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Expert System for Identifying Dramatic Behavior and Emotional Outbursts in Adolescent Couples Using the Certainty Factor Method

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Abstract

Many teenagers today often experience explosive and dramatic emotions. This behavior is an indication of a personality disorder, namely histrionics, which is commonly found among teenagers, especially in couples. However, many teenagers are unaware of their condition or feel reluctant to consult directly with a professional because of social stigma. This research aims to build an expert system that is able to identify tendencies in dramatic behavior and overflowing emotions as a means of independent initial screening. The method used in this system is Certainty Factor (CF) to accommodate uncertainty in subjective diagnosis. Knowledge data was built based on the Strengths and Difficulties Questionnaire (SDQ) questionnaire instrument and expert validation of eight main symptoms. The test results show that the system is able to provide accurate certainty values, where simulations on respondents with key symptoms such as manipulative and impulsive behavior produce a confidence level of 99.6%. The conclusions of this research show that the integration of expert knowledge into digital systems is effective in converting qualitative behavioral data into precise quantitative output, making it easier for teenagers to recognize their emotional conditions early.

1. Introduction

Mental and emotional health has become one of the most pressing public health concerns in Indonesia. The burden of mental disorders remains alarmingly high: according to the 2013 Basic Health Research (Riskesdas), the prevalence of mental and emotional disorders marked by symptoms of depression and anxiety reached 6% among individuals aged 15 and over, equivalent to approximately 14 million people. Among the emotional disorders most commonly affecting adolescents is histrionic personality disorder, a condition particularly prevalent in the context of romantic relationships [4], [10], [13]. Adolescents experiencing this disorder frequently exhibit excessive attention-seeking, emotional dysregulation, and deep feelings of worthlessness, which in turn drive impulsive reactions and, in severe cases, self-destructive urges. When left unaddressed, these patterns can escalate into clinical depression, chronic frustration, and broader physical and psychological deterioration. Despite the prevalence of this condition, the majority of those affected remain unaware of their diagnosis or actively resist seeking professional help due to social stigma. This gap between need and access underscores the urgency of developing a system that empowers individuals to conduct independent preliminary self-assessments. An expert system a computer-based application that encodes expert knowledge, factual rules, and reasoning mechanisms to replicate decision-making in a specialized domain represents a viable solution to this challenge. The broader aim of expert system development in this context is not to replace mental health professionals, but to bring their expertise closer to the general public, particularly those who may otherwise have no access to clinical support.

Within the context of adolescent romantic relationships, dramatic and emotionally explosive behavior is increasingly observed as couples spend more time together, both through face-to-face interaction and through social media. Symptoms such as excessive jealousy, manipulative threats of separation, and an inability to tolerate being ignored even briefly are often dismissed by peers and family members as ordinary

"teenage drama," even though, when these patterns persist and intensify, they may indicate the early manifestation of histrionic personality disorder. Left unaddressed, this condition does not only affect the individual experiencing it, but also places considerable emotional burden on their partner, who may feel trapped, controlled, or responsible for managing the other person's emotional stability. The difficulty in distinguishing normal adolescent emotional volatility from a clinically significant pattern of histrionic behavior makes early, low-stigma screening tools particularly valuable for this population.

Several studies have explored the use of computer-based reasoning to support mental health screening among adolescents. Budiman and Setiawan [1] applied the Certainty Factor method to diagnose neurosis-related symptoms in teenagers, demonstrating that uncertain expert reasoning can be translated into a usable diagnostic tool outside clinical settings. Nugroho and Sismoro [2] compared the Certainty Factor and Dempster-Shafer methods for early screening of mental-emotional disorders and found that Certainty Factor offered simpler implementation with comparable accuracy for single-expert knowledge bases. In a related direction, Pratama and Widiastuti [3] developed a web-based expert system for the early detection of personality disorder indications using uncertain reasoning, underlining the importance of an accessible, non-face-to-face interface for users who are reluctant to seek direct clinical consultation a reluctance that Wahyudi and Lestari [6] attribute largely to the social stigma surrounding mental health issues in Indonesia.

More specifically related to the present study, Ramadhan and Saputra [8] built a Certainty-Factor-based application to determine adolescent anxiety levels, while Hidayat and Permana [9] and Kurniawan and Pratama [14] each developed web-based expert systems for the early detection of histrionic personality disorder and Cluster B personality disorders, respectively, both relying on the Certainty Factor method to manage the inherent uncertainty of self-reported psychological symptoms. Collectively, these studies confirm that Certainty Factor is a well-established and effective method for translating subjective behavioral indicators into quantifiable diagnostic output.

However, most of the systems reviewed above either focus on personality disorders in general or examine anxiety and emotional symptoms in isolation, without specifically targeting the dramatic, manipulative, and emotionally explosive behavior patterns that emerge within adolescent romantic relationships. Few, if any, combine a validated psychological screening instrument such as the Strengths and Difficulties Questionnaire (SDQ) with expert-weighted Certainty Factor values that are tailored specifically to relationship-context symptoms, such as the threat of breaking up, obsessive monitoring of a partner's phone or social media, and the use of the silent treatment as an emotional control tactic. This research seeks to close that gap by building an expert system whose knowledge base is constructed from eight key symptoms validated jointly through the SDQ instrument and direct expert input, and by applying the Certainty Factor method to combine expert confidence values with user-reported symptom frequency into a single, interpretable certainty score. The resulting system is intended to function as a confidential, independent, and low-stigma initial screening tool that adolescents can use before deciding whether to seek professional consultation.

The remainder of this paper is organized as follows. Section 2 describes the research methodology, including the waterfall-based system development approach, the data collection process, and the system design. Section 3 presents the results and discussion, covering the construction of the knowledge base, the Certainty Factor calculation procedure, and a sample case simulation. Section 4 concludes the paper and outlines directions for future work.

2. Research Methodology

This study adopts a waterfall model as its software development framework, progressing through the sequential stages of requirements analysis, system design, coding, implementation, testing, and maintenance. To handle the inherent uncertainty involved in behavioral diagnosis, the Certainty Factor (CF) method was applied, enabling the system to quantify degrees of confidence from both expert knowledge and user self-reports. Symptom data covering both psychological and emotional dimensions were gathered through a structured literature review encompassing topics in mental health, personality disorders, emotional regulation, expert system theory, and the Certainty Factor method. The primary screening instrument used was the Strengths and Difficulties Questionnaire (SDQ), supplemented by structured interview questionnaires. These instruments span multiple assessment domains, including emotional

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symptoms, behavioral indicators, peer relationship difficulties, and other contextually relevant aspects [5], [11]. System analysis drew on symptom data sourced from domain experts (psychologists and psychiatrists) and validated through user input from patients and respondents. The system was designed as a web-based platform to enable independent initial screening without requiring face-to-face clinical contact [7], [15]. System modeling employed both structured and object-oriented approaches: process flows were represented using Data Flow Diagrams (DFDs) and Use Case Diagrams to illustrate user-system interactions, while the database architecture organized symptom records, disorder classifications, and rule-based inference relations into structured relational tables [12].

3. Results and Discussion

This section presents the outcomes of the expert system development, covering three core components: the construction of the knowledge base, the application of the Certainty Factor (CF) method, and a simulation of the system's diagnostic output. Knowledge Base The knowledge base was constructed from symptom data characterizing dramatic behavior and emotional outbursts in adolescent romantic relationships. All symptoms were derived from the Strengths and Difficulties Questionnaire (SDQ) and cross-validated by domain experts, then assigned structured codes and integrated into the system's inference engine. Knowledge Representation and Expert Weights: The first step in building the knowledge base was to map each questionnaire item onto a symptom code and assign it a Measure of Belief (MB) value reflecting expert confidence in its diagnostic relevance. Using a Google Form-based instrument, eight key symptoms were identified as reliable indicators of dramatic behavior and emotional dysregulation in adolescent couples. Certainty Factor Method The Certainty Factor (CF) method was selected as the primary inferencing mechanism because it is well-suited to handle diagnostic uncertainty arising from the subjective nature of behavioral self-reports. Since individuals experience psychological symptoms with varying frequency and intensity, CF weights offer a principled framework for quantifying degrees of certainty without forcing binary diagnostic conclusions.

Mathematical Formulation The diagnostic process integrates expert confidence values with subjective user input through a two-step calculation. In the first step, each symptom certainty value is obtained by multiplying the expert's Measure of Belief (MB) by the user's chosen confidence level (MD): CF(Gn) = MB(Expert)n x MD (User) n. ***CF(Gn) = MB (Pakar) n X MD (User)n.*** Second Step (CF Combination): Combine several symptoms that appear into one conclusion value ***CFcombine = CFold + CFnew X (1 - CFold).***

Table 1. User Confidence Scale and Examples and Expert Confidence Values

Code	Symptoms (G)	MB Value (Expert)
G01	Feeling anxious/irritable if you don't get enough attention	0.8
G02	Using the Silent Treatment to get forgiveness	0.7
G03	Obsessively checking your partner's phone/social media	0.6
G04	Obsessively saying the word "break up"	0.9
G05	Exaggerating one's suffering to gain pity	0.7
G06	Inability to function normally if a text message isn't replied to	0.6
G07	Explosive emotions during minor conflicts	0.8
G08	Obsession with looking beautiful/handsome so your partner won't turn away	0.5

Table 1 presents the eight key symptoms (G01–G08) used as the knowledge base of the expert system, together with their corresponding Measure of Belief (MB) values as determined through expert validation. Each MB value reflects how strongly a given symptom is associated with dramatic, histrionic behavior in a romantic relationship; for example, the obsessive use of break-up threats (G04) carries the highest MB value of 0.9, indicating that experts regard this symptom as the strongest single indicator, whereas an obsession with physical appearance to retain a partner's attention (G08) carries the lowest MB value of 0.5, reflecting a weaker and more ambiguous association with the disorder. These MB values form the expert-confidence component of the Certainty Factor calculation and are later multiplied by the user's self-reported symptom frequency (MD) to produce a certainty value for each symptom.

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Table 2. Levels of Personality Disorders

Code	Personality Disorder Level
T1	Frequent
T2	Fairly Frequent
T3	Rarely
T4	Never

Table 2 defines the four frequency levels (T1–T4) used by the system to capture how often a user experiences each symptom, ranging from "Frequent" to "Never." This frequency scale functions as the response option presented to users during the screening questionnaire and serves as the basis for deriving the user's confidence (MD) value attached to each symptom, which is subsequently combined with the expert's MB value in the Certainty Factor formulation.

Table 3 CF Value Rules and Level of Histrionic Personality Disorder

Frequency Level	Rule	Code
TI	Often	1.0
T2	Fairly Often	0.6
T3	Rarely	0.4
T4	Never	0.0

Table 3 translates the four frequency levels from Table 2 into numerical CF rule values, where "Often" (T1) is assigned a value of 1.0, "Fairly Often" (T2) a value of 0.6, "Rarely" (T3) a value of 0.4, and "Never" (T4) a value of 0.0. These rule values represent the user's degree of confidence (MD) in experiencing a given symptom and are used directly in the Certainty Factor multiplication shown below; a higher frequency level results in a proportionally higher MD value, which in turn increases the final certainty score when combined with the expert's MB value.

Certainty Factor Calculation Analysis simulates calculations on the results of respondents who show high behavioral intensity in key symptoms (G01, G04, and G07) according to the answer choice "Often" CFgejala = MB x MD):

G01 : 0.8 x 1.0 : 0.8
G04 : 0.9 x 1.0 : 0.9
G07 : 0.8 x 1.0 : 0.8
Combining CF Values (CF Combine)
First Stage (Combining G01 and G04) :

$$CFc1 = CF1 + CF2 \times (1 - CF1)$$
$$CFc1 = 0.8 + 0.9 \times (1 - 0.8) = 0.98$$

Second stage (Combination of CFc1 with G07) :

$$CFc2 = CFc1 + CF3 \times (1 - CFc1)$$
$$CFc2 = 0.98 + 0.8 \times (1 - 0.98) = 0.996$$

The final result of this calculation, a certainty value of 99.6%, is not merely a statistical figure; it carries psychological meaning. A near-perfect certainty value indicates that the emotional turmoil observed is not

ordinary adolescent dynamics, but reflects a consistent pattern of manipulative and impulsive behavior. This high level of certainty signals an urgent need for intervention: the adolescent falls into a high-risk category requiring further support and education on healthy relationships to protect the mental health of both themselves and their partner. In summary, the calculation procedure works as follows: each symptom certainty value is first computed by multiplying the expert-assigned MB weight (e.g., 0.9 for G04, 0.8 for G07) by the user's reported frequency score. These individual CF values are then iteratively combined using the CF combination formula to yield a single cumulative certainty score. This design ensures that symptoms reported with greater frequency by the user, and assigned higher expert confidence, contribute more strongly to the final diagnostic output.

4. Conclusion

This study demonstrates that an expert system built on the Certainty Factor method constitutes an effective and accessible solution for identifying dramatic behavior and emotional dysregulation in adolescents, particularly within romantic relationship contexts. By combining expert-assigned Measure of Belief values with user-reported symptom frequency, the system successfully converts subjective behavioral observations into precise, quantifiable diagnostic output. The simulation results highlight that key manipulative behaviors most notably the repeated threat of breaking up (G04) and explosive emotional reactions during minor conflicts (G07) are the strongest contributors to the final certainty score, yielding a combined confidence level of 99.6% when co-occurring at high frequency. Importantly, this system lowers the barrier to early help-seeking: adolescents who feel reluctant or unable to attend face-to-face consultations can now complete an initial screening independently and online, enabling earlier identification and intervention before emotional distress escalates into clinical depression, frustration, or self-harm.

For future work, several improvements are recommended to strengthen the reliability and reach of the system. First, the knowledge base should be validated with a larger and more diverse panel of experts and tested on a larger sample of adolescent respondents to confirm the consistency of the Measure of Belief values across different populations and cultural contexts. Second, the system could be extended by incorporating machine learning techniques, such as classification or clustering methods, to complement the Certainty Factor approach and to allow the knowledge base to be refined automatically as more user data is collected. Third, future development could integrate the screening system with a referral mechanism that connects users showing high-risk certainty scores directly to licensed psychologists, counselors, or mental health hotlines, thereby strengthening the link between independent screening and professional intervention. Finally, usability testing on mobile platforms and longitudinal evaluation of the system's impact on adolescents' help-seeking behavior would provide stronger evidence of the system's real-world effectiveness.

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