

The Total Physical Response Technique of Learning¹

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One striking generalization which seems apparent from the literature on motor learning is the small amount of decay for memory traces over time. Motor learning, in contrast with verbal learning, appears to have enormous resistance to extinction.

However, the literature dealing with motor learning (Adams, 1964; Bilodeau & Bilodeau, 1961; Noble, 1968) has been concerned almost exclusively with partial rather than total physical responses. For example, research in motor learning is usually done with tasks which involve parts of the body—the receptors and effectors—as illustrated in display-control problems (i.e., tracking).

The work that comes closest to total physical response motor learning is Humphrey's investigation (1967b) of learning through games in which, for example, the acquisition of certain reading skills was significantly accelerated when the learning task occurred in the context of a game involving the entire body. In a theoretical paper (1967a), Humphrey listed these generalizations, which were suggested by available data:

1. In general, children tend to learn certain academic skills and concepts better through the motor activity medium than through many of the traditional media in such subject areas as reading and language, science, and mathematics.

2. This approach, while favorable for both boys and girls, appears to be more favorable for boys.

3. It appears to be more favorable for children with normal or below normal intelligence.

4. For children with high levels of intelligence, it may be possible to introduce more advanced academic skills and concepts at an earlier age

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through the learning medium of motor activity.

Our work with the total physical response technique of learning began in 1963 with an attempt to accelerate the rate at which American children and adults could learn to comprehend Japanese (Asher, 1964b; Kunihiro & Asher, 1965). Not only was there a dramatic increase in the velocity of understanding Japanese, but also the stress which usually accompanies second language learning was non-existent. The technique used in those studies may be seen in a 15-minute film, *Demonstration of a New Strategy in Language Learning*, available from the Film Library of the University of California, Berkeley. A still picture from this film is shown in Figure 1.

TECHNIQUE

The total physical response technique involves having students listen to a command in a foreign language and immediately respond with the appropriate physical action. For example, two students sit on either side of their instructor. In Japanese the instructor says *tate* and immediately the students and instructor stand up. When the instructor says *aruke*, everyone walks forward. Other commands used in the program were *tobe* (jump), *maware* (turn), *kagame* (squat), and *hashire* (run).

The training began with brief one-word utterances, but within thirty minutes, the morphological and syntactical complexity of the commands was considerably increased, as is illustrated in the following commands:

Isu kara tatte, kokuban no anata no namae o kесе. (Stand up and erase your name from the blackboard.)

Kara no namae o enpitsu de kono kami ni kake. (Take the pencil and write your name on this paper.)

Sono hana o tsuekue kara tori, kanojo no watase. (Take that flower from the desk and give it to her.)

The initial work with Japanese was followed by 24 experiments in which the total physical response technique was used to accelerate the comprehension of Russian. The subjects were undergraduate college students, most of whom were between the ages of 18 and 21.

Procedure

In the experimental group (N = 18), four subjects (Ss) were seated, two on each side of the experimenter (E), who began by reading these instructions:

You're going to be learning some Russian words this week. The Russian words are to be played on the tape recorder (*points to recorder*). When you hear the Russian words, do exactly what I do. I'll be showing you what the Russian words mean. For example, if the Russian word means to walk, I'll walk. Listen carefully, then follow me. Try to act as quickly as you can. Do not say the words out loud. Just be silent, follow me, and try to learn what the words mean. Are there any questions?

Immediately after the instructions were read, E turned on the tape recorder and presented the first unit of training, which consisted of the following utterances in Russian, each of which was given approximately 10 times: stand, sit, walk, stop, turn, squat, run. The sequence was varied so that Ss did not simply memorize a fixed pattern of behavior. After each Russian utterance, E, along with the Ss, executed the appropriate action response. For instance, if the Russian command was "run," E and Ss ran. After 1½ minutes of training, during which Ss had responded five times to each Russian utterance, E said:

From now on, I will slow down a little and you try to act before I do. When you hear the Russian, go ahead of me if you can.

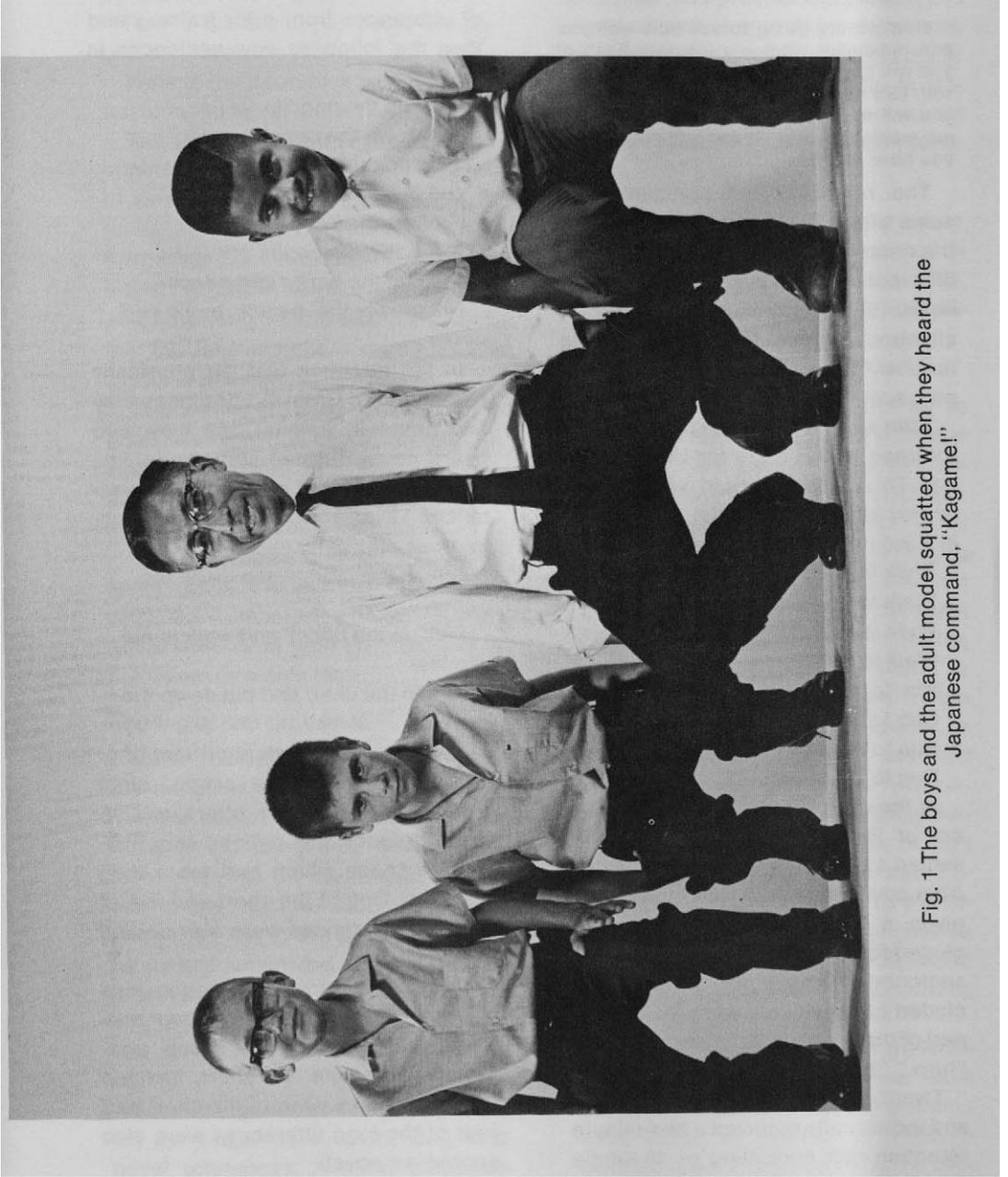


Fig. 1 The boys and the adult model squatted when they heard the Japanese command, "Kagamei!"

Then for another 1½ minutes *E* and *Ss* again physically acted in response to each command, which they heard five more times. This completed Unit I training. Then *E* said:

Now we are going to see how well you can remember what you learned. Each of you will follow the Russian words by yourself. (*S*'s name), you'll be first. The rest of you will wait your turn outside. While you are waiting, please do not talk about what you have heard.

The retention test contained the same utterances used in training, but the order of presentation and number of exposures were changed. Each *S* heard 20 utterances which lasted, in all, about 1½ minutes. *E* recorded the number of correct physical responses on a score sheet.

After each *S* had been tested, all *Ss* returned to the room for Unit II training. This session began with a brief review and then the single utterances in Russian were expanded as follows:

Walk to the door.

Walk to the window.

Walk to the chair.

Walk to the table.

Run to the door.

Run to the window.

Run to the chair.

Run to the table.

In the nine minutes of training, this set of Russian sentences was presented three times in a varying order. After training, each *S* was individually given a 1½ minute test, which included four single words and the short sentences. Single words were included because they were an integral part of the action, e.g., "stand," "stop," "turn," "sit."

Twenty-four hours later, *Ss* returned and individually received a two-minute retention test consisting of 18 single Russian words and the eight short Russian sentences. The order of pre-

sentation differed from previous training and tests.

Immediately after the recall test, there were six minutes of Unit III training, which began with a brief review of utterances from prior training and then the following new sentences in Russian:

Pick up the pencil.

Put down the pencil.

Pick up the book.

Put down the book.

Pick up the paper.

Put down the paper.

Pick up the paper and pencil.

Put down the pencil, book and paper.

In the retention test, *Ss* physically responded to Russian utterances they had heard in training, but they also heard novel Russian commands, i.e., recombinations of elements into sentences never experienced in training, for example:

Run to the table and pick up the paper.

Pick up the pencil and walk to the window.

Run to the chair and put down the book.

The two-minute retention test after Unit III included one single, eight short, and nine long utterances. A long utterance was defined as a Russian sentence which had more than one verb. One of the short and five of the long utterances were also scored as novel.

Forty-eight hours later, *Ss* returned for another individual retention test, 2½ minutes in length, which contained two single, six short, and ten long utterances. One of the short and four of the long utterances were also scored as novel.

Unit IV training began with a review of previous learning and then *Ss* acted

in response to the recombination and expansion of learned patterns such as:

Pick up the paper and pencil and put them on the chair.

Run to the table, put down the paper, and sit on the chair.

Walk to the door, pick up the pencil, put it on the table, and sit on the chair.

The training in Unit IV required 7½ minutes, during which each utterance of varying complexity was heard only once. The retention test which followed was 3½ minutes per S and consisted of eight single, three short, and nine long utterances. Two short and five long sentences were counted as novel utterances.

Two weeks later, Ss returned for a final retention test of six minutes, in which there were 13 single, 13 short, and 14 long utterances. Two short and five long utterances were novel.

The total amount of time spent in small group training was 25½ minutes, as compared with almost an equal amount of time (19 minutes) in individual retention tests.

Scoring of retention tests

Each behavioral unit was scored in the retention tests. For example, if a S in the experimental group heard in Russian the command "Run to the table and pick up the flower," he received one point for running, another point if he ran to the table, another if he picked something up, and a point if the item picked up was a flower. Therefore, that utterance in Russian had a total possible score of four points.

Four categories of complexity were set up: single word, short, long, and novel utterances. A short utterance was a sentence with one verb and one object, such as "Walk to the chair." A

long utterance was defined as a sentence with more than one object of the verb ("Pick up the book and pencil.") or more than one verb ("Walk to the chair and pick up the pencil."). A novel utterance was defined as some recombination of sentences which Ss had heard in training so that, in this sense, the command was presented for the first time in the retention tests.

RESULTS

Since the findings from this series of experiments have been reported in detail elsewhere (Asher, 1965, 1966, 1968, 1969), the results will only be summarized here.

Training versus testing

The data showed that in order to accelerate learning, it was critical that students make total physical responses during retention tests, but not necessarily during training. For some still unknown reason, motor acts during retention tests were more important than motor acts in training. This meant that students had the option during training of acting with the model or observing the model act. This option did not affect learning. However, a powerful boost in learning resulted when students individually demonstrated competency by physically acting in the retention tests. Most of the *t* test comparisons were significant beyond the .001 level. Each S in the retention tests listened to an utterance in Russian and then if he understood it, immediately obeyed by performing a physical action.

The only exception to this generalization was when translations were used. For example, when students were asked in training to translate from Russian to English either by saying or writing the English, motor action during retention tests did not signifi-

cantly increase learning. The most retarding effect on the acquisition of listening comprehension of Russian was translation used either in training, in the retention tests, or in *both* training and the retention tests. If total physical responses are conceptualized as powerful facilitators of learning, then translation can be viewed almost as an anti-learning variable.

In the search to discover what aspects of the total physical response acted to increase learning during retention tests, the motor act was analyzed into component parts. Then experiments were designed to find which of the components accounted for the facilitation of learning. The results showed that no single component could explain the phenomenon. Apparently the *intact* motor act during retention was critical in the acceleration of learning.

Task complexity

Across all experiments a dramatic facilitation of learning occurred when the Russian was increased in complexity from single-word utterances to long or novel sentences. For instance, when the commands in Russian were single words, such as "stand," "sit," etc., Ss who acted during retention tests did not have retention superior to that of Ss who did not act. Striking increments in learning usually occurred only when the Russian utterances were more complex as, for example, "Run to the window and pick up the pencil," or "Stand up, walk to the door, put down the book and run to the table."

One implication of these findings is that a reductionistic learning task such as the paired-associate format would not have identified the powerful variable of motor action. Therefore, it may not be realistic to generalize from simple paradigms of verbal

learning to more complex, wholistic verbal achievements.

Retention over time

When subjects acted during the retention tests, what effect did it have on recall following training? Table 1 suggests that the total physical response technique had long-term effects on retention. Notice that the experimental Ss were superior in performance to control Ss, whether the time interval between training and testing was zero, 48 hours, or two weeks. There were no significant differences for retention tests in Units I and II because of the structural simplicity of the commands.

The audio-lingual approach

It would be interesting to know how the total physical response technique compares with an established procedure such as the audio-lingual approach, which attempts to train students almost simultaneously to achieve listening and speaking competency.

We hypothesized that the simultaneous learning of two skills—listening and speaking—inflicts acute stress upon the student because he is expected to make the alien sounds before he is "perceptually ready." This stress may retard the learning of a second language. The hypothesis was tested in an experiment in which the training consisted of one group of college students (N=37) who either observed the model act or acted along with him, but in the retention tests, each S individually acted after hearing a Russian utterance. This group was trained in listening comprehension only. Another group (N=24) underwent an identical procedure with the exception that, in training, after listening to a Russian utterance, Ss and teacher spoke it. For example, if the Russian command

Table 1
Acting Versus Writing During Retention Tests

Retention Measures	Combined ^a Groups 1 & 2 N=37		Combined ^b Groups 3 & 4 N=34		Level of Significance (two-tailed test)	
	\bar{X}	s	\bar{X}	s	t*	
Unit I						
1. Total	17.02	3.11	15.47	2.62	2.25	.05
Unit II						
2. Total	19.33	2.40	18.91	3.67	.56	NS
3. Single	3.89	.32	3.85	.53	.40	NS
4. Short	15.43	2.41	15.06	3.63	.49	NS
Unit II (24 Hr)						
5. Total	30.06	3.33	28.74	5.27	1.23	NS
6. Single	16.62	1.97	16.12	2.59	.89	NS
7. Short	13.43	2.03	12.62	3.22	1.25	NS
Unit III						
8. Total	45.70	5.56	39.85	9.85	3.00	.01
9. Short	15.27	1.21	13.38	2.87	3.50	.001
10. Long	29.43	5.09	25.42	7.68	2.54	.02
11. Novel	17.54	4.78	14.58	6.45	2.14	.05
Unit III (48 Hr)						
12. Total	47.84	9.99	44.76	7.00	1.50	NS
13. Short	11.40	1.36	10.62	1.96	1.90	NS
14. Long	35.92	4.81	32.26	5.50	2.93	.01
15. Novel	22.25	4.40	18.64	5.50	2.98	.01
Unit IV						
16. Total	64.43	9.56	51.82	13.78	4.38	.001
17. Single	7.46	1.20	7.50	.94	.15	NS
18. Short	5.86	.55	5.58	.93	1.56	NS
19. Long	50.73	9.48	38.70	12.82	4.41	.001
20. Novel	34.54	5.41	25.88	8.63	4.95	.001
Two Week						
21. Total	95.05	6.46	78.97	14.74	5.78	.001
22. Single	12.94	.44	12.26	1.34	2.83	.01
23. Short	25.40	1.20	23.04	5.05	2.62	.02
24. Long	56.70	5.89	43.74	10.90	6.06	.001
25. Novel	27.78	4.44	19.18	7.14	5.93	.001
Combined						
26. Total	320.86	26.01	278.53	46.71	4.60	.001
27. Single	43.86	3.01	42.56	4.41	1.41	NS
28. Short	86.81	4.59	80.50	11.52	2.93	.01
29. Long	172.78	20.76	140.12	33.56	4.81	.001
30. Novel	102.38	15.60	78.29	25.04	5.07	.001

^aThe Experimental Group (N=37) either observed a model act or acted themselves in training, but each S individually acted during the retention tests.

^bThe Control Group (N=34) either observed a model act or acted themselves in training, but each S translated in writing from Russian to English during the retention tests.

*Note: We are aware that there is increased likelihood for significant *ts* to occur, as a function of randomness, when many *t* tests are run in a series. However, no alternate statistical test offered the clarity of the *t* test, and the number of significant *ts* was usually overwhelming, showing a consistent pattern before the null hypothesis was rejected.

from the tape recorder was "walk," the Ss and the model repeated the Russian word, then walked.

The expectation was that an attempt to both listen and speak would decrease one's skill in listening compre-

hension. The results confirmed this expectation (see Table 2).

Children versus adults

There is a strong belief that children learn foreign languages more easily than adults. This belief is probably the

Table 2
Retention When Ss Learned Listening and Speaking Together

Retention Measures	Combined Groups 1 & 2 N=37		Combined ^a Groups 20 & 21 N=24		t	Level of Significance (one-tailed test)
	\bar{X}	s	\bar{X}	s		
Unit I						
1. Total	17.02	3.11	15.37	4.32	1.59	NS
Unit II						
2. Total	19.33	2.40	17.92	3.57	1.68	.05
3. Single	3.89	.32	3.50	.72	2.44	.01
4. Short	15.43	2.41	14.42	3.31	1.26	NS
Unit II (24 Hr)						
5. Total	30.06	3.33	30.50	2.92	.54	NS
6. Single	16.62	1.97	16.33	3.55	.36	NS
7. Short	13.43	2.03	13.50	2.24	.12	NS
Unit III						
8. Total	45.70	5.56	34.00	9.65	5.27	.0005
9. Short	15.27	1.21	12.58	3.99	3.13	.005
10. Long	29.43	5.09	20.33	6.92	5.45	.0005
11. Novel	17.54	4.78	9.84	4.76	6.06	.0005
Unit III (48 Hr)						
12. Total	47.84	9.99	43.62	8.68	1.72	.05
13. Short	11.40	1.36	10.42	2.08	2.00	.025
14. Long	35.92	4.81	31.29	7.32	2.69	.005
15. Novel	22.25	4.40	17.92	5.86	3.05	.005
Unit IV						
16. Total	64.43	9.56	56.71	12.88	2.47	.01
17. Single	7.46	1.20	6.80	.98	2.28	.025
18. Short	5.86	.55	5.83	.68	.18	NS
19. Long	50.73	9.48	43.34	12.77	2.38	.025
20. Novel	34.54	5.41	30.21	7.32	2.45	.01
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21. Total	95.05	6.46	91.16	11.09	1.52	.10
22. Single	12.94	.44	12.79	.67	.94	NS
23. Short	25.40	1.20	25.04	2.56	.63	NS
24. Long	56.70	5.89	53.33	8.87	1.61	.10
25. Novel	27.78	4.44	25.67	6.11	1.44	.10
Combined						
26. Total	320.86	26.01	289.30	35.97	3.64	.0005
27. Single	43.86	3.01	40.29	3.95	3.72	.0005
28. Short	86.81	4.59	81.79	9.16	2.44	.01
29. Long	172.78	20.76	148.29	26.95	3.71	.0005
30. Novel	102.38	15.60	83.62	17.78	4.14	.0005

^aGroup 20 was identical with Group 1 and Group 21 was identical with Group 2, except that Ss uttered the Russian in training before executing an action.

result of the common observation that children living in a foreign country rapidly acquire a native-like fluency, while their parents struggle to achieve even a minimal level of competency.

This belief in the superiority of children in language acquisition may be an illusion if children learn the new language in play situations while adults do not. In play, children tend to synchronize utterances with physical action (e.g., "Come on, let's ride our bikes,"); for adults, a new language tends to be independent of physical action (e.g., "Hello! It's a beautiful day, isn't it?"). If the difference in learning contexts is play versus non-play, active versus passive, and physical versus no physical involvement, then this may partially explain the accelerated foreign language performance of children.

This idea was tested in a controlled study by Asher & Price (1967). Both adults and children learned listening comprehension of Russian using the total physical response technique, which simulates the play situation of children by synchronizing utterances with physical actions. The results showed that adults vastly outperformed children who were eight, 10, and 14 years old ($p < .0005$). Further, the older children—the 10- and 14-year-olds—did significantly better than the younger children.

For the present, this finding of adult superiority is limited to listening fluency since a recent study (Asher & Garcia, 1969) suggests that there may be a biological factor in the pre-puberty development of children which enables them to achieve a native-like pronunciation of a second language.

Ideal language program

In the usual school situation, foreign

language instruction may have minimal effectiveness because the program is too ambitious. For example, given only one hour a day during the school year for second language instruction, it is unrealistic to expect fluency in listening, speaking, reading *and* writing, even at the college level.

An objective of listening and speaking may be an unrealistic one with the limited time available (Asher, 1969). Therefore we suggest that in the first stage of learning, only one of the four language skills be selected. The skill we recommend is listening fluency, because it seems to have positive transfer to the other three skills, especially speaking (Asher, 1964b).

Transfer between listening and reading will be a function of the "phonetic fit" between the phonology and orthography of the language (Asher, 1964a). For example, there should be great positive transfer if the language is Spanish and less if it is Russian.

For at least one semester in college, or six months to a year in elementary or high school, the goal of foreign language learning should be listening fluency only. The intent should be to pre-tune the student with a high level of listening skill so that he will have a "perceptual readiness" to make a graceful, non-stressful transition to speaking the language. The strategy recommended to achieve a keen level of listening understanding is the total physical response technique.

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