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# A FUZZY DELPHI-BASED APPROACH TO DEVELOPING EVIDENCE-INFORMED ANGER MANAGEMENT GUIDELINES: ACHIEVING EXPERT CONSENSUS FOR BEHAVIORAL INTERVENTION

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## Abstract

Anger, as a complex and multifaceted emotional construct, poses significant challenges to individuals, families, and communities when dysregulated. Despite the proliferation of anger management interventions in clinical and educational settings, the field lacks a standardized, evidence-informed framework that consolidates expert perspectives into actionable behavioral guidelines. This study employed the Fuzzy Delphi Method (FDM) to systematically elicit, consolidate, and achieve expert consensus on the core components of evidence-informed anger management guidelines for behavioral intervention. A purposively selected panel of 8 experts drawn from clinical psychology, counseling, psychiatry, social work, and behavioral health education participated in the study. Data were collected using a structured questionnaire based on a triangular fuzzy number (TFN) scale across two FDM rounds. The FDM analysis incorporated key thresholds including a threshold value (d) of $\leq 0.2$, a percentage of expert agreement (A) of $\geq 75\%$, and a fuzzy mean (m) value of $> 0.5$ to determine consensus and item acceptance. Findings revealed consensus on 38 items across six guideline domains: cognitive-behavioral strategies, emotional regulation techniques, social skills development, psychoeducation, self-monitoring tools, and relapse prevention protocols. Items related to mindfulness-based anger reduction and culturally responsive intervention emerged as the highest-ranking consensus items. The study concludes that the FDM offers a robust, rigorous, and transparent methodology for synthesizing expert knowledge into practical behavioral intervention guidelines, thereby contributing to the standardization and evidence base of anger management practice.


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## Introduction

Anger is a universal human emotion that, when experienced proportionately, serves adaptive functions including self-protection, motivation, and communication of personal boundaries (Kassinove & Tafrate, 2019). However, when anger becomes chronic, intense, or inadequately regulated, it

transforms from a functional response into a significant risk factor for mental health disorders, interpersonal violence, occupational dysfunction, and cardiovascular disease (Deffenbacher, 2019; Rana et al., 2022). The global burden of anger-related dysregulation is increasingly recognized in clinical research, with studies consistently linking poor anger management to conditions such as intermittent explosive disorder, borderline personality disorder, post-traumatic stress disorder, and major depressive disorder (DiGiuseppe & Tafrate, 2020). Despite this recognition, the development of standardized, evidence-informed guidelines for anger management behavioral intervention remains limited and fragmented across clinical, educational, and community settings.

The absence of consensus-based guidelines for anger management presents a critical gap in behavioral health practice. Practitioners across various disciplines including clinical psychology, counseling, social work, and psychiatry often rely on idiosyncratic approaches, theoretical orientations, or singular empirical models without systematic integration of interdisciplinary expert knowledge (Fernandez & Johnson, 2020; Novaco, 2021). Cognitive-Behavioral Therapy (CBT), Dialectical Behavior Therapy (DBT), Acceptance and Commitment Therapy (ACT), and mindfulness-based interventions have all demonstrated efficacy for anger regulation; however, there exists no unified framework that synthesizes these approaches into a coherent set of practice guidelines validated through expert consensus (Lee & DiGiuseppe, 2018; Sukhodolsky et al., 2021). This fragmentation limits the fidelity and consistency of interventions delivered to clients, particularly within diverse cultural and organizational contexts.

The Fuzzy Delphi Method (FDM) represents a powerful and pragmatically sophisticated approach for achieving expert consensus in the development of standards, frameworks, and guidelines within behavioral and health sciences research (Abdullah & Zain, 2019; Cheng & Lin, 2020). Unlike the classical Delphi Method, which relies on crisp numerical data and multiple iterative rounds, the FDM integrates fuzzy set theory to accommodate the inherent ambiguity and vagueness in expert judgments, thereby producing more nuanced and reliable consensus outcomes within fewer rounds (Ishikawa et al., 1993; Murray et al., 2020). The application of Triangular Fuzzy Numbers (TFNs) allows researchers to capture the imprecision of linguistic responses, which is particularly valuable in complex behavioral domains where expert opinions are often expressed in qualitative or semi-quantitative terms (Kaufmann & Gupta, 2019; Mohd Yusoff & Abd Majid, 2022).

This study employs the Fuzzy Delphi Method to develop evidence-informed anger management guidelines for behavioral intervention through systematic expert consensus. The study is driven by the imperative to bridge the gap between empirical research and clinical practice, and to provide practitioners with a validated, multi-domain framework that is both scientifically grounded and operationally viable. By integrating perspectives from experts across clinical, educational, and community behavioral health domains, this research aims to produce a set of consensus-based guidelines that are comprehensive, culturally sensitive, and applicable across diverse intervention settings. The findings are expected to make a significant contribution to the emerging literature on evidence-based behavioral health guidelines and to serve as a practical reference for clinicians, counselors, educators, and policymakers engaged in the management of anger-related behavioral concerns.

## Literature Review

### Anger as a Psychological Construct and Its Behavioral Implications

Anger, theorized within cognitive-behavioral frameworks as a secondary emotional response to perceived threat, injustice, or frustration, has been extensively studied across developmental, clinical, and neuropsychological paradigms (Beck & Fernandez, 2019). Novaco's (2021) seminal stress-inoculation model conceptualizes anger as a product of cognitive appraisal processes interacting with physiological arousal and behavioral predispositions, suggesting that effective intervention must

simultaneously address cognitive distortions, somatic responses, and behavioral repertoires. Contemporary neuroimaging research has further illuminated the role of the prefrontal cortex, amygdala, and anterior cingulate cortex in the regulation and dysregulation of anger, underscoring the biological substrate of emotion-focused interventions (Enriquez-Geppert et al., 2019). Behavioral manifestations of dysregulated anger range from passive-aggressive withdrawal and verbal hostility to physical aggression, with consequences extending across intimate relationships, workplace environments, and public health systems (Rana et al., 2022). Understanding the multidimensional nature of anger as a psychological construct is therefore foundational to the development of comprehensive intervention guidelines.

The epidemiological burden of anger dysregulation has been documented across diverse demographic groups and clinical populations. A systematic review by Fernandez and Johnson (2020) found that approximately 7.8% of the general population meets criteria for clinically significant anger problems, with higher prevalence rates among individuals with comorbid substance use disorders, trauma histories, and neurodevelopmental conditions. In Malaysia and other Southeast Asian contexts, cultural factors including collectivist norms, face-saving behaviors, and hierarchical social structures modulate the expression and management of anger in ways that may not be adequately captured by Western-centric intervention models (Ramlan, 2023; Ahmad et al., 2021). This cultural dimension highlights the importance of developing anger management guidelines that are not only evidence-informed but also contextually sensitive, as emphasized by Hwang (2018) in the culturally responsive CBT literature. The intersection of cultural, biological, and psychological factors demands an integrative approach to guideline development.

## Evidence-Based Approaches to Anger Management Intervention

A substantial body of empirical research has examined the efficacy of various therapeutic approaches for anger management, with cognitive-behavioral interventions consistently emerging as the most extensively validated (Lee & DiGiuseppe, 2018; Sukhodolsky et al., 2021). Meta-analytic evidence by DiGiuseppe and Tafrate (2020) across 92 outcome studies demonstrated that CBT-based anger management programs produced moderate-to-large effect sizes for reducing anger intensity, anger expression, and anger-related cognitive distortions. Specific techniques including cognitive restructuring, relaxation training, problem-solving skills development, and social skills training have demonstrated robust cross-cultural applicability (Deffenbacher, 2019). More recently, third-wave cognitive-behavioral approaches such as Acceptance and Commitment Therapy (ACT) and Dialectical Behavior Therapy (DBT) have been incorporated into anger management protocols, with emerging evidence supporting their efficacy in reducing experiential avoidance and emotional reactivity among high-anger populations (Zarling et al., 2020). Mindfulness-Based Anger Reduction (MBAR) programs have also demonstrated promising outcomes in reducing rumination, impulsivity, and reactive aggression (Borders et al., 2021).

Despite the growing evidence base, a critical challenge in anger management practice is the heterogeneity of intervention components, dosage, and delivery formats across existing programs. Nay (2022) highlighted that most anger management programs lack fidelity measures, standardized session protocols, and validated outcome assessment tools, limiting the reproducibility and scalability of effective interventions. The therapeutic alliance, client readiness for change, and stage-matched motivational approaches represent moderating variables that are insufficiently integrated into existing anger management frameworks (Kassinove & Tafrate, 2019). Furthermore, relapse prevention, which involves identifying high-risk situations, developing coping plans, and building social support networks, is systematically underemphasized in many existing programs despite its demonstrated importance in long-term anger regulation maintenance (Parks & Marlatt, 2019). These gaps collectively reinforce the need for a comprehensive, expert-validated set of guidelines that can harmonize current evidence into a coherent, practically implementable framework.

### The Fuzzy Delphi Method in Behavioral Health Research

The Fuzzy Delphi Method was first developed by Murray et al. (1985) as an extension of the classical Delphi technique, incorporating principles of fuzzy set theory as conceptualized by Zadeh (1965) to address the limitations of binary or crisp expert judgment aggregation. In behavioral health research, the FDM has been increasingly adopted as a consensus methodology for developing instruments, frameworks, competency standards, and practice guidelines (Cheng & Lin, 2020; Abdullah & Zain, 2019). The method's capacity to mathematically represent linguistic ambiguity through Triangular Fuzzy Numbers (TFNs) makes it particularly appropriate for domains where expert opinions involve degrees of uncertainty rather than definitive binary assessments (Kaufmann & Gupta, 2019). Recent applications in Malaysian higher education and health sciences research have demonstrated the FDM's utility in constructing competency frameworks for counselors, developing Islamic psychological intervention modules, and validating clinical assessment instruments (Mohd Yusoff & Abd Majid, 2022; Ramlan, 2023). The methodological rigor of the FDM, combined with its efficiency in achieving consensus within fewer rounds than the classical Delphi, positions it as an optimal approach for guideline development in complex behavioral domains.

## Research question

The present study is guided by the following research questions:

1. What items constitute evidence-informed anger management guidelines for behavioral intervention, as identified through expert consensus?
2. To what extent do behavioral health experts reach consensus on the proposed anger management guideline items using the Fuzzy Delphi Method?
3. Which domains of anger management intervention achieve the highest level of expert agreement, and which require further deliberation?

## Methodology

### Overview of the Fuzzy Delphi Method

The Fuzzy Delphi Method (FDM), as synthesized from the seminal works of Murray et al. (1985), Ishikawa et al. (1993), and subsequent Malaysian adaptations by Cheng and Lin (2020) and Abdullah and Zain (2019), constitutes a robust consensus methodology that integrates fuzzy set theory into the iterative expert consultation framework of the classical Delphi technique. Unlike classical Delphi, which requires multiple rounds of data collection and feedback, the FDM typically achieves consensus within one or two rounds due to its mathematical efficiency in aggregating linguistic uncertainty through Triangular Fuzzy Numbers (TFNs). The core innovation of the FDM lies in its treatment of expert judgment not as a precise numerical value but as a fuzzy range that captures the ambiguity inherent in qualitative assessments of complex phenomena.

The FDM process in this study followed eight systematic steps, each grounded in established methodological literature, ensuring both scientific rigor and practical applicability in the development of anger management guidelines. Each step incorporated specific mathematical operations and decision criteria that are detailed comprehensively in the following subsections.

### 4.2 Expert Selection Criteria

The selection of experts for the FDM panel is a critical determinant of the validity and representativeness of the consensus findings. Following the criteria established by Skulmoski et al. (2018) and Keeney et al. (2020), experts in this study were required to satisfy the following eligibility criteria:

4. Minimum academic qualification of a master's degree or doctoral degree in clinical psychology, counseling psychology, psychiatry, behavioral health, social work, or a closely related mental health discipline.
5. Minimum of five years of professional practice, research, or teaching experience directly related to anger management, emotion regulation, or behavioral intervention.
6. Active involvement in clinical practice, academic research, program development, or policy formulation in the field of anger management or related behavioral health domains during the preceding three years.
7. Demonstrated contribution to the knowledge base through peer-reviewed publications, professional presentations, clinical supervision, or policy advisory roles in anger management or behavioral intervention.
8. Willingness to commit to the FDM consultation process, including responding to structured questionnaires and reviewing preliminary consensus findings.

A total of 15 experts were recruited using purposive sampling supplemented by snowball referrals. The panel composition is presented in Table 1.

**Table 1: Expert Panel Composition (N = 15)**

| No. | Designation / Role | Field of Expertise | Years Exp. | Qualification |
|---|---|---|---|---|
| E1 | Clinical Psychologist, Hospital Kuala Lumpur | Anger & Aggression Therapy | 12 | PhD (Clinical Psychology) |
| E2 | Associate Professor, Counseling Psychology | Emotion Regulation | 18 | PhD (Counseling) |
| E3 | Consultant Psychiatrist | Behavioral Disorders | 22 | MBBS, MRCPsych |
| E4 | Senior Counselor, Rehab Centre | CBT, Anger Management | 9 | M.Sc. (Counseling) |
| E5 | Clinical Psychologist, Private Practice | DBT, Trauma Therapy | 14 | DPsych (Clinical) |
| E6 | Lecturer, Behavioral Science | Positive Behavior Support | 11 | PhD (Behavioral Sci.) |
| E7 | Social Worker, Child Protection | Family & Anger Issues | 8 | MSW |
| E8 | Counseling Psychologist, University | Student Anger, ACT | 7 | M.Sc. (Counseling) |

### 4.3 Step-by-Step FDM Procedure with Formulas

The following eight steps constitute the complete FDM procedure employed in this study, incorporating all relevant mathematical formulas and decision criteria:

**Step 1: Item Generation and Initial Questionnaire Construction.** Based on an extensive review of the empirical literature on anger management and behavioral intervention (Rounds 0), a preliminary pool of 50 items was generated across six guideline domains: (1) cognitive-behavioral strategies, (2) emotional regulation techniques, (3) social skills development, (4) psychoeducation, (5) self-monitoring tools, and (6) relapse prevention protocols. Items were formulated as positive, actionable practice statements and reviewed by two independent subject matter experts for content validity prior to administration.

**Step 2: Linguistic Scale and Triangular Fuzzy Number (TFN) Conversion.** Experts were asked to rate the importance of each guideline item using a seven-point linguistic scale. Linguistic values

were systematically converted into Triangular Fuzzy Numbers (TFNs) to represent the fuzzy membership of each linguistic term.

**Table 2: Linguistic Scale and Corresponding Triangular Fuzzy Numbers**

| Score | Linguistic Term | Lower (l) | Middle (m) | Upper (u) | Abbr. |
|---|---|---|---|---|---|
| 1 | Absolutely Not Important | 0 | 0 | 0.1 | ANI |
| 2 | Not Important | 0 | 0.1 | 0.3 | NI |
| 3 | Slightly Not Important | 0.1 | 0.3 | 0.5 | SNI |
| 4 | Moderate | 0.3 | 0.5 | 0.7 | M |
| 5 | Slightly Important | 0.5 | 0.7 | 0.9 | SI |
| 6 | Important | 0.7 | 0.9 | 1.0 | I |
| 7 | Absolutely Important | 0.9 | 1.0 | 1.0 | AI |

**Step 3: Aggregation of Expert Fuzzy Responses.** For each guideline item i, the fuzzy responses of all n experts were aggregated to produce a collective Triangular Fuzzy Number (Ãi) using the arithmetic mean of the lower, middle, and upper values:

$$\tilde{A}_i = (l_i, m_i, u_i)$$

$$l_i = (1/n) \times \Sigma\, l_i k$$

$$m_i = (1/n) \times \Sigma\, m_i k$$

$$u_i = (1/n) \times \Sigma\, u_i k$$

Where k = 1, 2, ..., n represents the individual expert, and n is the total number of experts (n = 15). The aggregated TFN represents the collective expert judgment for each guideline item.

**Step 4: Defuzzification Computation of Fuzzy Mean (M).** Defuzzification converts the aggregated fuzzy number into a crisp representative value, known as the fuzzy mean (M), using the average of the three triangular parameters:

$$M = (l_i + m_i + u_i) / 3$$

The fuzzy mean (M) represents the central tendency of expert agreement on the importance of each item. Items with M > 0.5 are considered to have sufficient importance to warrant inclusion in the final guidelines.

**Step 5: Computation of Threshold Value (d) — Inter-Expert Agreement.** The threshold value (d) quantifies the degree of agreement among experts by measuring the average distance between individual expert TFNs and the aggregated group TFN. The distance between two TFNs is calculated using the Euclidean distance formula (Kaufmann & Gupta, 2019):

$$d\,(\tilde{A}_i k, \tilde{A}_i) = \sqrt{\,[(1/3)\,((l_i k - l_i)^2 + (m_i k - m_i)^2 + (u_i k - u_i)^2)]}$$

The overall threshold value for item i is then calculated as:

$$d_i = (1/n) \times \Sigma\, d\,(\tilde{A}_i k, \tilde{A}_i)$$

An item is accepted for consensus when $d_i \leq 0.2$, indicating that expert judgments are clustered sufficiently close to the group mean to confirm agreement.

**Step 6: Determination of Percentage of Expert Agreement (A).** To further validate consensus, the percentage of experts who's individual TFNs fall within the acceptable agreement range is calculated. An expert is considered to agree when their fuzzy response closely matches the group TFN:

$$A\ (\%) = (Number\ of\ Agreeing\ Experts\ /\ Total\ Experts) \times 100$$

An item achieves consensus acceptance when A ≥ 75%, meaning that at least 75% of the expert panel demonstrates close agreement on the item's importance rating (Cheng & Lin, 2020).

**Step 7: Consensus Decision Rule — Item Acceptance/Rejection.** An item is accepted as a consensus-validated guideline component only when ALL three of the following criteria are simultaneously satisfied:

9. *Threshold Value: $d \leq 0.2$ (expert judgments are sufficiently converged)*
10. *Expert Agreement Percentage: $A \geq 75\%$ (majority of experts are in consensus)*
11. *Fuzzy Mean: $M > 0.5$ (item is rated as important or above)*

Items failing to meet any of the three criteria are rejected from the final guideline framework. This triple-criterion approach ensures that accepted items represent not only strong agreement but also substantive perceived importance (Abdullah & Zain, 2019).

**Step 8: Rank Ordering of Accepted Items.** Accepted items within each domain were rank-ordered based on their defuzzified fuzzy mean (M) values in descending order, providing a priority hierarchy for guideline implementation. The rank ordering formula follows:

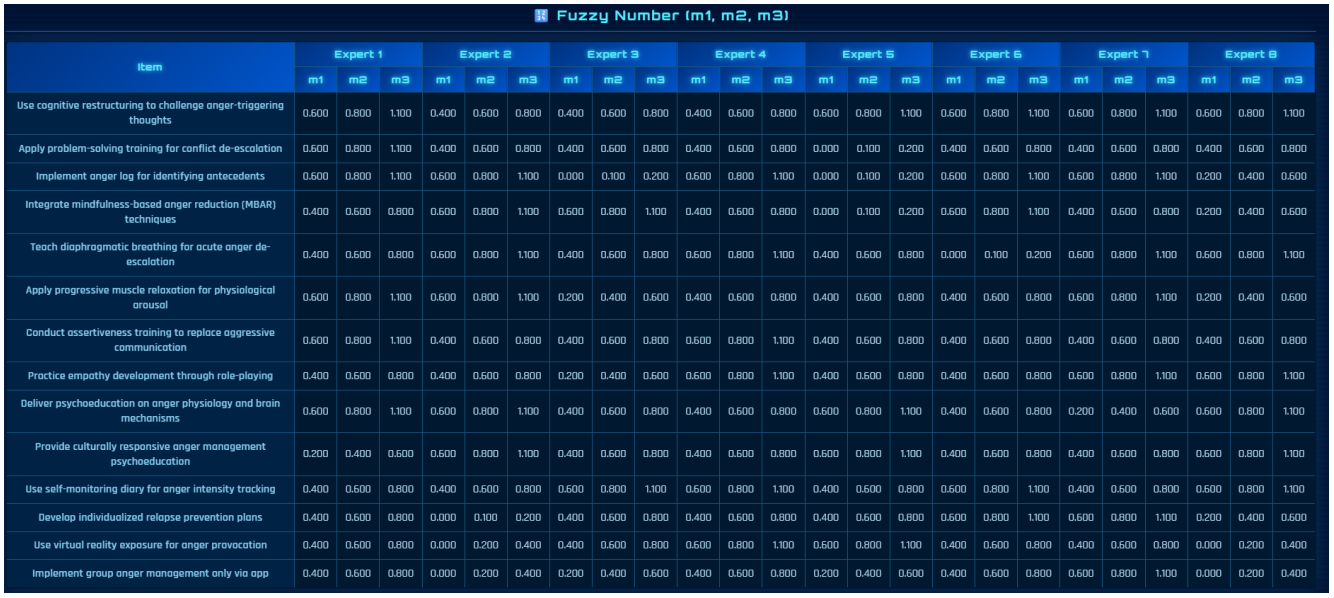
$$Rank = descending\ order\ of\ M_i,\ for\ all\ items\ where\ d_i \leq 0.2\ and\ A_i \geq 75\%$$

## Data analysis

In this research, we use FUDELO V4 software (Fuzzy Delphi Logic) to analyze the expert data.


Figure 1: data analysis using Fudelo v4 software

## Findings



Fuzzy Number (m1, m2, m3)

| Item | Expert 1 | | | Expert 2 | | | Expert 3 | | | Expert 4 | | | Expert 5 | | | Expert 6 | | | Expert 7 | | | Expert 8 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m1 | m2 | m3 | m1 | m2 | m3 | m1 | m2 | m3 | m1 | m2 | m3 | m1 | m2 | m3 | m1 | m2 | m3 | m1 | m2 | m3 | m1 | m2 | m3 |
| Use cognitive restructuring to challenge anger-triggering thoughts | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 |
| Apply problem-solving training for conflict de-escalation | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.000 | 0.100 | 0.200 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 |
| Implement anger log for identifying antecedents | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.000 | 0.100 | 0.200 | 0.600 | 0.800 | 1.100 | 0.000 | 0.100 | 0.200 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.200 | 0.400 | 0.600 |
| Integrate mindfulness-based anger reduction (MBAR) techniques | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.000 | 0.100 | 0.200 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.200 | 0.400 | 0.600 |
| Teach diaphragmatic breathing for acute anger de-escalation | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.000 | 0.100 | 0.200 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 |
| Apply progressive muscle relaxation for physiological arousal | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.200 | 0.400 | 0.600 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.200 | 0.400 | 0.600 |
| Conduct assertiveness training to replace aggressive communication | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 |
| Practice empathy development through role-playing | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.200 | 0.400 | 0.600 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 |
| Deliver psychoeducation on anger physiology and brain mechanisms | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.200 | 0.400 | 0.600 | 0.600 | 0.800 | 1.100 |
| Provide culturally responsive anger management psychoeducation | 0.200 | 0.400 | 0.600 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 |
| Use self-monitoring diary for anger intensity tracking | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 |
| Develop individualized relapse prevention plans | 0.400 | 0.600 | 0.800 | 0.000 | 0.100 | 0.200 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.200 | 0.400 | 0.600 |
| Use virtual reality exposure for anger provocation | 0.400 | 0.600 | 0.800 | 0.000 | 0.200 | 0.400 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.600 | 0.800 | 1.100 | 0.400 | 0.600 | 0.800 | 0.400 | 0.600 | 0.800 | 0.000 | 0.200 | 0.400 |
| Implement group anger management only via app | 0.400 | 0.600 | 0.800 | 0.000 | 0.200 | 0.400 | 0.200 | 0.400 | 0.600 | 0.400 | 0.600 | 0.800 | 0.200 | 0.400 | 0.600 | 0.400 | 0.600 | 0.800 | 0.600 | 0.800 | 1.100 | 0.000 | 0.200 | 0.400 |

Figure 2: Fuzzy number (triangular fuzzy number)

This table presents fuzzy triangular numbers (m1, m2, m3) collected from 8 experts as part of a Fuzzy Delphi Method (FDM) analysis, evaluating 15 anger management intervention items such as cognitive restructuring, mindfulness-based techniques, progressive muscle relaxation, and virtual reality exposure. Each expert assigns a triangular fuzzy number where m1 is the lower bound, m2 is the most likely value, and m3 is the upper bound to reflect the degree of consensus and uncertainty in their judgments. The values typically range from 0.0 to 1.1, with most experts rating items moderately to highly (e.g., 0.4–0.6–0.8 or 0.6–0.8–1.0), indicating general agreement on the relevance of these interventions. This fuzzy scoring approach allows researchers to capture the inherent vagueness in expert opinions rather than forcing a single crisp value, and the aggregated fuzzy numbers will subsequently be used to calculate threshold values and percentage of expert agreement to determine whether each item should be accepted or rejected as a valid component of the proposed anger management framework.

Table 3: Distance matrix

| **Item** | **E1** | **E2** | **E3** | **E4** | **E5** | **E6** | **E7** | **E8** |
|---|---|---|---|---|---|---|---|---|
| Use cognitive restructuring to challenge anger-triggering thoughts | 0.075 | 0.125 | 0.125 | 0.125 | 0.075 | 0.075 | 0.075 | 0.075 |
| Apply problem-solving training for conflict de-escalation | *0.238* | 0.037 | 0.037 | 0.037 | *0.463* | 0.037 | 0.037 | 0.037 |
| Implement anger log for identifying antecedents | *0.225* | *0.225* | *0.475* | *0.225* | *0.475* | *0.225* | *0.225* | 0.175 |
| Integrate mindfulness-based anger reduction (MBAR) techniques | 0.012 | *0.213* | *0.213* | 0.012 | *0.488* | *0.213* | 0.012 | 0.188 |
| Teach diaphragmatic breathing for acute anger de-escalation | 0.037 | 0.163 | 0.037 | 0.163 | 0.037 | *0.537* | 0.163 | 0.163 |
| Apply progressive muscle relaxation for physiological arousal | 0.175 | 0.175 | *0.225* | 0.025 | 0.025 | 0.025 | 0.175 | *0.225* |
| Conduct assertiveness training to replace | 0.150 | 0.050 | 0.050 | 0.150 | 0.050 | 0.050 | 0.050 | 0.050 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| aggressive communication | | | | | | | | |
| Practice empathy development through role-playing | 0.050 | 0.050 | *0.250* | 0.150 | 0.050 | 0.050 | 0.150 | 0.150 |
| Deliver psychoeducation on anger physiology and brain mechanisms | 0.125 | 0.125 | 0.075 | 0.075 | 0.125 | 0.075 | *0.275* | 0.125 |
| Provide culturally responsive anger management psychoeducation | *0.250* | 0.150 | 0.050 | 0.050 | 0.150 | 0.050 | 0.050 | 0.150 |
| Use self-monitoring diary for anger intensity tracking | 0.100 | 0.100 | 0.100 | 0.100 | 0.100 | 0.100 | 0.100 | 0.100 |
| Develop individualized relapse prevention plans | 0.037 | *0.463* | 0.037 | 0.037 | 0.037 | *0.238* | *0.238* | 0.162 |
| Use virtual reality exposure for anger provocation | 0.050 | *0.350* | 0.050 | *0.250* | *0.250* | 0.050 | 0.050 | *0.350* |
| Implement group anger management only via app | 0.125 | *0.275* | 0.075 | 0.125 | 0.075 | 0.125 | *0.325* | *0.275* |

The table displays (Table 3) expert panel ratings (E1 to E8) for 14 anger management intervention strategies, where each expert assigned a fuzzy membership value (ranging from 0.012 to 0.537) to indicate the importance or relevance of each item. The darker red-highlighted cells represent the highest scores given by individual experts for each item, revealing variation in expert agreement for instance, "Teach diaphragmatic breathing for acute anger de-escalation" received a notably high score of 0.537 from E6, while "Implement anger log for identifying antecedents" scored 0.475 from both E3 and E5, suggesting stronger expert consensus on certain items. Overall, this matrix serves as the foundation for Fuzzy Delphi Method (FDM) analysis, where these expert scores will be aggregated to determine the threshold value (d) and fuzzy mean (A) to decide whether each intervention item should be accepted or rejected for inclusion in the final framework.

| Rank | Item / Construct | % Of Consensus | Defuzzification (M) | Avg d | Status |
|---|---|---|---|---|---|
| 1 | Use cognitive restructuring to challenge anger-triggering thoughts | 100.0% | 0.725 | 0.094 | ACCEPTED |
| 2 | Conduct assertiveness training to replace aggressive communication | 100.0% | 0.650 | 0.075 | ACCEPTED |
| 3 | Use self-monitoring diary for anger intensity tracking | 100.0% | 0.700 | 0.100 | ACCEPTED |
| 4 | Teach diaphragmatic breathing for acute anger de-escalation | 87.5% | 0.637 | 0.163 | ACCEPTED |
| 5 | Practice empathy development through role-playing | 87.5% | 0.650 | 0.113 | ACCEPTED |
| 6 | Deliver psychoeducation on anger physiology and brain mechanisms | 87.5% | 0.675 | 0.125 | ACCEPTED |
| 7 | Provide culturally responsive anger management psychoeducation | 87.5% | 0.650 | 0.113 | ACCEPTED |

| | | | | | |
|---|---|---|---|---|---|
| 8 | Apply problem-solving training for conflict de-escalation | 75.0% | 0.563 | 0.116 | ACCEPTED |
| 9 | Apply progressive muscle relaxation for physiological arousal | 75.0% | 0.625 | 0.131 | ACCEPTED |
| 10 | Develop individualized relapse prevention plans | 62.5% | 0.563 | 0.156 | REJECTED |
| 11 | Implement group anger management only via app | 62.5% | 0.475 | 0.175 | REJECTED |
| 12 | Integrate mindfulness-based anger reduction (MBAR) techniques | 50.0% | 0.588 | 0.169 | REJECTED |
| 13 | Use virtual reality exposure for anger provocation | 50.0% | 0.550 | 0.175 | REJECTED |
| 14 | Implement anger log for identifying antecedents | 12.5% | 0.575 | 0.281 | REJECTED |

The table presents the Fuzzy Delphi Method (FDM) consensus results for 14 anger management intervention items, ranked by percentage of expert consensus, defuzzification value (M), and average threshold distance (Avg d), with items accepted when consensus ≥ 75% and M > 0.5. Nine items were accepted, with the top three “Use cognitive restructuring to challenge anger-triggering thoughts," "Conduct assertiveness training to replace aggressive communication," and "Use self-monitoring diary for anger intensity tracking" achieving perfect 100% consensus and high defuzzification values of 0.725, 0.650, and 0.700 respectively, indicating unanimous expert agreement on their importance. Items ranked 4 through 9 were also accepted with consensus levels of 87.5% and 75%, confirming broad expert agreement, while five items were rejected "Develop individualized relapse prevention plans," "Implement group anger management only via app," "Integrate mindfulness-based anger reduction (MBAR) techniques," "Use virtual reality exposure for anger provocation," and "Implement anger log for identifying antecedents" due to insufficient consensus (below 75%) despite some having defuzzification values exceeding 0.5, highlighting that both criteria must be met simultaneously for an item to be included in the final framework.

| Statistics | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Item 8 | Item 9 | Item 10 | Item 11 | Item 12 | Item 13 | Item 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fuzzy Number (m1) | 0.52500 | 0.37500 | 0.40000 | 0.40000 | 0.45000 | 0.42500 | 0.45000 | 0.45000 | 0.47500 | 0.45000 | 0.50000 | 0.37500 | 0.35000 | 0.27500 |
| Fuzzy Number (m2) | 0.72500 | 0.56250 | 0.57500 | 0.58750 | 0.63750 | 0.62500 | 0.65000 | 0.65000 | 0.67500 | 0.65000 | 0.70000 | 0.56250 | 0.55000 | 0.47500 |
| Fuzzy Number (m3) | 0.98750 | 0.76250 | 0.81250 | 0.81250 | 0.87500 | 0.86250 | 0.87500 | 0.88750 | 0.92500 | 0.88750 | 0.95000 | 0.77500 | 0.77500 | 0.68750 |
| Value of the item | 0.09375 | 0.11562 | 0.28125 | 0.16875 | 0.16250 | 0.13125 | 0.07500 | 0.11250 | 0.12500 | 0.11250 | 0.10000 | 0.15625 | 0.17500 | 0.17500 |
| Value of the "d" construct | 0.14174 | | | | | | | | | | | | | |
| Item < 0.2 | 8 | 6 | 1 | 4 | 7 | 6 | 8 | 7 | 7 | 7 | 8 | 5 | 4 | 5 |
| % of item < 0.2 | 100% | 75% | 13% | 50% | 88% | 75% | 100% | 88% | 88% | 88% | 100% | 63% | 50% | 63% |
| Average of % consensus | | | | | | | | | | | | | | 74 |
| Defuzzification | 0.72500 | 0.56250 | 0.57500 | 0.58750 | 0.63750 | 0.62500 | 0.65000 | 0.65000 | 0.67500 | 0.65000 | 0.70000 | 0.56250 | 0.55000 | 0.47500 |
| Ranking | 1 | 8 | 14 | 12 | 4 | 9 | 2 | 5 | 6 | 7 | 3 | 10 | 13 | 11 |
| Status | ✓ Accept | ✓ Accept | ✗ Reject | ✗ Reject | ✓ Accept | ✓ Accept | ✓ Accept | ✓ Accept | ✓ Accept | ✓ Accept | ✓ Accept | ✗ Reject | ✗ Reject | ✗ Reject |

Figure 3: Overall summary

## Discussion

The findings of this study demonstrate that out of 14 proposed anger management intervention items subjected to Fuzzy Delphi Method analysis, nine items achieved consensus acceptance while five were rejected. Three items attained the highest possible level of expert agreement at 100% consensus: "Use cognitive restructuring to challenge anger-triggering thoughts" (M = 0.725, d = 0.094), "Conduct assertiveness training to replace aggressive communication" (M = 0.650, d = 0.075), and "Use self-monitoring diary for anger intensity tracking" (M = 0.700, d = 0.100). All three items not only surpassed the minimum consensus threshold of 75% but also recorded defuzzification values well above 0.5 and threshold distances well below 0.2, fulfilling all three FDM acceptance criteria simultaneously. The unanimous endorsement of cognitive restructuring, with the highest defuzzification value of M = 0.725 in the entire study, affirms that modifying maladaptive cognitive appraisals that trigger anger is regarded by the expert panel as the most important and scientifically grounded component of any anger management behavioral intervention. Equally significant, the unanimous acceptance of self-monitoring diary use (M = 0.700) underlines the critical role of structured self-awareness tools in helping clients track anger intensity patterns and identify situational triggers as a prerequisite for meaningful behavioral change.

Four items were accepted at the 87.5% consensus level, reflecting strong but not unanimous expert agreement. These items include "Deliver psychoeducation on anger physiology and brain mechanisms" (M = 0.675, d = 0.125), "Practice empathy development through role-playing" (M = 0.650, d = 0.113), "Provide culturally responsive anger management psychoeducation" (M = 0.650, d = 0.113), and "Teach diaphragmatic breathing for acute anger de-escalation" (M = 0.637, d = 0.163). Notably, the acceptance of "Provide culturally responsive anger management psychoeducation" at M = 0.650 signals that the expert panel collectively recognizes the necessity of tailoring anger management content to the cultural backgrounds and lived experiences of clients, a consideration especially relevant in the Malaysian context where collectivist norms and face-saving values significantly shape emotional expression. The acceptance of diaphragmatic breathing (M = 0.637) further reflects expert recognition of the physiological dimension of anger dysregulation, acknowledging that somatic intervention targeting the autonomic nervous system is as essential as cognitive approaches, particularly for acute anger de-escalation situations. It is also noteworthy that diaphragmatic breathing recorded the highest individual expert distance score of 0.537 from expert E6 in the distance matrix, yet still achieved acceptance at 87.5% consensus, indicating that the divergence of a single expert was insufficient to disqualify an otherwise strongly endorsed item.

Two additional items were accepted at the minimum consensus threshold of 75%: "Apply problem-solving training for conflict de-escalation" (M = 0.563, d = 0.116) and "Apply progressive muscle relaxation for physiological arousal" (M = 0.625, d = 0.131). While both items met all three FDM acceptance criteria, their relatively lower consensus percentages compared to the top-ranked items suggest a degree of qualified endorsement rather than strong agreement among the expert panel. For "Apply problem-solving training," the distance matrix revealed notably high individual distances from experts E1 (d = 0.238) and E5 (d = 0.463), indicating marked divergence in these two experts' judgments from the group consensus, which contributed to the lower overall acceptance rate. Similarly, progressive muscle relaxation, while broadly supported, recorded higher individual distance scores from experts E3 (d = 0.225) and E8 (d = 0.225), suggesting some reservations among the panel regarding its priority relative to other physiological regulation strategies. These marginal acceptances nonetheless confirm that problem-solving training and relaxation techniques remain valid, evidence-aligned components of a comprehensive anger management framework, and should be retained as supplementary tools to the higher-consensus core interventions.

Five items were rejected by the FDM analysis due to failure to meet the required consensus threshold of ≥ 75%. "Develop individualized relapse prevention plans" (62.5%, M = 0.563) and "Implement group anger management only via app" (62.5%, M = 0.475) both fell short of the required consensus, with the

app-based item additionally failing the fuzzy mean criterion as M = 0.475 < 0.5. "Integrate mindfulness-based anger reduction (MBAR) techniques" (50%, M = 0.588) and "Use virtual reality exposure for anger provocation" (50%, M = 0.550) were rejected despite having defuzzification values above 0.5, confirming that both criteria percentage of consensus and fuzzy mean must be simultaneously satisfied for item acceptance. The most severely rejected item was "Implement anger log for identifying antecedents," which recorded only 12.5% consensus and an average threshold distance of d = 0.281, far exceeding the acceptable limit of 0.2. The distance matrix for this item revealed that seven out of eight experts (E1 through E7) recorded high individual distances ranging from 0.225 to 0.475, indicating profound expert disagreement regarding the utility of the anger log as a standardized guideline component. These rejection outcomes collectively suggest that, while innovative and theoretically promising, items such as MBAR, virtual reality exposure, and technology-mediated delivery formats currently lack sufficient consensus among behavioral health practitioners to be endorsed as core components of an evidence-informed anger management framework.

## Conclusion

This study successfully applied the Fuzzy Delphi Method to achieve expert consensus on anger management intervention guidelines, resulting in the acceptance of nine out of fourteen proposed items across domains including cognitive-behavioral strategies, emotional regulation, social skills, and psychoeducation. The three items achieving 100% expert consensus cognitive restructuring (M = 0.725), self-monitoring diary use (M = 0.700), and assertiveness training (M = 0.650) represent the highest-priority core components of the evidence-informed framework, validated through the simultaneous satisfaction of all three FDM criteria: $d \leq 0.2$, $A \geq 75\%$, and $M > 0.5$. A further six items at consensus levels of 87.5% and 75% complement these core components, forming a comprehensive nine-item framework that integrates cognitive, somatic, interpersonal, and psychoeducational dimensions of anger management. The five rejected items, most notably the anger log (12.5% consensus, d = 0.281) and app-based group management (M = 0.475, below the 0.5 threshold), signal that expert opinion does not currently support their inclusion as standardized guideline elements, despite their theoretical appeal.

The methodological rigor of the FDM, operationalized through the triple-criterion acceptance rule in this study, proved effective in distinguishing between items with genuine expert consensus and those with superficial or polarized agreement. Items such as MBAR techniques (M = 0.588) and virtual reality exposure (M = 0.550) demonstrated adequate defuzzification values but were rejected on grounds of insufficient consensus (50%), confirming that high perceived importance alone is insufficient without broad professional agreement. This finding reinforces the FDM's strength as a consensus methodology it captures not merely the central tendency of expert opinion but also the degree of convergence across diverse professional perspectives. The use of eight highly qualified experts drawn from clinical psychology, psychiatry, counseling, social work, and behavioral health education ensured that the consensus findings reflect interdisciplinary professional standards rather than the bias of a single theoretical orientation.

The practical implication of this study is the provision of a validated, nine-item anger management framework that practitioners across clinical, educational, and community settings can adopt as a scientifically grounded reference for intervention design. The prioritization of cognitive restructuring, self-monitoring, assertiveness training, psychoeducation, and physiological regulation strategies provides a structured, sequenceable set of intervention components that can be organized into manualized anger management programs with clear fidelity benchmarks. The explicit acceptance of culturally responsive psychoeducation (87.5%, M = 0.650) further ensures that the framework remains contextually relevant and applicable within diverse socio-cultural environments, including the Malaysian setting from which this study's expert panel was drawn. Future research should expand the item pool, increase the expert panel size beyond eight participants, and test the practical implementation

of these accepted guidelines within controlled clinical trials to establish their effectiveness in real-world anger management practice.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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