# Treatment Effect of a Modified Melodic Intonation Therapy (MMIT) in Korean Aphasics*

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## ABSTRACT

The present study attempted to modify the conventional Melodic Intonation Therapy (MIT) in three aspects: number of syllables of adjacent target utterances (ATU), melody patterns of ATU, and initial listening of melody and intoned speech with the eyes closed. The modified Melodic Intonation Therapy (MMIT) was applied to two severe Korean aphasics. The patients exhibited a severely nonfluent aphasia resulting from a left CVA(Cerebrovascular Accident). The purpose of the modification was to avoid perseveration and improve reflective listening skills. First, the treatment program avoided ATU with the same number of syllables. Second, four different patterns of melody were developed: rising type, falling type, V-type, and inverted V-type. One type of prosodic pattern was preceded and followed by another type of melody. These two variations were to decrease perseverative behaviors. Finally, the patients kept their eyes closed when the clinician played and hummed a target melody at the initial stage of the program in order to improve reflective listening skills. A single-subject alternating treatment design was used. The effects of MMIT were compared to the conventional MIT. Differing the number of syllables and the type of melodic patterns decreased perseverative behaviors and produced more correct names. The initial listening of the target melody with the patients' eyes closed seemed to increase their attentiveness and result in a more fluent production of target utterances. Probable reasons for the effectiveness of MMIT were discussed.

**Keywords: aphasics, melodic intonation, target utterances**

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## I. Introduction

MIT is a highly structured treatment program frequently used since the 1970s (Albert et al., 1973; Sparks et al., 1974; Sparks & Holland, 1976; Laughlin & Naeser, 1979; Naeser & Helm-Estabrooks, 1985; Jeong, O. 1993; Benson et al., 1994; and Belin et al., (1996). It was developed for severely nonfluent physics in order to achieve at least a basic recovery of ability to use some language accurately, using musical functions of the right hemisphere. However, a recent PET (positron emission tomography) conducted by Belin et al., (1996) challenged this notion. According to the investigators, MIT reactivated essential motor language zones such as Broca's area in the left hemisphere, while reducing abnormal activations in the right hemisphere. That is, the application of MIT may not activate and develop the function for music and language abilities of the right hemisphere. Rather, it may directly stimulate or reactivate motor language areas of the left hemisphere.

Good candidates for MIT demonstrate extreme paucity of speech and are well aware of such an incapacity due to their relatively intact auditory comprehension. Reasonable priorities of therapeutic purpose for such patients would relegate the quality of articulation and syntax to secondary consideration. Emphasis on the linguistic or semantic aspects of verbal utterances for these aphasics is the primary goal of MIT (Sparks & Deck, 1986).

One of the major difficulties in application of MIT appear to be perseveration. Perseveration consists of the inappropriate and unintentional recurrence or continuation of a previous response in the absence of the appropriate exciting stimulus (Papagno & Basso, 1996). According to Sandson and Albert (1987), perseveration manifests its form in three types: recurrent perseveration, continuous perseveration, and stuck-in-set perseveration. Recurrent perseveration is caused by failure to access specific information in semantic memory and is typical of temporoparietal damage. Continuous perseveration, on the other hand, is due to a disorder of attention and is found in right-hemisphere-damaged patients. Finally, stuck-in-set perseveration is resulted from disorders of executive functions and is found in patients with fronto-subcortical lesions and dysfunction of the dopamine system. Hudson (1968) described an aphasic patient with a tumor in the frontal and anterior temporal lobes, in whom perseveration was present in a wide variety of tasks such as spoken and written language, drawing, arithmetic, and so on, and was "most apparent with sustained continuation in activities of a similar kind."

In the application of MIT, the patient with perseveration tends to insist on repeating a previously learned utterance instead of the new target utterance. In addition, the patient does not usually exercise reflective listening in spite of relatively spared auditory comprehension. Therefore, the authors developed MMIT to avoid perseveration and to improve careful listening skills. The modified portions of MIT included 1) differing the number of syllables of ATU, 2) differing the type of melodic patterns of ATU, and 3) listening of the melody and intoned speech with the eyes closed.

The purpose of the change in the number of syllable was attempted due to the authors' clinical observations that the perseverative behaviors increased when the new target word had the same number of syllables as the previously learned utterance. Secondly, the same phenomenon exhausted with the similar melody pattern to the previous melody. Furthermore, the authors conjectured that using a different melodic pattern in a subsequent item is a means of achieving variety of stimulation, and hopefully finding a better pattern for the individual patients could be possible. These two changes are based on the Hudson's claim that perseveration is most prominent with a continued similar kind of activities. Thirdly, since an unimpaired right hemisphere is dominant for music aphasics usually almost involuntarily sing the melody when the tone is played despite the repeated instructions that they have to "just listen." It then may prevent a careful listening of target utterances. Therefore, the third change, closing the eyes while listening to the melody and intoned speech at the initial stage of the program, was attempted.

The purpose of the study was to determine if MMIT produces more correct responses compared to conventional MIT.

## Subjects

Two left CVA patients served as subjects who have not received any speech therapy prior to the current experiment. Table 1 shows the subject descriptions.

S1 demonstrated fairly good auditory comprehension but was severely nonfluent. He exhibited a significant buccofacial apraxia. He was depressed but stable and highly motivated. S2 also showed a relatively spared auditory comprehension, but has had little verbal output. He showed neologistic verbal stereotypes and was moderately motivated. S1 was more emotionally stable and highly motivated as compared to S2. S2 was more severely aphasic as well.

Table 1. Subjct Description.

| Subject | Gender | Age | Etiology | Lesion Site | Post Onset | Handed-ness | Lang. Status |
|---|---|---|---|---|---|---|---|
| S1 | M | 49 | Ischemic LCVA | Front, temporal | 6 mos | right | mono-lingual |
| S2 | M | 41 | Ischemic LCVA | Front, temporal | 1 mo | right | mono-lingual |

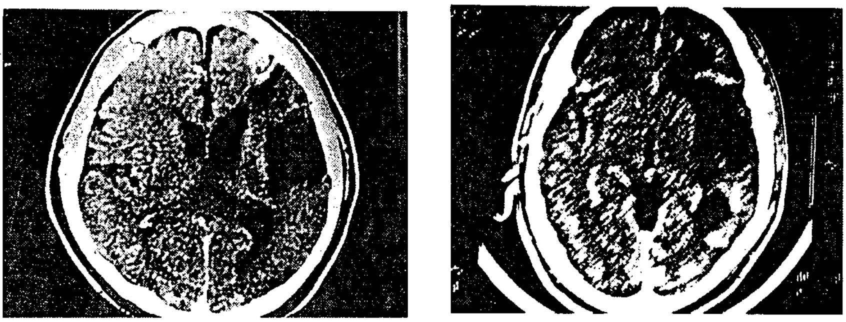

Fig 1. CT Scan of S1

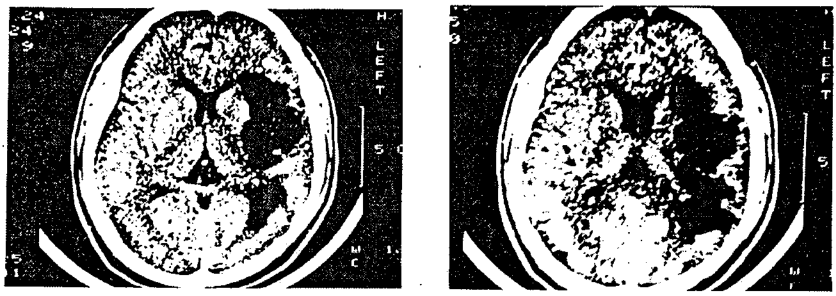

Fig 2. CT scans of S2.

Figure 1 and Figure 2 show the CT scans of S1 and S2, respectively. S1 showed a damaged Broca's area and ipsilateral dilatation of the ventricular system. S2 displayed a wide range of infarctions in that not only Broca's and Wernicke's areas were damaged but subcortical lesions were large. After reviewing S2's CT scans, the neurologist thought that S2 would be globally aphasic based on the site and range of the infarction, although S2 demonstrated a fair auditory comprehension.

Both patients displayed perseverative behaviors and poor reflective listening skills in the application of MIT. They insisted on repeating the previously learned utterances in spite of the clinician's effort to change the task and their attention when the behavior occurred. Furthermore, they attempted to verbalize or hum when they were supposed to just listen at the beginning although the clinician gave the verbal prompt "Just listen" each time. Therefore, the authors made some modifications of MIT in an attempt to decrease perseveration and increase reflective listening skills, and, in turn, produce more fluent and correct responses.

## Modifications

MIT was modified in 3 aspects: 1) number of syllables of ATU, 2) patterns of melody of ATU, and 3) patients' initial listening of melody and MIT-loaded words with the eyes closed.

The training utterance sequence, for example, included "hwa-jang-shil" (3-syllable word meaning bathroom) followed by "mool" (1-syllable word meaning water), then by "yun-pil" (2-syllable word meaning pencil) and finally by "ahn-nyung-ha-se-yo?" (5-syllable word meaning how are you?) and so on.

Prosodic patterns of Korean are fairly monotonous compared to English. Utilizing melodies similar to normal speaking prosody, therefore, is not quite applicable in administering MIT in Korean aphasics. Thus, four types of melody were developed which were not quite similar to normal speaking patterns of Korean: 1) rising-type, 2) falling-type, 3) V-type, and 4) Inverted V-type. The sung notes did not exceed 4 whole notes as suggested by Sparks and Deck (1986). The melodic patterns avoided familiar melodies which can stimulate recall of well-known songs (Sparks, et al., 1974). Figure 3 shows the melodic patterns used. The presentation sequence was determined by the Latin Square design so that the currently used pattern was preceded and followed by different patterns.

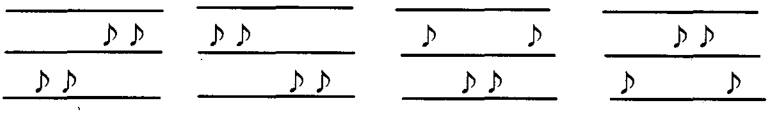

Figure 3. Four Types of Melodic Patterns Developed.

## Alternating Treatment Design

The stable baseline measurements were obtained for three sessions for both subjects. The two interventions (MIT and MMIT) were introduced in a rapidly alternating fashion in accordance with the counterbalancing schedule. Since the time of the day can be a serious confounding variable Treatment 1 in the morning was followed by Treatment 2 in the afternoon within a day, and in the next session the order of the treatment was reversed: Treatment 2 in the morning and Treatment 1 in the afternoon. Table 2 shows the layout of the treatment sequence.

Table 2. Treatment Sequence.

| Subject | S1 | | | | S1 | | | |
|---|---|---|---|---|---|---|---|---|
| Session | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| AM | MIT | MMIT | MIT | MMIT | MMIT | MIT | MMIT | MIT |
| PM | MMIT | MIT | MMIT | MIT | MIT | MMIT | MIT | MMIT |

## Procedures

The treatment took place at the Speech and Hearing Clinic of the department of Speech Pathology at Taegu University. Three baseline sessions were followed by the two treatments, 21 sessions for MIT and 21 sessions for MMIT. Each session lasted 15 to 30 minutes. The dependent variable was the percentage score of the number of correct naming response for both treated stimuli and untreated stimuli after each treatment session was completed. The objective of each session was training 10 words. However, there were sessions in which patients' physical and emotional conditions did not allow proceed ing with 10 words. So the same 100% percentage scores do not necessarily mean the patients acquired 10 words. It can mean 5 out of 5 words. But the 10 untreated stimuli were examined each time. If the subjects self-corrected the answer within 10 seconds, it was scored correct. This evaluation used a visual confrontation naming method using word cards for treated stimuli and picture card for untreated stimuli. No feedback or prompt was given at this time. Moreover, if patient was not able to name the target word within 10 seconds, it was put away and rated as an incorrect response. Scoring did not take misarticulations into consideration. If the subjects produced an auditorily recognizable correct response, it was scored correct. Each treatment was audio-taped for a later inter-observer reliability analysis.

## Results

Table 3 shows raw score and percentage score of correct responses for treated and untreated stimuli. Five audio-taped sessions were randomly selected and reviewed by one Speech-Language Pathologist unrelated to the experiment for the reliability check-up. The inter-observer reliability was 88.9%. Figure 4 presents the graphic results for S1 and S2. The magnitude of the difference between the vertical distance between the data paths of the conditions does not seem to be very large. The MMIT condition, however, appear to be superior for both patients. Therefore, the data was subjected to t-test in order to clearly demonstrate the effects. Improvement with MMIT was significant, in both the treated ($p<0.01$, paired t-test) and the untreated stimuli ($p<0.05$, paired t-test). Figure 5 shows the mean correct response in percent for baseline, MIT, and MMIT conditions. The magnitude of improvement was more prominent in treated stimuli.

## Summary and Discussions

The present investigation was conducted to determine the effectiveness of MMIT. MMIT controlled the number of syllables and patterns of melody of ATU which were not dealt with the conventional MIT. In addition, the subjects listened to the melodies and intoned target words with their eyes closed at the beginning of MMIT for each target word.

Table 3. Number and Percent of Correct Response. TS: treated stimuli. UTS: untreated stimuli. The numbers in parenthesis are percentage score of correct response.

| Ses-sion | S1 | | | | S2 | | | |
|---|---|---|---|---|---|---|---|---|
| | MIT | | MMIT | | MIT | | MMIT | |
| | TS | UTS | TS | UTS | TS | UTS | TS | UTS |
| 1 | 3/5(60) | 1/10(10) | 4/6(67) | 2/10(20) | 1/3(33) | 0/10(0) | 1/3(33) | 0/10(0) |
| 2 | 2/5(40) | 1/10(10) | 5/5(100) | 1/10(10) | 2/4(50) | 0/10(0) | 2/3(67) | 0/10(0) |
| 3 | 4/10(40) | 3/10(30) | 4/10(40) | 4/10(40) | 1/5(20) | 0/10(0) | 1/4(25) | 0/10(0) |
| 4 | 5/10(50) | 3/10(30) | 4/10(40) | 4/10(40) | 1/5(20) | 1/10(10) | 1/2(50) | 0/10(0) |
| 5 | 5/7(71) | 2/10(20) | 6/7(86) | 2/10(20) | 2/6(33) | 1/10(10) | 1/4(25) | 0/10(0) |
| 6 | 6/10(60) | 4/10(40) | 6/7(86) | 4/10(40) | 1/5(20) | 1/10(10) | 2/4(50) | 0/10(0) |
| 7 | 5/10(50) | 4/10(40) | 7/9(78) | 5/10(50) | 2/6(33) | 0/10(0) | 3/6(50) | 1/10(10) |
| 8 | 6/10(60) | 4/10(40) | 6/10(60) | 4/10(40) | 3/10(30) | 1/10(10) | 3/5(60) | 1/10(10) |
| 9 | 8/10(80) | 5/10(50) | 7/9(78) | 5/10(50) | 3/8(38) | 1/10(10) | 3/7(43) | 1/10(10) |
| 10 | 9/10(90) | 5/10(50) | 9/10(90) | 5/10(50) | 4/10(40) | 2/10(20) | 2/5(40) | 1/10(10) |
| 11 | 4/5(80) | 5/10(50) | 4/4(100) | 5/10(50) | 3/8(38) | 1/10(10) | 4/5(80) | 1/10(10) |
| 12 | 4/10(40) | 4/10(40) | 5/10(50) | 5/10(50) | 4/8(50) | 2/10(20) | 6/10(60) | 1/10(10) |
| 13 | 5/8(63) | 5/10(50) | 6/8(75) | 5/10(50) | 4/8(50) | 1/10(10) | 5/10(50) | 2/10(20) |
| 14 | 6/10(60) | 5/10(50) | 6/10(60) | 5/10(50) | 5/10(50) | 2/10(20) | 5/9(56) | 2/10(20) |
| 15 | 7/10(70) | 6/10(60) | 7/7(100) | 5/10(50) | 4/10(40) | 1/10(10) | 5/8(63) | 2/10(20) |
| 16 | 6/10(60) | 6/10(60) | 7/10(70) | 6/10(60) | 5/10(50) | 2/10(20) | 5/10(50) | 2/10(20) |
| 17 | 4/10(40) | 5/10(50) | 7/10(70) | 6/10(60) | 1/3(33) | 1/10(10) | 2/2(100) | 2/10(20) |
| 18 | 5/10(50) | 6/10(60) | 10/10(100) | 6/10(60) | 4/10(40) | 2/10(20) | 6/10(60) | 1/10(10) |
| 19 | 7/10(70) | 6/10(60) | 10/10(100) | 6/10(60) | 5/10(50) | 2/10(20) | 6/10(60) | 2/10(20) |
| 20 | 7/10(70) | 5/10(50) | 7/10(70) | 5/10(50) | 6/10(60) | 3/10(30) | 7/9(78) | 3/10(30) |
| 21 | 6/10(60) | 6/10(60) | 8/10(80) | 6/10(60) | 5/10(50) | 3/10(30) | 6/10(60) | 3/10(30) |
| | | | | | | | | 3/10(30) |
| Avg. | 5.4/9 | 4.3/10 | 6.4/8.7 | 4.6/10 | 3/7.6 | 2/10 | 6/6.5 | 3/10 |
| | (60) | (43) | (76.2) | (46) | (39.5) | (12) | (55.2) | (13) |

Two severely non-fluent aphasics participated in the experiment. The study used an alternating treatment design in the form of A-B-C-C-B-B-C for S1 and A-C-B-B-C-C-B for S2. The B and the C were administered within a same day, the B in the morning and the C in the afternoon or vice versa. However, the C was introduced in the morning and B in the afternoon or vice versa in the next session. This counterbalancing was done since the time of the day may affect the subjects' physical condition and, in turn, their language performance. Three baseline evaluations were followed by 21 sessions of MIT treatment and 21 sessions of MMIT treatment. Two evaluations were completed for each treatment session: one for treated stimuli and the other for untreated stimuli via visual confrontation naming task with word cards or picture cards.

The results showed that MMIT was more effective in producing accurate verbal production of target words. The effectiveness of MMIT may be attributable to the following reasons: First, inhibition of perseveration by utilizing different melodic patterns and different number of syllables adjacent to target utterances; and second, improved attentiveness by having them keep their eyes closed while listening to the melodies and intoned utterances.

The application of MMIT required more time especially in the earlier sessions. The patients often forgot to close their eyes. Then, verbal instruction had to be followed again and the process was re-started. However, this procedure might have helped the subjects' performance in terms not only of increasing attentive listening but of decreasing the chance of perseveration. The working mechanism of perseveration has been proposed by several investigators like the following. Once a response is produced and reinforced, it would be retained in working memory as stimulus trace, interfering with the short-term memory skill to add new items or to search and retrieve from long-term memory (Pietro & igrodsky, 1986). Albert and Sandson (1986) suggested that there is a difference between experimenter-regulated and subject-regulated tasks, with less perseveration for the latter. It might mean that the patient can earn time until his saturated short-term memory capacity becomes workable. In this regard, taking longer time for each item in the MMIT session may have played a role in obtaining more correct responses.

The patients became easily fatigued and the treatment was discontinued. Therefore, although the goal of therapy for each session was to train 10 words and evaluate if they could name the treated stimuli when the session was over, there were sessions which did not reach the goal of 10 words. Thus, the evaluation was done on the treated words only. In other words, if the patient learned 5 words, visual confrontation naming was done on those 5 words. However, the evaluation on untreated stimuli was always 10.

It seemed that the general effectiveness of MMIT to untreated stimuli was weak. Although the fluctuating points of the treatment effects were seen in several places, the overall trend towards improving naming skills was evidenced.

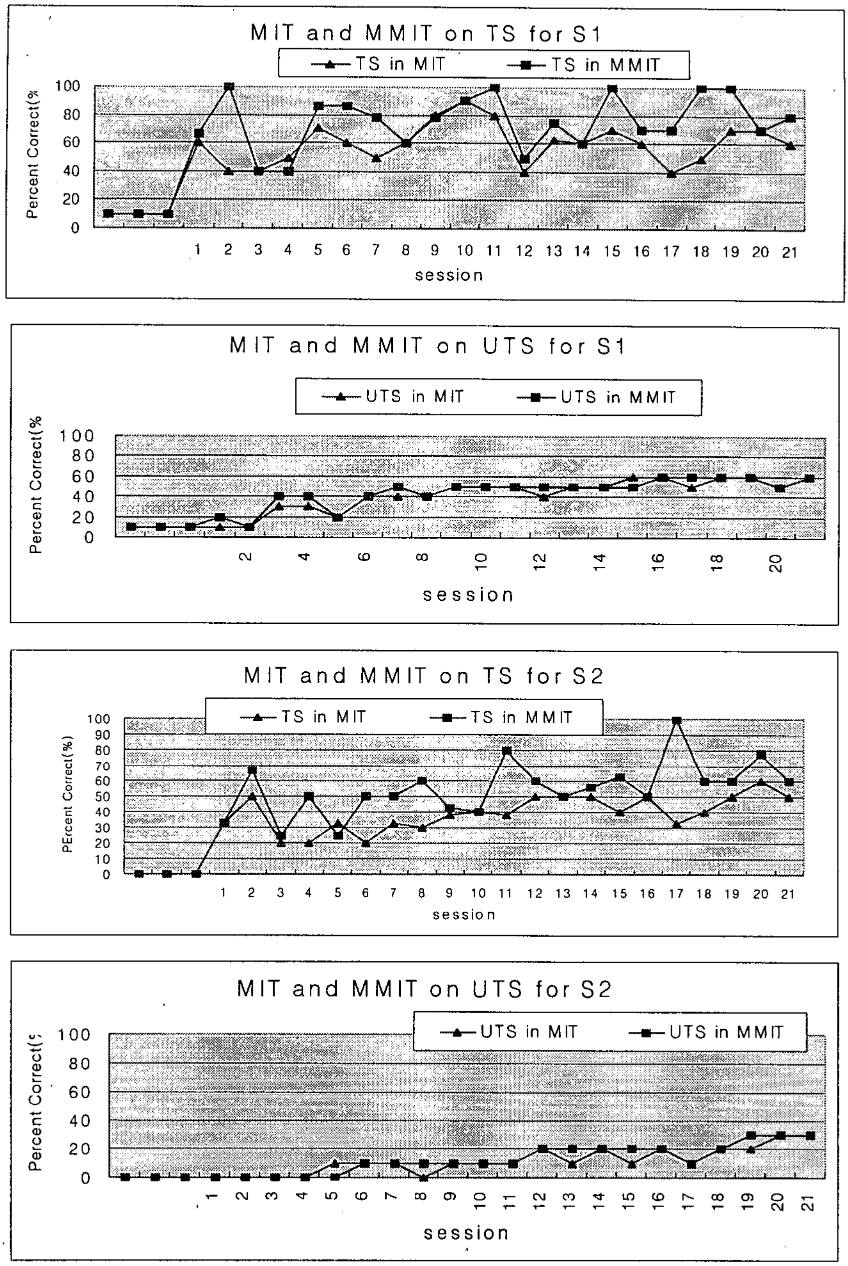


Figure 4. Alternating Treatment Results of MIT and MMIT on TS (treated stimuli) and UTS (untreated stimuli) for S1 and S2.

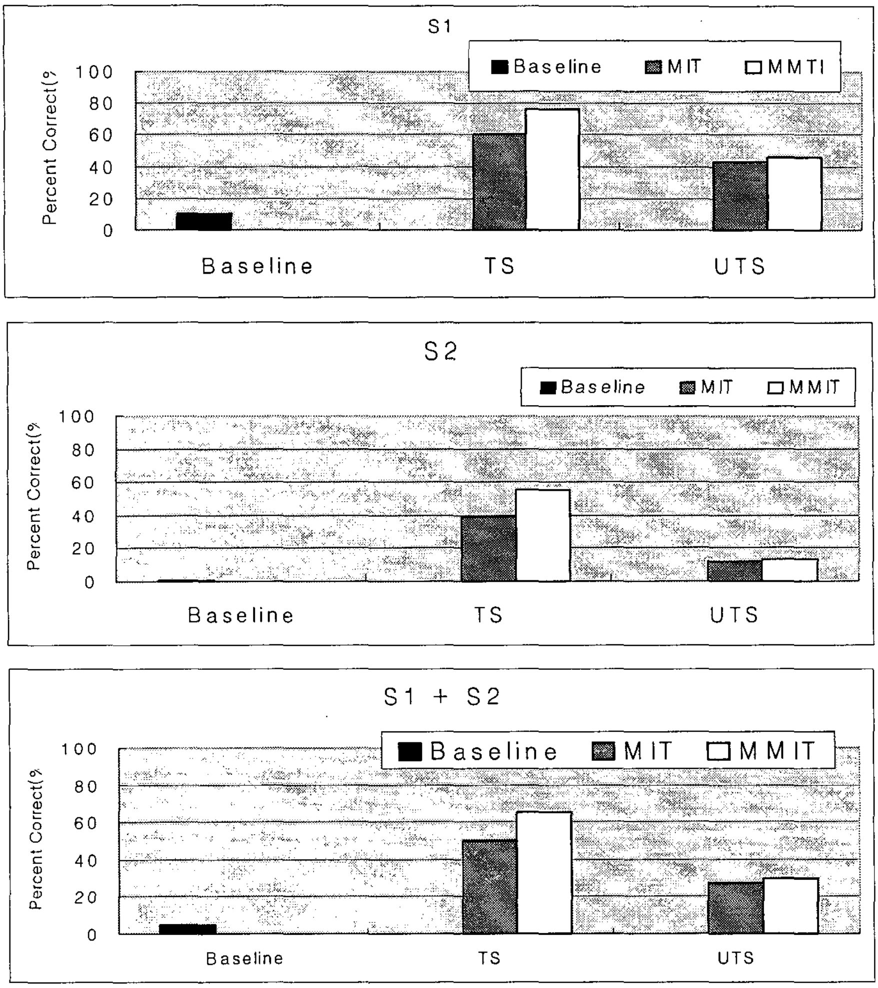


Figure 5. Comparison of Mean Scores for Baseline and 2 treatment Conditions.

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