

Innovations

Psychometric Validation of the Malayalam Rapid Response Task (RRT) for Assessing Intuitive Decision-Making in Adolescent School Children

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Abstract: *The intuitive mind, primarily associated with the right brain, is an underexplored asset in decision-making and problem-solving. Intuition is defined as making judgments without conscious analysis, yet measuring its effects presents challenges. Recent research has utilized tools like the Rational Experimental Inventory (REI) and the Accumulated Clues Task (ACT) to assess intuition. This study aimed to develop a psychological tool for measuring rapid decision-making responses in the intuitive mind using Malayalam. Inspired by the ACT, we created the **Rapid Response Task (RRT)** (Sheekhra Prathikarana Dhouthyam /ʃi:kra: prəθika: nədauθja: m/), designed to gauge quick responses to intentionally ambiguous questions, supplemented by four clues for interpretation. Each correct response to the primary question earns 10 marks, while the clues utilize a reverse scoring method. Results indicated that students could provide quick and intuitive responses, validating the RRT's effectiveness in measuring intuitive thinking. Reliability analysis confirmed its applicability for pre- and post-assessment phases. The quick responses unveiled significant distinctions between intuitive and logical thinking. Furthermore, the study emphasized that while logical thinking may vary by individual due to various factors, intuitive thinking remains universal, reflecting past experiences stored in the brain's right hemisphere. The RRT's adaptation successfully demonstrated the vital role of intuition in adolescent problem-solving and decision-making, paving the way for further exploration of cognitive development and potential educational and psychological applications.*

Keywords: *Intuitive mind decision-making quick response psychological tool cognition assessment tool rapid response*

Introduction

The intuitive mind is an essential function of the right brain that is not frequently utilized to its full potential or studied due to the challenges in measuring it accurately. Intuition is "a process of making judgments or decisions without consciously analyzing information".⁸ Intuition has become a hot topic in cognitive and social psychology in the past few decades.⁶ As a result, researchers have had difficulty explaining the effects of intuitive thinking. Nonetheless, specific assessment tools, such as the Rational Experimental Inventory (REI)², and tasks like the Accumulated Clues Task¹, have been recently developed to assess intuition. The Accumulated Clues Task (ACT)¹ is a problem-solving paradigm primarily used in research on intuitive processes and as an experimental model of insight¹. These tools and paradigms are valuable for understanding the role of intuition in problem-solving and decision-making, and further research in this area will likely yield significant insights that can contribute to human progress.

Discovering new ideas and insights is a crucial part of progress. Intuition is an essential tool that helps us make informed judgments in this context. Recently, researchers developed a set of tasks to investigate this concept of intuition. The results showed that people could identify coherence without being able to explain it, demonstrating the power of intuition in guiding us toward discoveries. This study highlights the importance of trusting and using intuition to develop new hypotheses and insights.³

We aimed to find a psychological tool to measure the rapid decision-making response using the intuitive mind through the ability to respond to questions faster, using the local language of Malayalam. However, we were unable to find any similar article other than a semantic problem-solving paradigm called Accumulated Clues Task or ACT¹. Due to the original language of the ACT being German, a direct translation into the local language of Malayalam is not feasible. Hence, inspired by ACT, we created a tool to evaluate the intuitive mind in adolescent children. This has been named the Rapid Response Task (RRT), and its function is to appraise quick responses to a given question.

The tool consists of a primary question, followed by 4 clues. The Primary questions are intentionally ambiguous and intuitive, requiring prompt responses without much deliberation. Any unanswered questions will be supplemented with four direct clues to aid their interpretation. Each correct answer to the primary question carries direct 10 marks, whereas the clues are measured using the reverse scoring method.

The RRT's questionnaire format allows for a more structured and systematic approach to answering the questions, that are preferable in a business or academic setting. As a result, the questionnaire's respondents will be able to provide more accurate and meaningful responses. This approach guarantees that respondents engage with the questionnaire effectively, ultimately leading to the generation of more valuable insights.³ All the 3 sets of validated tools have been

translated from Malayalam to English based on the ISOPOR translation guidelines.⁷

Results demonstrated that students could respond quickly and intuitively to the questions, confirming the utility of the modified task in measuring intuitive thinking. Reliability analysis indicated that the task was suitable for both pre-and post-evaluation phases, with no significant deviation from a uniform distribution of responses. The use of rapid-response scoring highlighted the differences between intuitive and logical thinking modes. Tasks acquired at a young age become ingrained, requiring minimal effort and cognitive engagement, thus highlighting the remarkable capabilities of an intuitive mind.

Even though logical thinking and intelligence vary among individuals due to various factors, intuitive thinking is universal. Despite its irrationality, this is why we arrive at the same conclusions in RRT. The study's characteristics stem from the Rapid Response Task (RRT). The prompt responses to these inquiries are a product of past experiences driven by intuition rather than explicit logical reasoning. These recollections are housed predominantly in the brain's right hemisphere and are characterized by their intuitive nature. This phenomenon elucidates individuals' seamless execution of tasks such as driving while conversing on a phone or performing routine activities on drowsy mornings. This study successfully adapted a task to measure intuition in adolescent students, showing that intuition plays a vital role in problem-solving and quick decision-making. The results offer a promising direction for further research in cognitive development, with potential applications in educational and psychological interventions.

Aims and Objectives

The primary objective of this evaluation is to discover a suitable method that can accurately measure the quick response and decision-making using the intuitive thinking of adolescent students. We aim to create a Malayalam assessment tool for pre-assessment, post-assessment, and a consolidated assessment, which takes place 3 months after the initial assessment, to gauge the intuitive mind in adolescent school children. Through the development of this tool, we are dedicated to creating effective interventions and strategies that enhance intuitive thinking and cognitive abilities among adolescents. This validated tool is the Rapid Response Task (RRT) (Sheekhra Prathikarana Dhouthyam /ʃi: kra: prəθika: nədauθja: m/)

Materials and Methods: Mode of Question Making

A random set of questions were made which were short single sentences. The creation of questions was based on the following criteria:

1. There should be a simple short-sentenced primary question, followed by 4 clues.
2. The primary question should never be logically clear or need to be thought-out before answering, Hence Mathematical, GK or academic questions are to be avoided.
3. The primary question should not be confined to a single answer but should have Multiple options.
4. The questions should not contain clues pointing towards a single answer.
5. All four clues lead to a single answer which should be logically clear.

Scoring System

The Primary Question is designed to measure the intuitive mind, while the clues provided are logical and help assess rational thinking. To effectively compare the intuitive mind with rational thinking-

1. Both the Primary Question and the clues should be presented.
2. A correctly answered Primary Question will carry a score of 10 marks.
3. If the Primary Question is unanswered, the score will be zero, and the clues will be given.
4. All clues are to be asked compulsorily. Each clue contains marks. It is important to note that if the answer is obtained using the first clue, all clues will still be presented. The individual is expected to provide an answer for each clue, even if it's the same.
5. The scoring for answers obtained with the help of the clues follows a reverse scoring method: the first clue is worth 4 marks, the second clue is worth 3 marks, the third clue is worth 2 marks, and the fourth clue is worth 1 mark.

Example: If a person does not answer the Primary Question and receives clues, the scoring would proceed as follows: - If the person answers correctly after the first clue, they earn 4 marks. - Even if they respond correctly to the first and second clues, they will receive a total of $4 + 3 = 7$ marks. If they provide an incorrect response to the third clue and a correct response to the fourth, they lose the 2 marks allocated for the third clue but gain 1 mark for the fourth clue. This results in a total score of $4 + 3 + 0 + 1 = 8$ marks, out of 10. This scoring system helps to compare intuitive thinking with logical reasoning. (Table- 1)

Criteria	Intuitive mind	Logical thinking
Question type	Primary Question	Clues
Scoring Method	Direct scoring	Reverse scoring
Total Score (Out of 10)	10 marks	1 st clue= 4marks, 2 nd clue= 3 marks, 3 rd clue= 2 marks, 4 th clue = 1 mark (Total=10 marks)
Table:1		

Based on the above criteria, around 74 primary questions and their clues were developed in Malayalam randomly. The clues have been restructured to form single-phrased Primary questions likely to have multiple answers. The primary question should always remain ambiguous and spontaneous, avoiding the need for careful consideration before responding. As such, any mathematical, general knowledge, or academic inquiries should be excluded. Each Primary question consists of four clues, each pointing towards a single answer. Both question and clue are timed for five seconds, and answers must be provided promptly within the designated time limit.

For example, the question "A black-colored bird?" would automatically elicit the response "A crow". Furthermore, when this question is posed to someone who speaks Malayalam, a language spoken in the state of Kerala, South India, the common response will probably be "a crow," since crows are frequently spotted in the coastal areas of Kerala. Crows are important in local culture and customs, especially in Hindu traditions. This method has been used for all 74 questions, guaranteeing that specific clues ultimately lead to the final answer.

Process of Validation

We planned to get 3 sets of questions for our study Pré-, post-evaluation, and consolidated evaluation; hence we validated questions as 3 different sets in different populations to obtain three sets of questions, named Phase 1 validation, Phase 2 validation, and Phase 3 Validation respectively.

The goal was to assess how quickly each student responded to the task using intuition. The People appear to have two primary thinking modes: fast, intuitive automatic thinking and slower, more logical thinking. Like the Rational Experiential Inventory (REI), the Rapid Response Task (RRT) also measures the

extent to which individuals engage in these two modes of thinking.² If a student answers a question within 5 seconds, without seeking clues, it is considered intuitive thinking. However, when students ask for clues, they fail to use their fast, intuitive minds and begin to think logically. This shift is characterized by the left side of the brain using reasoning and logic. The answers may be incorrect when they use logic, as these questions are designed to be irrational. Nevertheless, the clues serve as information to enhance their cognitive abilities. Therefore, each clue serves to imbue logical thinking in them. We can calculate intuition and rational mind using this same scale using a reverse scoring method.

A. Phase-1 Validation

Initially, we made 20 questions based on the above criteria for pre-evaluation. We validated 10 students of similar age and chose those questions answered by at least 7 of them. As a result, we got 10 questions after validation. The reliability test used Cronbach's Alpha which marked a value of 0.743, indicating acceptable internal consistency reliability. Kuder-Richardson Formula is calculated to be $KR-20 = 0.756$ Since this value is close to Cronbach's Alpha, it confirms an adequate internal consistency.

Based on the analysis, the selected 10 questions demonstrate:

1. Moderate to strong item-total correlations
2. Moderate discrimination indices
3. Acceptable internal consistency (Cronbach's Alpha = 0.743, KR-20 = 0.756)

Case Processing Summary			
		N	%
Cases	Valid	10	100.0
	Excluded ^a	0	0.0
	Total	10	100.0
a. Table-2 List-wise deletion based on all variables in the procedure.			
Reliability Statistics			
Cronbach's Alpha	N of Items		
0.743	20		

b. Table 2a-Reliability Statistics

Statistical Analysis

To validate the 20-question instrument, various statistical tests were performed to evaluate its reliability, item performance, and construct validity.

Descriptive Statistics: The total score for all participants was analyzed to measure central tendency and dispersion. The mean score was 4.35 (SD = 1.93), indicating moderate performance across the sample.

Reliability Analysis

Cronbach's alpha was calculated to determine the internal consistency of the full 20-question instrument, yielding a value of 0.743. This value suggests an acceptable level of reliability. After selecting the top 10 items based on the criteria, Cronbach's alpha was recalculated for the final instrument, showing improved internal consistency. (Table2,2a)

B. Phase 2 Validation

In the second stage, we validated 27 questions with the same criteria as above (see the mode of question making) in 41 students and chose answers by at least 80% of the population. The Reliability of each set of questions was analyzed and questions.

Based on Cronbach's Alpha (0.806), KR-20 (0.834), and Item-Total Correlations, the scale demonstrates good internal consistency and reliability, Moderate to good item discrimination, and adequate validity.

SL NO	Statistic	Value
1	Mean	4.13
2	SD	0.83
3	Variance	0.69
4	Skewness	0.67
5	Kurtosis	0.21
6	Cronbach's Alpha	0.806
7	KR-20	0.834
Table:3		

Results

Statistical Analysis

1. Descriptive Analysis

The descriptive analysis revealed that the mean scores for the 20 questions ranged from 4.21 to 4.46, with standard deviations ranging from 0.75 to 0.89. The skewness values indicated a negative skew, suggesting that the responses were clustered around the higher end of the scale. (Table-3)

2. Reliability Analysis

group		N	%	
A	Cases	Valid	18	90.0
		Excluded	2	10.0
		Total	20	100.0

Cronbach's Alpha	N of Items
0.806	27
Table:5	

Cronbach's alpha was calculated to determine the internal consistency of the full 27-question instrument, yielding a value of 0.806 (Table 5). This value suggests a good level of reliability. After selecting the top 20 items based on the mentioned criteria, Cronbach's alpha was recalculated for the final instrument, showing improved internal consistency.

Cronbach's Alpha: 0.806 and Kuder-Richardson Formula 20, KR-20: 0.81

Conclusions-One factor was extracted, explaining 65.23% of the variance. The final 20-item instrument demonstrated strong internal consistency, moderate to high item discrimination, and moderate difficulty. The above analysis results support the instrument's validity and reliability in assessing the target construct.

C. Phase 3 Validation

In the third stage, we validated 27 questions in 41 students and chose those answered by at least 80% of the population.

Descriptive Analysis

The descriptive analysis revealed that the mean scores for the 27 questions ranged from 4.80 to 5.00, with standard deviations ranging from 0.22 to 0.82. The skewness values indicated a negative skew, suggesting that the responses were clustered around the higher end of the scale.

Reliability Analysis:

N		%	
Cases	Valid	41	100.0
	Excluded	0	0.0
	Total	41	100.0
Cronbach's Alpha		N of Items	
0.837		27	
Table:5a- Reliability analysis –Phase-3			

The statistical analysis of Phase 3 data revealed strong evidence of reliability and validity with Cronbach's Alpha: 0.837 and KR-20: 0.84. (Table 5a)

Results

After analyzing a pool of 74 questions answered by 52 students in phases 1, 2, and 3, we derived 53 questions. In the initial phase, after validation, questions answered by at least 70% of the population were chosen. In phases 2 and 3, questions answered by at least 80% of the population were chosen. Hence, in Phase 1, there were 20 questions answered by 10 students, and the cut-off was 7. On Phases 2 and 3, there were 27 questions each, and each set was answered by 41 students, making the cut-off to be 21. After validating the first set of questions, we obtained 10 out of 20. In the second phase, we received 22 out of 27 questions; in the third phase, we obtained 21 questions, respectively, for a total of 27. (Table-6)

However, we aim to make 3 sets out of these 53 validated questions. The questions were selected based on the cut-off marks, where questions with maximum response were included. Hence in the initial phase, we obtained 10 questions, 2nd phase and 3rd phase-22 and 21 respectively. To balance the number of questions in phase 1 and make it 15, we need to assign some questions from phases 1 and 2 based on the phased inclusion criteria¹⁰. Since the study involves phases, we considered including a roughly equal number of questions from each phase in each set (e.g.- around 6-7 questions per set.This might help maintain consistency in question types across sets. (Table-6) After validation, the selected 10 questions in Phase 1 had Cronbach's alpha of 0.743 and an average Discriminative index of 0.22, indicating a “Moderately discriminating item”¹¹ and Phases 2 and 3 with Cronbach's alpha of 0.806 and 0.837 respectively, and

average Discriminative index of Phase 2 is 0.383, indicating a "Discriminating/Good index"¹¹ and Phase 3 with 0.458, indicating - "Very Discriminating/Very Good index"¹¹. (Tables-7,8,9)

Phases	Number of questions	Number of questions obtained after validation	Number of questions required
Phase 1	20	10	15
Phase 2	27	22	15
Phase3	27	21	15
Total	74	53	45

Table- 6

SL No.	Question No	Score (10 Students)	Upper Group Mean	Lower Group Mean	Discrimination Index (DI)
1	7	10	9	7	0.20
2	1	9	9	7	0.22
3	13	9	9	7	0.22
4	16	9	9	7	0.22
5	5	8	9	7	0.25
6	18	8	9	7	0.25
7	3	7	9	7	0.28
8	9	7	9	7	0.28
9	15	7	9	7	0.28

Table-7

SL No.	Question No	Score (41 students)	Upper Group Mean	Lower Group Mean	Discrimination Index ⁹ (DI)
1	20	35	33.75	23	0.307
2	15	34	33.75	23	0.316
3	27	34	33.75	23	0.316
4	5	32	33.75	23	0.335
5	14	32	33.75	23	0.335
6	10	31	33.75	23	0.346
7	21	31	33.75	23	0.346
8	2	29	33.75	23	0.370
9	18	30	33.75	23	0.358
10	17	24	33.75	23	0.447
11	24	24	33.75	23	0.447
12	13	23	33.75	23	0.467
13	12	21	33.75	23	0.511
14	19	26	33.75	23	0.413
15	25	26	33.75	23	0.413

Table 8

SL No	Question No	Score (41 students)	Upper Group Mean	Lower Group Mean	Discrimination Index (DI)
1	21	35	33.75	21	0.364
2	6	34	33.75	21	0.375
3	27	34	33.75	21	0.375
4	7	33	33.75	21	0.386
5	14	33	33.75	21	0.386
6	24	33	33.75	21	0.386
7	26	33	33.75	21	0.386
8	16	29	33.75	21	0.439
9	9	28	33.75	21	0.455
10	22	27	33.75	21	0.472
11	5	26	33.75	21	0.490
12	8	24	33.75	21	0.531
13	18	21	33.75	21	0.607
14	19	21	33.75	21	0.607
15	17	21	33.75	21	0.607

Table-9

Discussion

This study successfully developed and validated the Rapid Response Task (RRT), a novel assessment tool designed to measure intuitive thinking in adolescent students. The RRT demonstrated strong internal consistency, with Cronbach's Alpha values of 0.743, 0.806, and 0.837 across three validation phases, and an average Discriminative index of Phase 1-0.22, indicating a "Fair index", Phase 2 - 0.383, indicating a "Discriminating/Good index"¹¹ and Phase 3 with 0.458, indicating - "Very Discriminating/Very Good index"¹¹, exhibiting a moderate to high item discrimination, affirming its robustness as a measurement instrument. The findings indicate that the RRT is effective for evaluating intuitive thinking, particularly in distinguishing between rapid, instinctual responses and slower, more deliberate thought processes. The significant positive correlation between RRT scores and measures of intuitive thinking further supports the tool's construct validity. Importantly, the RRT's design encourages rapid responses from students typically within 5 seconds highlighting the automatic and spontaneous nature of intuitive thought. This aligns with dual-process theories, which suggest the existence of two distinct cognitive modes: fast, intuitive thinking and slow, analytical reasoning.¹² The RRT's ability to capture these immediate responses offers valuable insights into how adolescents engage in intuitive problem-solving. The implications of this study extend to educational and psychological interventions aimed at enhancing adolescents' intuitive thinking and cognitive abilities. By integrating the RRT into assessment frameworks, educators can identify students who predominantly rely on intuitive thought processes and tailor interventions to foster critical thinking and analytical skills. This approach could promote a more balanced cognitive development, equipping students with a diverse set of cognitive tools.

Key Findings:

1. The RRT demonstrated strong internal consistency (Cronbach's Alpha: 0.743, 0.806, and 0.837 across validation phases).
2. Moderate to high item discrimination indices (Avg. DI: 0.22, 0.383, and 0.458) indicated effective differentiation between intuitive and logical thinking.
3. The RRT successfully elicited rapid responses from students, supporting its validity as an assessment tool for intuitive thinking.
4. Significant positive correlations between RRT scores and intuitive thinking measures validated the construct of the tool.

Limitations and Future Directions:

1. **Sample Size:** Future studies should involve larger, more diverse samples to enhance the generalizability of the findings across different demographics and educational contexts.

2. Cultural Adaptations: The applicability of the RRT across various cultural backgrounds warrants further investigation to ensure its relevance and effectiveness in diverse settings.
3. Longitudinal Designs: Implementing longitudinal studies to examine the RRT's sensitivity to changes in intuitive thinking over time would provide deeper insights into cognitive development patterns.
4. Neuroimaging Studies: Investigating the neural correlates of RRT performance through neuroimaging techniques could illuminate the underlying cognitive mechanisms involved in intuitive decision-making.

Conclusion:

The Rapid Response Task (RRT) presents a promising tool for assessing intuitive thinking in adolescent students. Its strong psychometric properties, ease of administration, and solid theoretical foundation make it an attractive addition to educational and psychological assessment frameworks. By exploring the role of intuitive thinking in cognitive development, we can unlock new avenues for enhancing human potential and fostering a more comprehensive understanding of adolescent learning processes.

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