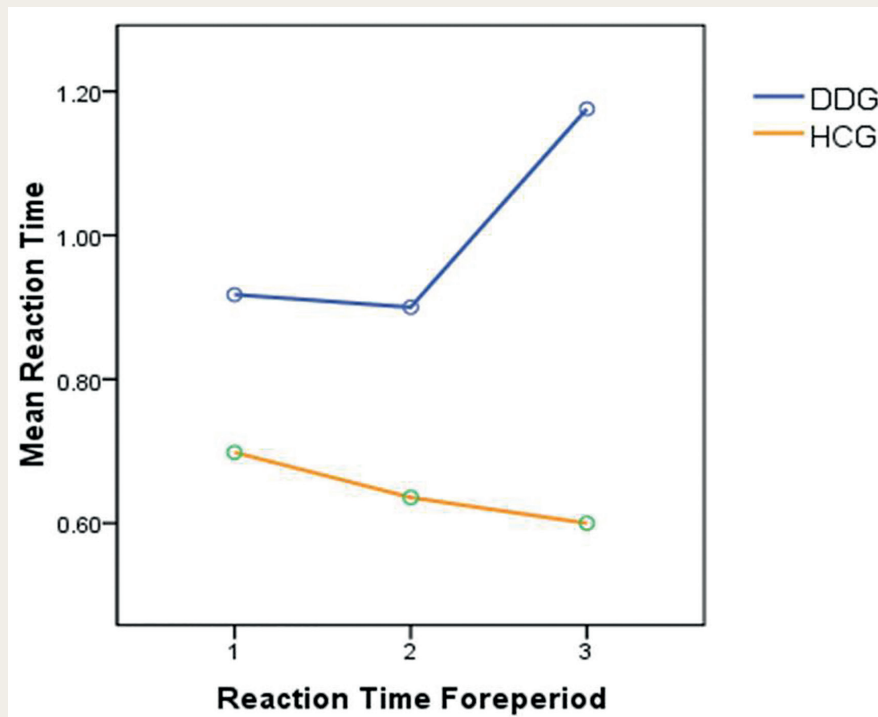
The study identified that specific personality disposition, low arousability,

and poor feedback utilization in decision making are associated with dissociative disorders and may significantly contribute to the psychopathology of the DCD. In addition to the published report of the association of the DCD with the characterological trait or environmental factors,¹² the current study, in agreement with Sarisoy et al.,¹³ reveals that the temperament factors also play a significant role in DCD (**Table 2**).

Considering the clinical presentation of patients with DCD, stable and moderately heritable high autonomic emotional responses to experiences that characterize their temperament are expected. NS is a personality trait

FIGURE 1.

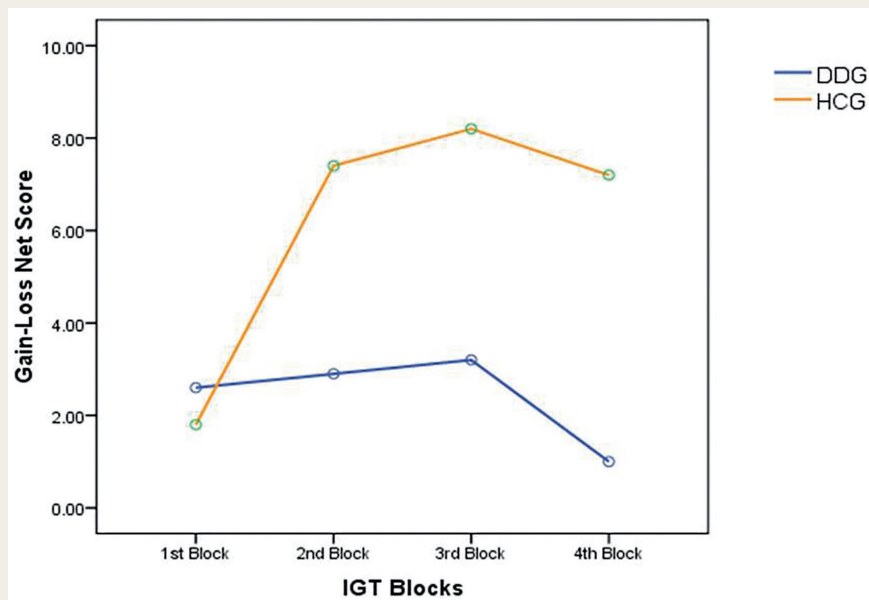
Comparison of RTs Across Three Fore Periods in DDG and HCG



DDG: dissociative disorder group, HCG: healthy control group, RT: reaction time.

FIGURE 2.

Comparison of Net Scores Across Four Blocks of Gambling Task in DDG and HCG



DDG: dissociative disorder group, HCG: healthy control group.

associated with the exploratory activity or extravagance approach in response to novel stimulation or reward cues. NS causes impulsive decision-making and risk-taking behavior that are perceptibly evident in the DDG.²³ Amplified resting state activation of the ventral region of

the medial prefrontal cortex (MPFC) that functions as a part of the reward-related network and is related to NS²⁸ might explain the impulsivity in DDG. It may be hypothesized that MPFC is activated so that expectancy of emotionally loaded stimuli (in terms of approach/avoidance)

TABLE 3.

Association/Correlation Between Temperament-Character Variables and RT with Total Net Gain Score of IGT

| Domain | DDG | HCG |
|-------------------------|--------|-------|
| Novelty seeking (NS) | -0.69* | -0.15 |
| Harm avoidance (HA) | 0.04 | 0.08 |
| Reward dependence (RD) | 0.64* | -0.27 |
| Persistence (P) | -0.17 | -0.48 |
| Self-directedness (SD) | 0.44 | 0.02 |
| Cooperativeness (C) | 0.50 | -0.24 |
| Self-transcendence (ST) | 0.55 | 0.43 |
| RT 1 s | 0.33 | 0.02† |
| RT 2 s | 0.37 | -0.03 |
| RT 3 s | 0.49 | -0.10 |

*Significant at P < 0.05, DDG: dissociative disorder group, HCG: healthy control group, RT: reaction time.

and the desire for immediate gratification²⁹ might prompt their impulsive decision making in different life situations.

High HA in DDG may explain their excessive worry in the face of impulsive action as guilt-induced arousal that facilitates aversion-related processing.²⁹ HA attenuates their resting-state activity in the dorsal region of MPFC (DMPFC) that possibly helps them in top-down motor cortex inhibitory function, which is important in selecting goal-directed actions in unpredictable environments.³⁰⁻³¹ An avoidance response to minimize the anxiety or fear or unpredictability may be related to the symptoms of DDG. DMPFC has also been found to play roles in integrating social impressions, morality, judgments, decision making, fear, and anxiety information processing.^{30,31}

RD is characterized by a tendency to respond markedly to signals of social reward that can manifest in persisting repetition of actions associated with rewards, increased sociability, and a need for social approval.³² In response to a lack of social reward, individuals with high reward dependence are more likely to have increased noradrenergic activity, that is, increased arousal level and emotional reactivity to stress.³³ They may experience feelings of depression, anxiety or agitation, and extreme dissatisfaction that can lead them to indulge

in habits that reinforce reward-seeking or social dependency, including conversion episodes. DDG, for their higher reward dependence (**Table 2**), are primed to attend to immediately rewarding feedback along with utter neglect of the feedback from the environment regarding the cost associated. When constantly faced with frustrating and uncertain result, they jump into a hasty responding style. For example, a young girl who could not perform well in her last examination can perceive herself in emotional crisis and seek immediate acceptance (reward) from significant others. Frequent incidences of dissociative unresponsiveness can earn her immediate attention and care that she is presently unable to secure through more effort in her further academic performance, satisfying her reward-seeking temperament. However, this mode of passivity also brings her the desired attention. Nonpersistence has emerged as a salient factor in the psychopathology of conversion disorder in the present study (**Table 2**). This suggests that the patients with dissociation are less industrious or hard-working, with relatively less ambition toward achievement and having a tendency to easily give up.²³ It appears from the lower score on persistence that their rewarding circuit is activated mostly by the presence of strong stimulus in the environment, which is, again, explained by their attraction for newer stimulation every time and tendency to give up easily when faced with any negativity in the environment, for example, frustration, criticisms, obstacles, and fatigue. They are less engaged in formal tasks as they are not motivated enough to cognitively engage in demanding tasks, due to lack of arousability.

It is being already mentioned that characterological traits, such as low SD and high ST, are implicated in conversion disorders, and our study has identified the same (**Table 2**).¹³

The low SD character trait in DDG indicates their immaturity and poor self-determination that disable them to regulate and adapt behavior to the demands of a situation.³⁴ Low self-directedness makes them fail to take responsibility and more to use projective mechanisms, such as blaming, which may be attributed to their external locus of control.³⁵ Consequently, they are

appraised by others as unreliable. The high ST, though primarily it may be associated with spirituality or creativity, when associated with low SD, it might indicate the dissolution of the self in the experience or belief in supernatural or magical thinking. Dissolution of self is mostly linked to the experience of absorption or dissociation if there is nothing to suggest bipolar or psychotic illnesses.^{36,37}

Low arousability and inability to maintain goal-directed arousal over a given period of time (**Table 2**) in DDG are detected from their delayed natural RT, that is, more time to respond than the HCG. Within-group analysis of DDG reveals that fore period of 1 s yields the fastest RT for DDG compared to their own performance with a fore period of 2 and 3 s (**Figure 1**). This suggests that they perform the best when they were to respond with the shortest time interval between the ready signal and the onset of the stimulus. However, the research so far have shown 2 s to be an optimal condition for eliciting the best RT.³⁸⁻³⁹ Though in the present study, the HCG showed a faster RT compared to the DDG across all the fore periods, they have shown their best performance with 3 s. The findings suggest that probably the fastest RT of DDG in 1-s fore period appears to be a sign of their ready arousability; however, their progressively slower performance from 1 s to 2 s to 3 s of fore period indicates a sharp decline in their state of arousal necessary for remaining in engaged mode in goal-directed behavior. These two observations together suggest that their ready arousability is more of an index of impulsivity than cognitive promptness and adequate capacity for cognitive monitoring. Longer waiting time makes them less productive as compared to the HCG, and they cannot maintain the preparedness for long. Although the role of incentive in any active motor performance is well established,⁴⁰ it seems that DDG finds it difficult to function in the longer nonrewarding intervals of the fore period than HCG and a nonrewarding time-frame propels them toward passivity, which possibly is their preferred response style. As DDG are greater novelty seekers (**Table 2**) than the HCG, it may be difficult for them to remain persistent over the fore periods due to

the absence of any newness during the longer empty interval. It again suggests their extent of vulnerability to monotony that leads to seek novel sensations.

Previous researchers have found that people who seek immediate gratification of need are impulsive by nature are irresponsible and reluctant, and, generally, plan their goals in a short-term manner. They fail to utilize the cues or to understand the consequence of their behavior.⁴¹ The same has been found to be true for some of the psychiatric populations; they choose from decks that yield them immediate huge reward for their cognitive bias for positive cues.⁴² In his paper, Doya voiced that expectation of a high reward can motivate a subject to go for an action despite a large cost.⁴³ In the present study, the DDG did not progress in the gambling task over the time (**Figure 2**). As the task progressed, it was observed that the HCG utilized the cue of the gambling task and not only opted for more advantageous decks where they have received little immediate benefits but also could decode the relevant cues and appreciate long-term gain. Therefore, the HCG made a strategy for the long-term maximization of profit than immediate short-term benefits. On the other hand, DDG loses interest in cognitively engaging task, such as gambling task, as the demand of the gambling task does not satisfy their temperament of NS, which is evident from the inverse correlation between decision making on IGT outcome measure and NS (**Table 3**). Moreover, their incentive dependency in the decision-making process is also evident with positively correlated RD score (**Table 3**). On the contrary, not only the HCG had lower score on NS (**Table 2**) but also no such relationship was obtained between IGT outcome measure and NS for HCG (**Table 3**).

Thus, the prompt arousability (RT) and impulsivity (NA) and excessive vigilance and worry (HA), high social dependency (RD) along with poor persistence (P) may result in propensity to be stirred up with perceived provocation, and, at the same time, make them susceptible to adopt primitive coping style, such as dissociation. As fear, anxiety, anger, surprise, joy, sadness, and sexuality show heightened physiological activity,⁴⁰ the patients with DCD are vulnerable to these stimuli

especially that are having negative valence for them.⁴⁴

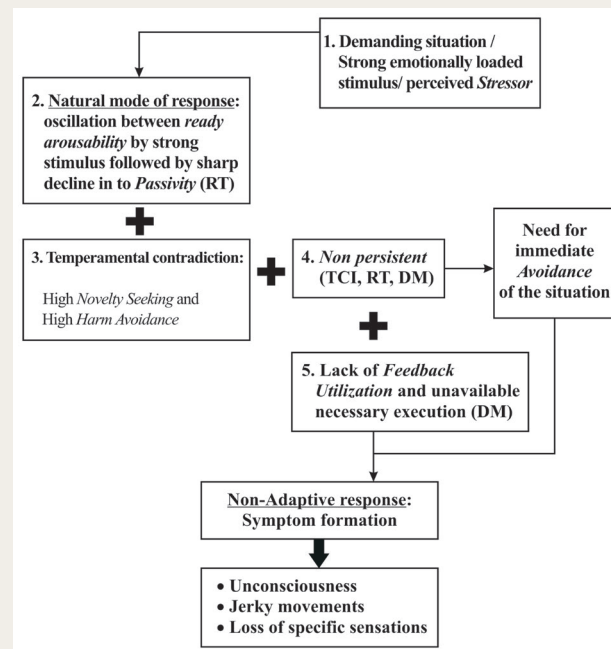
As emerged from the above discussion, in a prevailing low arousal state, in patients with DCD, a stimulus having strong valence may evoke organismically approaching attitude and result in sudden high arousal and associated physiological changes. Hypervigilance to those physiological changes may immediately activate inhibitory activity. This inhibitory activity can be related to appeasement behavior, where there is rapid alteration of signal by inhibition of emotional experience toward the source and prompt act of seeking nurturance from the same.¹⁹ As their high harm-avoidance tendency makes them tense, apprehensive, and nervous of their experience of organismic pleasure, it may be overpowering enough to result in dissociative or conversion symptoms. This also serves the purpose of curbing the impulsivity to an accepted level of expression for the given stimulus that was the source of excitation, as well as getting attention from a significant other that maintains the response style.

Figure 3 is a psychopathology formulation based on the findings of the present study. Biopsychosocial conceptualization on conversion disorder, as proposed by Stonnington et al.,⁴⁵ has already highlighted the role of triggering and lifelong stressors, and the current summarization is an extension of that model.

However, with limited samples, it is difficult to pinpoint on those findings. In the future research, the sampling biases, mostly for the HCG, should be minimized by adopting a stringent sampling procedure. Moreover, the validity of IGT, especially the computerized version, with this population needs further exploration, due to paucity of work. Dissociative conditions are heterogeneous in nature; comparison of various subgroups could be a necessary task. Presence of depressive symptoms were not ruled out in DDG, and that might have had some impacts on the cognitive assessments in this study.⁴⁶ This study was conducted only on females. In India, though DCD is 12 times more prevalent in females, it is not that infrequent in males too.⁴⁷ Future studies may address some of these issues. Prospective studies of these traits might be more helpful to have a better understanding of this

FIGURE 3.

Psychopathology Formation in Dissociative Disorder



population. Moreover, there is a scope to explore the relationship of stress or psychological conflict with personality and neurocognitive variables in the formation and maintenance of DCD symptoms.

Conclusion

The current study highlights the role of both temperament and characterological traits associated with DCD. The study also points toward Breuer and Freud’s historical speculation on cognitive arousability and inhibition of the nervous system in the symptom formation of “konversion.” There is a scope to revisit the old model of hysteria as well as blend current neuropsychological understanding of psychopathology for a comprehensive view of the disorder.

Declaration of Conflicting Interests

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