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The Effectiveness of Auditory Bombardment in the Remediation of Phonological Processes

Lisa M. Gangloff

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The Effectiveness of Auditory Bombardment in the Remediation of Phonological Processes

(TITLE)

BY

Lisa M. Gangloff

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ABSTRACT

Current research examining the efficacy of different stages of phonological remediation is limited to the use of minimal pairs and the integration of language therapy to assist children with accompanying language deficits. Auditory bombardment, however, although frequently used, has not been researched as to its effectiveness in the remediation of phonological processes. Auditory bombardment is currently being presented through word lists. This researcher suggests that a language-based bombardment, in the form of children's stories, would aid in the reduction of phonological processes and the acquisition of language skills.

Six subjects were included in the research study. The subjects ranged in age from 3-3 to 5-6. Subject selection criteria were as follows: 1) monolingual homes; 2) no history of previous speech and language services; 3) adequate speech mechanisms; 4) normal hearing; 5) moderate to profound phonological delays as determined by the Assessment of Phonological Processes-Revised (APP-R).

Pretesting consisted of the APP-R deviancy scores and a 50 utterance language sample analyzed for Developmental Sentence Score (DSS) and Mean Length of

Utterance (MLU). These three measures were the dependent variables for the study.

The subjects were matched for age and divided into three groups. Group 1 was the control group and received no auditory bombardment. Group 2 was an experimental group and received auditory bombardment in the form of word lists. Group 3 was an experimental group and received auditory bombardment in the form of children's stories. All three groups received minimal pair therapy. The therapy was administered during twelve 30 minute sessions over six weeks.

After treatment the subjects the APP-R was readminstered and a 50 utterance language sample analyzed for DSS and MLU. These measures were analyzed using one way analysis of variances in pre/post comparisons. These comparisons did not yield any statistically significant differences among dependent variables. This indicated that change was not demonstrated as a result of the application of the independent variable. However, reductions in the use phonological processes were noted in all subjects.

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My sincere appreciation goes to Virginia Eason-Sons for helping to develop the idea of the thesis, writing the stories and assisting with the reliability checks.

The fact that the control group reduced its deviancy scores without auditory bombardment suggests that auditory bombardment is not an effective use of therapy time. Further research is needed, however, to examine the long term effects of using language-based auditory bombardment on children's language skills.

To the rest of the faculty and students at the Speech-Language Hearing Clinic, your support and encouragement kept me motivated throughout the experience. Thank you.

DEDICATION

I would like to dedicate the completion of this project to my parents, my brother and sister. Without your support and guidance through the years I never would have even attempted a project such as this. You have taught me that I can succeed by trying, and through your own examples instilled in me that only integrity and hard work can help you to reach your goals.

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Chapter I

INTRODUCTION

The remediation of phonological disorders has generally utilized three types of intervention techniques: minimal pairs, language intervention, and auditory bombardment.

Ferrier and Davis (1973) were the first to use minimal pairs with a TMH child who demonstrated final consonant deletion. They hypothesized that the child would learn to differentiate word productions, when there was a need to communicate that difference. They induced a need to communicate differences and the child learned to differentiate his productions. Weiner (1982) believes the reason that utilization of minimal pairs is effective is that they target successful communication rather than correct articulation.

There is a growing understanding in the field of speech-language pathology of the interaction between phonological development and language development and how delays or disorders in either can affect the other. Support for this in the literature is given by Hodson and Paden (1983), who believe that a child must be able to recognize semantic differences in words to reduce the frequency of phonological processes. Grunwell (in Jones, 1980) redefines a functional articulation

disorder as a language disorder at the phonological level, and states that these often co-occur with language disorders at the grammatical, syntactical and morphological levels, as well.

Hoffman, Norris and Monjure (1990) compared minimal pair therapy to whole language treatment for phonological delayed children. They found both therapies to be effective in reducing the frequency of phonological processes, but the subject receiving the whole language treatment, also exhibited increased expressive language skills. The integration of language and phonology therapies in research studies has proven to be effective.

Auditory bombardment, the third technique used in phonological remediation, has not been researched sufficiently to determine its effectiveness. Studies involving phonological remediation have been limited to case studies and the effects of various treatment techniques. Many of these studies included an auditory bombardment phase, citing Hodson and Paden (1983) as their reason for doing so. However, Hodson and Paden provide no data to support the necessity or effectiveness of this technique.

Stoel-Gammon and Dunn (1985) imply that the reason Hodson and Paden's program spread so rapidly is because it was such an innovative approach at the time of its

Introduction in 1983. Stoel-Gammon and Dunn do call for further research in the areas of auditory bombardment as well as cyclic training and target selection.

The limited research on auditory bombardment has only led to questions of its effectiveness. Perhaps the theory behind the concept is valid, but the execution of it may not be the most efficient that it could be.

The current research study proposes to answer the following questions:

1. Does auditory bombardment in the form of word lists presented at low levels of amplification for two minutes prior to and following treatment cause suppression of phonological processes?

2. Is there a difference between auditory bombardment using word lists and auditory bombardment using stories and the suppression of phonological processes?

3. Is there a difference between auditory bombardment using word lists and auditory bombardment using stories and the acquisition of expressive language?

Chapter II

REVIEW OF LITERATURE

Research investigating phonological therapy and its efficacy has been limited to individual case studies and the effects of various treatment techniques. In the normal treatment paradigm three techniques have generally been accepted into therapy. Minimal pairs have been shown to be effective in facilitating remediation of phonological processes. Language intervention has also been successfully integrated with phonological therapy to improve children's expressive language. Auditory bombardment, however has been utilized, but not completely researched as to its effectiveness.

Auditory bombardment is defined by Hodson and Paden (1983) as "listening to numerous repetitions at a low level of amplification of words containing the target sound of sequence." This practice supposedly produced an awareness of the target sound (Hodson & Paden, 1983) and helped the children to improve their self-monitoring skills (Hodson, 1989). Although Hodson advocated the use of auditory bombardment before and after a phonological treatment session, she provided no data to support the necessity or effectiveness of this technique in remediating phonological processes.

Current practices in school settings incorporate the use of auditory bombardment, as well as minimal pairs and language. Research needs to break down therapy into its components to test for their efficacy so that unnecessary procedures and techniques can be eliminated and therapy can therefore become more streamlined and effective.

Minimal Pairs

Research in the use of minimal pair therapy has proven it to be a highly effective technique for the reduction of phonological processes. In minimal pair therapy a child is presented with two words that vary by one phoneme. If the child pronounces the words the same and is required to change his production, he eliminates the ambiguity (Weiner, 1981).

Ferrier and Davis (1973) were the first to advocate the use of minimal pairs as a therapeutic technique. They found it effective in decreasing the frequency of final consonant deletion in a 6 year old TMH child. They hypothesized that the child's limited vocabulary promoted the deletion of final consonants because they carried no specific information (i.e. plurality, possessiveness, etc.) Therefore, by increasing the child's vocabulary with words containing final consonants (i.e. specific information) the child

would learn to differentiate between the words by production of the final consonant. The results supported their hypothesis. When the need to communicate a difference in words involved the production of different final consonants, the subject demonstrated a significant reduction in the use of final consonant deletion.

Weiner (1982) stated that minimal pair therapy was effective because it targeted successful communication rather than just correct articulation of a phoneme. He advocated establishing word contrasts as opposed to establishing correct sound production because it affected intelligibility, which is the goal of speech therapy. Leach (1984) stated that therapy utilizing minimal pairs was an effective technique to use with young children. He claimed adult listeners were rarely confused about a child's communication intent. Therefore, when a listener did express confusion, the child was motivated to alter his/her production of the intended target. This motivation was described as a negative reinforcer for the child because of the break down in communication.

Another investigation by Weiner and Ostrowski (1979) studied the effects of listener uncertainty on consistency of articulation. They found that when a child labeled a picture and the examiner questioned his

response, the child modified his production. Production errors observed were significantly reduced following examiner expressed confusion. These results support the hypothesis that communication failure results in modification of articulation.

Gallagher (1977) also studied the revision behaviors in children. Her subjects were children with normally developing language varying only in Brown's Stages I, II, or III. Her findings revealed that children at all three language levels modified the linguistic form of their utterance when an adult listener did not comprehend their spoken message. Rarely did the subjects repeat the same message or completely ignore the request for clarification. Results also indicated that children at stage I incorporated significantly more phonetic changes when compared to the revisions made by children at the other two stages. When the phonetic changes were analyzed they were shown to be systematic replacements, which the author concluded was indicative of a primitive language system. The author's interpretation suggested that the phonological system of children at stage I was not fully developed. The immature system resulted in the greater degree of phonetic variability.

Tyler, Edwards and Saxman (1987) compared the efficacy of two phonologically based treatment

procedures: a modified cycles approach and a minimal pairs approach. Results indicated that both approaches were effective in the reduction of phonological processes for all subjects. The minimal pairs approach included both a perception and production phase. The major difference between the two therapy approaches was the number of processes targeted. Minimal pairs targeted one process at a time, while modified cycles targeted two to three processes simultaneously. Both groups of children made significant gains in phonological process suppression. The authors attributed this effectiveness to the intense analysis of each subjects's phonological system to determine which therapy approach should be used. Therapy selection was based on several different variables, including the number of processes displayed by the subject, stimulability, type and age appropriateness of processes, frequency of occurrence of processes and their effect on intelligibility. Another factor that may have contributed to the effectiveness of therapy was preferred procedures by different children. It was the authors' opinion that children, who utilized many inappropriate processes that occurred frequently and which significantly reduced intelligibility, responded better to the modified cycles approach because of the number of processes targeted. It was the authors'

conclusion that children who exhibited pervasive processes or who exhibited few age-inappropriate processes responded better to the minimal pair treatment program because the intense concentration of one target process at a time.

Monahan (1986) conducted four case studies to assess the effectiveness of minimal pair phonological therapy. Subjects were between the ages of 5:5 and 5:8 and enrolled in a kindergarten class. None of these children had received speech therapy prior to this study, and all subjects made significant gains in process suppression as a result of the intervention technique. These results contradict Hodson and Paden (1983) and Hodson (1989). They did not advocate the use of minimal pairs until later cycles when therapy success had been demonstrated at the lower levels and when a child would be able to recognize semantic differences in words.

The minimal pair technique was also successfully used in group therapy with preschoolers. This suggested its usefulness in the school system (Montgomery & Bonderman 1989). Leach (1984) recommended that as many individuals in the child's environment as possible practice this approach so as to obtain a high degree of response consistency.

Communication of differences between words is the basis of minimal pair therapy. Stressing this to the child through listener uncertainty has proven an effective way to instigate change in a child exhibiting phonological processes in his or her speech. The communication breakdown that the child experiences many times is complicated by a language delay or deficit. Language therapy has therefore been incorporated into the phonological therapy to aid in remediation of both.

Language

There is a growing understanding in the field of speech-language pathology of the interactions between phonological development and language development and how disorders or delays in either can affect the other (Paul & Shriberg, 1982; Panagos, Quine & Klich, 1979; Panagos & Prelock, 1982; Whitacre, Luper & Pollio, 1970; Hoffman, Norris & Monjure, 1990). Blache (1978) boldly states, "Phonological development is a linguistic skill. The dichotomy between 'speech' and 'language' has allowed phonology to fall between the cracks."

If a child needs to be able to recognize semantic differences in words in order to successfully decrease the frequency with which she utilizes phonological simplification processes, (Hodson & Paden, 1983;

Hodson, 1989) then this is evidence supporting the theory of phonological and language interaction.

A functional articulation disorder can be redefined as a language disorder at the phonological level (Grunwell in Jones, 1980). Functional articulation disorders are frequently reported as co-occurring with language disorders (e.g. grammatical, syntactical and morphological disabilities) (Grunwell in Jones, 1980) Grunwell (1985) listed three ways in which phonological disorders relate to language:

1. Limited grammatical abilities may lead to delayed or disordered syntax development.

2. Adults who cannot understand a child with a phonological disorder cannot model or expand on the child's utterance, one way to demonstrate correct syntax.

3. As the phonologically delayed child matures, vocabulary expansion may be inhibited by his/her difficulty pronouncing increasingly complex words.

In support of the synergistic view of language and phonological disorders, Schwartz, Leonard, Folger and Wilcox (1980) compared younger normal-speaking with older language-disordered children matched for mean length utterance (MLU) scores. They found significant similarities between the two groups in the use of syllabic structures, phonemes and processes. They

hypothesized that, as the MLU of language-disordered children increases and therefore syntactic complexity of the children's utterances increases, their phonological development may lag behind.

Schmauch, Panagos and Klich (1978) also found similarities between the errors made by normal and language disordered children. Both groups made sound production errors as syntactic complexity increased. The two groups differed, however, in the number of errors made. Language-disordered children made significantly more articulation errors. The researchers interpreted the results to mean that language disordered children may use encoding strategies (techniques that the child uses to organize the information contained in language) that reduce the amount of information to a level that they are able to deal with. In a related study, a relationship between increasingly complex syntactical structures and decreasingly accurate consonant articulation observed by Panagos, et.al. (1979) led the researchers to hypothesize that the difficulty in consonant production may be due to underlying limitations of organizational ability.

Results of a study conducted by Shriner, Holloway and Daniloff (1969) found that children with severe articulation deficits use syntactically simpler

sentences than their normal-articulating peers. Paul and Shriberg (1982) examined the co-occurrence of phonological and syntactical disorders by observing the effects of phonological reduction on the production of phonetically complex morphophonemes (e.g. two dogs). Overall syntactic delays were evidenced in two-thirds of the subjects, while one-half of the subjects exhibited limited use of phonetically complex morphophonemes. These results challenged the hypothesis by Panagos et. al. (1979), as only 50% of the subjects' delays could be explained using the limitations of organizational ability.

Renfrew's theory (1966) stated that open-syllables which were resistant to traditional articulation therapy were a characteristic of a unique articulation disorder. Retrospectively, Panagos (1974) stated that these open syllables were actually symptoms of a more broad-based phonological and language disorder, and called for an integration of the two in speech and language therapy. Young (1983) utilized a language approach, targeting semantic and conceptual skills to remediate open syllables and consonant cluster reduction.

Methany and Panagos (1978) conducted a study to examine the interaction between syntax and articulation therapy. They found that when children with both

syntactical and articulation disorders were enrolled in therapy targeting one or the other, both syntax and articulation improved.

Similar findings were found by Hoffman, Norris and Monjure (1990) when they compared minimal pair therapy and a whole language treatment for phonologically delayed children. Syntax development was considered when designing a whole language therapy. Similar results were found for both the minimal pair procedure and the whole language procedure in reducing the frequency of phonological simplification processes, however the subject who received the whole language treatment exhibited increased expressive language performance. These results also support the theory of interaction between language and phonology.

Language and phonology disorders have been shown to be related to one another. Therapy has just recently begun to reflect the integration of language and phonology by incorporating both treatments in therapy sessions. Auditory bombardment, however which has also been included in both school settings and research paradigms has not been fully researched for its efficacy in phonological treatment.

Auditory Bombardment

Several studies have used an auditory bombardment stage citing Hodson and Paden (1983) as their rationale for doing so (Monahan, 1986; Tyler et al., 1987; Montgomery & Bonderman, 1989). Monahan's study was designed to assess the effectiveness of minimal pair therapy, but did not address the effectiveness of auditory bombardment. The Tyler et al. study was designed to compare a modified cycles therapy with a minimal pair therapy. They also used auditory bombardment without evaluating its efficacy. Montgomery and Bonderman utilized auditory bombardment in group therapy with preschool children, but again, its effectiveness was not addressed. Stoel-Gammon and Dunn (1985) imply that the reason Hodson and Paden's therapy program spread so rapidly is because it was such an innovative approach to phonological therapy at the time of its introduction. They further suggest that research is needed in the areas of target selection, cyclic training and auditory bombardment.

A retrospective study conducted by Shriberg and Kwiatkowski in 1987 statistically analyzed different teaching strategies and their relation to generalization to spontaneous speech. Auditory bombardment was one of these teaching techniques

analyzed. They found that, when auditory bombardment was not a part of articulation and phonological therapy 15% of the targets generalized to spontaneous speech, but when auditory bombardment was a component in therapy 0% of the targets generalized. Further analyses of the data could not explain this finding. The authors believed that many different variables could have played into the results, and auditory bombardment was more than likely not detrimental to generalization of therapy-learned articulation.

The limited research that has been conducted on the efficacy of auditory bombardment has only led to questions of its effectiveness. Perhaps the theory behind the concept is valid, but the execution of it may not be the most efficient that it could be, therefore the following questions will be addressed in this study.

1. Does auditory bombardment in the form of word lists presented at low levels of amplification for two minutes prior to and following treatment cause suppression of phonological processes?

2. Is there a difference between auditory bombardment using word lists and auditory bombardment using stories and the suppression of phonological processes?

3. Is there a difference between auditory bombardment using word lists and auditory bombardment using stories and the acquisition of expressive language?

Chapter III

METHODS

Subject Selection:

Possible subjects were identified through four major sources. Letters were sent to sixty-eight area speech-language pathologists asking for assistance in finding possible subjects (See Appendix A). Included with the letters was a questionnaire regarding the use of auditory bombardment in phonological therapy. Twenty-nine speech-language pathologists returned the questionnaire. Only one of the letters contained the name of a possible subject. In addition, forty-six private day care centers were contacted by phone and were asked to identify children with possible phonological delays (See Appendix B). Two day care providers recognized articulation differences in children they cared for and allowed the researcher to contact the parents through them. Neither parent responded to the letter sent (See Appendix C). The researcher also attended a preschool screening in an area community. Three possible subjects were identified. Finally, potential subjects were identified by contacting parents whose children were waiting to receive services at the Eastern Illinois University Speech-Language-Hearing Clinic. These

referral sources resulted in the identification of nine possible subjects.

Procedures:

Pretesting

Nine children were seen individually for the initial testing session. Testing was conducted at the Speech-Language-Hearing Clinic on the campus of Eastern Illinois University. All pretesting sessions were video taped for later analysis using Polorold Supercolor Plus T-120 video tapes. Each child and parent met with the researcher for the initial five minutes of the testing session. During this time the procedure was discussed and any parental questions were answered. A brief case history was obtained from the parent to determine whether two other subject selection criteria had been satisfied: a) monolingual home environment and b) no previous history of speech or language services. A letter (See Appendix D) requesting permission for the child to be included in the study was signed by the parent. The parent was then excused from the therapy room.

The following test battery was administered to each child.

1. An oral peripheral screening (See Appendix E). The structure of the oral mechanisms was determined to be adequate for speech.
2. A hearing screening of 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz at 20 dB (ANSI, 1969). Hearing was determined to be within normal limits (0 to 25 dB).
3. An APP-R (Hodson, 1983) was administered to determine a phonological deviancy score and severity interval. A severity rating between severe to profound was the criteria set for inclusion in the study.

Failure to obtain any of the above criteria resulted in exclusion from the study. Six of the nine children met the above criteria and were identified as subjects for the study. Specific pretest data for these subjects is located in Table 1.

To complete the pretesting battery middle ear functioning was assessed through impedance testing. The criteria set for normal middle ear functioning was, ear canal volume between .25 and 2.5 ml, middle ear pressure between 0 and -100 mmws, and a normal tympanic peak. Children who did not meet this criteria were not excluded from the study, but parents were advised to

seek medical assistance. Three subjects were referred to a medical doctor.

A spontaneous speech sample (50 utterances in length) was obtained and analyzed for Mean Length of Utterance and Developmental Sentence Score to determine MLU and grammar and syntactical structures utilized by each subject. The children's utterances were elicited through their play with objects found in the APP-R testing kit and the toys arranged in the testing room. The same toys were offered to all subjects.

Table 1. Pretesting data and subject distribution

Subj	Age	Gender	Group	APP-R	DSS	MLU	Hear	Imped
TM	5-5	M	1	46	6.8	5.7	P	Normal
HR	5-6	F	3	77	6.7	5.3	P	RE Flat
LR	4-9	F	2	45	5.3	4.7	P	Normal
BM	4-8	M	1	52	5.8	4.3	P	Normal
JY	3-10	F	2	46	5.1	4.6	P	RE & LE Flat
JF	3-3	F	3	60	5.2	4.4	P	RE Flat & LE Abnormal

Treatment

A. Auditory Bombardment

Group 1 received no auditory bombardment.

Group 2 received auditory bombardment for 2 minutes at the beginning and ending of each session.

Bombardment was in the form of word lists and were chosen according to the processes being remediated for each subject. Word lists were presented via head phones from Maico portable audiometers and audio cassette recordings of female live voice. Recordings were made on an AKAI model HX-AI tape deck using Dolby noise reduction on Maxell UD II 60 minute high-biased cassette tapes. Word lists were presented at low amplification (60 dB SPL) over headphones via a Panasonic portable stereo component system model RX-CS750. The children colored while listening to the word lists and were instructed that during "listening time" they were to listen to the words while they colored. If the subjects began to talk during the auditory bombardment, they were asked to remain quiet and continue listening and coloring.

Group 3 received auditory bombardment for 2-4 minutes at the beginning and end of each session in the form of stories (See Appendix F). Stories were presented via head phones at low levels of amplification (60 dB SPL) from the Maico portable audiometers and Panasonic portable stereo component system model RX-CS750. Recordings were of female live voice, recorded on an AKAI tape deck model HX-AI using Dolby noise reduction on Maxell UD-II 60 minute high-biased cassette tapes.

The children in group three turned pages of an accompanying story book and engaged in a picture matching task while listening to the stories. Target words were chosen according to the processes being remediated for each subject. These words were represented in the pictures used in the matching task to facilitate focusing of the subject's attention on the target sounds. The children were instructed to listen to the stories and match the pictures to the page when they heard that word.

B. Minimal Pairs:

Minimal pair therapy was utilized with all three groups. Targets were dependent upon the processes focused on in auditory bombardment. Words for the minimal pair technique were chosen with age of the subject and expected vocabulary considered. A variety of materials and activities were used in the therapy sessions, but all groups engaged in the same activities each week to maintain consistency of therapy (See Appendix G).

Subjects participated in two, 30 minute group treatment sessions each week for a total of 6 weeks. Subjects were seen in groups of two. This treatment schedule was chosen to reflect the schedules in the

schools. The treatment was conducted by the researcher.

Hearing screenings at 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz at 20 dB (ANSI, 1969) were administered to the three children who had normal tympanograms at the time of pretesting. All children passed this hearing screening. Screenings were conducted between the sixth and eighth sessions to assure each subject's hearing acuity remained within normal limits. Tympanograms were conducted, instead of a hearing screenings, on the three children who had exhibited abnormal tympanograms at the initiation of the study. One of these subjects was referred for medical treatment following the procedure.

Post-testing

At the conclusion of the six week therapy period, the APP-R was readministered to the subjects. Spontaneous speech samples (50 utterances in length) were collected and analyzed to determine MLU and DSS scores. Hearing acuity was re-screened at the end of the six weeks of therapy to assure that each subject maintained hearing within normal limits.

Reliability

The researcher rescored 10% of tests (APP-R's, the MLU's and DSS's) from videotape. A Pearson product moment correlation was applied to the reliability data. A correlation coefficient of r = 1.000 reliability was obtained, which is significant at the p = .05 significance level.

A certified speech language pathologist rescored 10% of the APP-R's, the DSS's and the MLU's from videotape. A Pearson product moment correlation was applied to the reliability data. A correlation coefficient of .997 was obtained, which is significant at the p = .05 significance level.

Analysis

A one-way analysis of variance was performed to examine group differences before and after treatment. A post hoc comparison was applied to specify differences among treatment means.

Chapter IV

RESULTS

The purpose of this study was to determine the effectiveness of auditory bombardment in the remediation of phonological processes, and if the type of bombardment used affected language skills. The independent variables were two types of auditory bombardment and a control group that received no auditory bombardment. The dependent variables were the Assessment of Phonological Processes-Revised (Hodson & Paden, 1983), the Developmental Sentence Score (Lee, 1974), and Mean Length of Utterance (Brown, 1973). These three measures were administered prior to treatment and immediately following treatment. The APP-R was also administered in a one-month follow-up session. The APP-R was scored using the Computer Analysis of Phonological Processes (Hodson, 1985). These measures were compared between the pretest and both posttest scores for all three groups of subjects. The comparisons were analyzed with A One Way Analysis of Variance to determine whether significant differences among pretest and posttest scores existed. Pretest scores can be found in Table 2.

Table 2. Pretesting Scores for all Subjects.

	Subject	APP-R	DSS	MLU	Hearing	Impedance
Group 1	TM	46	6.8	5.7	Passed	Normal
	BM	52	5.8	4.3	Passed	Normal
Group 2	LR	45	5.3	4.7	Passed	Normal
	JY	46	5.1	4.6	Passed	RE & LE Flat
Group 3	HR	77	6.7	5.3	Passed	RE Flat
	JF	60	5.2	4.4	Passed	RE Flat & LE Abnorm

A one way analysis of variance using the APP-R pretest scores was performed between the control and experimental groups. The results indicated no significant differences at the .05 level. The results of the analysis is found in Table 3. It should be noted that all APP-R statistical computations were completed using deviancy scores derived from the age they were at the initiation of the study. Three of the children had birthdays during the time frame of the study. The age scores were not changed, however, because it was felt that the points added to the deviancy score for age did not adequately reflect the decrease in phonological processes.

Table 3. A Comparison of the Pretest APP-R Scores of the Control and Experimental Groups.

	N	Means	St.Dev
Group 1	2	49.000	3.000
Group 2	2	45.500	0.500
Group 3	2	68.500	8.500

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	2	614.333	307.167	5.653	.09602	-
W/I Gps	3	163.000	54.333			
Total	5	777.333				

Eta sq = .790

*significant if F ratio is beyond 9.552

A one way analysis of variance using DSS pretest scores was performed between the control and experimental groups. Results indicated no significant differences at the .05 level. A summary of the analysis is found in Table 4.

Table 4. A Comparison of Pretest DSS Scores for the Control and Experimental Groups.

	N	Means	St.Dev
Group1	2	6.530	.750
Group2	2	5.160	.100
Group3	2	5.820	.640

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	2	1.878	.939	1.434	.36556	-
W/I Gps	3	1.964	.655			
Total	5	3.842				

Eta sq. = .489

*significant if F ratio is beyond 9.552

A one way analysis of variance using MLU pretest scores was performed between the control and

experimental groups. Results indicated no significant differences at the .05 level. A summary of the analysis is found in Table 5.

Table 5. A Comparison of Pretest MLU Scores for the Control and Experimental Groups.

	N	Means	St.Dev
Group1	2	5.000	.700
Group2	2	4.650	.050
Group3	2	4.850	.450

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	2	.123	.062	.133	.88028	-
W/I Gps	3	1.390	.463			
Total	5	1.513				

Eta sq. = .081

*significant if F ratio is beyond 9.552

Comparisons were made between the control group's (Group 1) pretest, posttest and one-month follow-up APP-R scores. Results indicated that no significant differences were found at the .05 level of significance. Results are summarized in Table 6.

Table 6. Comparison of Pretest, Posttest and One Month Follow-up APP-R Scores for Group 1.

Condition	N	Means	St.Dev
Pretest	2	49.000	3.000
Posttest	2	46.000	4.000
Follow-up	2	45.500	6.500

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	2	14.333	7.167	.160	.85908	-
W/I Gps	3	134.500	44.833			
Total	5	148.833				

Eta Sq = .096

* significant if F ratio is beyond 9.552

Comparisons were made between the experimental group's (Group 2) pretest, posttest and one-month follow-up APP-R scores. Results indicated that no significant differences were found at the .05 level of significance. Results are summarized in Table 7.

Table 7. Comparison of Pretest, Posttest and One Month Follow-up APP-R Scores for Group 2.

Condition	N	Means	St.Dev
Pretest	2	45.500	0.500
Posttest	2	47.500	0.500
Follow-up	2	44.500	2.500

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	2	9.333	4.667	1.037	.45462	-
W/I Gps	3	13.500	4.500			
Total	5	22.833				

Eta Sq = .409

* significant if F ratio is beyond 9.552

Comparisons were made between the experimental group's (Group 3) pretest and posttest APP-R scores. Results indicated that no significant differences were found at the .05 level of significance. Results are summarized in Table 8.

Table 8. Comparison of Pretest and Posttest APP-R Scores for Group 3.

Condition	N	Means	St.Dev
Pretest	2	68.500	8.500
Posttest	2	63.000	9.000

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	1	30.250	30.250	.197	.70028	-
W/I Gps	2	306.500	153.250			
Total	3	336.750				

Eta Sq = .090

* significant if F ratio is beyond 18.500

Comparisons were made between pretest and posttest DSS scores for the control group. No significant differences existed at the .05 level of significance. A summary of the analysis is found in Table 9.

Table 9. Pretest vs. Posttest DSS Scores for Group 1.

Condition	N	Means	St.Dev
Pretest	2	6.550	.750
Posttest	2	5.400	.200

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	1	1.323	1.323	2.195	.27664	-
W/I Gps	2	1.205	.602			
Total	3	2.528				

Eta Sq = .523

* significant if F ratio is beyond 18.500

Comparisons were made between pretest and posttest DSS scores for the experimental group (Group 2). No significant differences existed at the .05 level of

significance. A summary of the analysis is found in Table 10.

Table 10. Pretest vs. Posttest DSS Scores for Group 2.

Condition	N	Means	St.Dev
Pretest	2	5.200	.100
Posttest	2	5.050	.650

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	1	.023	.023	.052	.84078	-
W/I Gps	2	.865	.432			
Total	3	.888				

Eta Sq = .025

* significant if F ratio is beyond 18.500

Comparisons were made between pretest and posttest DSS scores for the experimental group (Group 3). No significant differences existed at the .05 level of significance. A summary of the analysis is found in Table 11.

Table 11. Pretest vs. Posttest DSS Scores for Group 3.

Condition	N	Means	St.Dev
Pretest	2	5.850	.650
Posttest	2	6.550	.250

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	1	.490	.490	1.010	.42068	-
W/I Gps	2	.970	.485			
Total	3	1.460				

Eta Sq = .336

*significant if F ratio is beyond 18.500

Comparisons were made between pretest and posttest MLU scores for the control group. No significant

differences existed at the .05 level of significance. A summary of the analysis is found in Table 12.

Table 12. Pretest vs. Posttest MLU Scores for Group 1.

Condition	N	Means	St.Dev
Pretest	2	5.000	.700
Posttest	2	4.500	.100

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	1	.250	.250	.500	.55279	-
W/I Gps	2	1.000	.500			
Total	3	1.250				

Eta Sq = .200

* Significant if F ration is beyond 18.500

Comparisons were made between pretest and posttest MLU scores for the experimental group (Group 2). No significant differences existed at the .05 level of significance. A summary of the analysis is found in Table 13.

Table 13. Pretest vs. Posttest MLU Scores for Group 2.

Condition	N	Means	St.Dev
Pretest	2	4.650	.050
Posttest	2	4.700	.300

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	1	.002	.002	.027	.88453	-
W/I Gps	2	.185	.092			
Total	3	.187				

Eta Sq = .013

* Significant if F ratio is beyond 18.500

Comparisons were made between pretest and posttest MLU scores for the experimental group (Group 3). No

significant differences existed at the .05 level of significance. A summary of the analysis is found in Table 14.

Table 14. Pretest vs. Posttest MLU Scores for Group 3.

Condition	N	Means	St.Dev
Pretest	2	4.850	.450
Posttest	2	4.950	.050

Source	df	SS	MS	F	Prob	p =.05*
Bet Gps	1	.010	.010	.049	.84570	-
W/I Gps	2	.410	.205			
Total	3	.420				

Eta Sq = .024

*significant if F ratio is beyond 18.500

Chapter V

DISCUSSION

Comparisons of the dependent variables were analyzed using one way analysis of variances. The scores were computed using the computer program Stat Star Version 1.0 (Academy Software, 1990).

A comparison of the pretreatment dependent variables was calculated between the control group and the two experimental groups. The scores were analyzed using a one-way analysis of variance. No significant differences were found between APP-R scores among the three groups. The language scores, DSS and MLU, were compared using the same measures and were found not to be significantly different between groups, thus indicating that the three groups were similar in their articulation and language skills before treatment.

In order to determine whether auditory bombardment is effective in reducing phonological processes in preschool children, comparisons were calculated between the APP-R scores of the control group and the APP-R scores of the experimental groups. No significant differences were found among APP-R scores, indicating the experimental groups' scores did not change significantly due to the incorporation of an auditory bombardment phase in the remediation program. Although

subjects in all three groups demonstrated reductions in phonological processes, this could be attributed to the treatment method of minimal pair therapy. Minimal pair therapy has been proven effective in previous research (Ferrier & Davis, 1973; Gallagher, 1977; Weiner & Ostrowski, 1979; Weiner, 1982; Leach, 1984; Monahan, 1986; Tyler, et. al, 1987; Montgomery & Bonderman, 1989). It appears that the type of auditory bombardment did not affect the decrease in the APP-R scores. This suggests that auditory bombardment is not effective. The results of the questionnaires sent by the researcher indicated that of the 22 speech-language pathologists who provide phonological remediation, 19 utilize auditory bombardment. These speech-language pathologists may be wasting their therapy time.

A second research question addressed by this study was as follows: Is there a difference between auditory bombardment using word lists and auditory bombardment using stories and the suppression of phonological processes? The results of this research suggests that no significant differences exist between the two types of auditory bombardment. The children who received auditory bombardment in the form of lists reduced their deviancy scores, as did the children who received bombardment in the form of stories.

A final research question addressed auditory bombardment's effects on language scores. Four subjects exhibited a decrease in DSS scores at the time of posttesting. Three subjects exhibited a decrease in MLU scores. These variances in language scores were not statistically significant. This could be accounted for by the fact that the same materials and toys were used to obtain the language samples in both pretesting and posttesting sessions. The children could have found these to less stimulating. Time of testing was not controlled for and the children could have been tired and less motivated. The children also had become familiar with the researcher in the course of the six weeks of therapy and perhaps they did not feel as motivated to make themselves understood. It appeared that the type of auditory bombardment did not affect the language scores.

Some weaknesses were present in the research that may have decreased the effectiveness of the study. The small number of subjects may have affected the ability to find statistically significant changes in the dependent variables. The six week time allotment may also have not been enough time to see statistically significant results in the APP-R and language scores. Because the control group did not receive any type of auditory bombardment, their actual therapy time was

longer than the experimental groups (by as much as 120 minutes over the course of the six week therapy schedule). Although the results could not conclude that this extra time made significant differences in the dependent measures, perhaps a larger longer study might address this issue and determine its benefits.

Another weakness of this study was the fact that the subjects in the experimental groups often did not complete the task of coloring, as in the case of group 2, or matching the pictures, as in group 3. This suggested that the children were not focused on the auditory bombardment. The children in group 3 were easily distracted and at least 50% of the time did not complete the matching task by the end of the story. Perhaps the stories could be read by the clinician, who could also individually help each child locate the target word in the story book pictures.

The implications for further research in the area of auditory bombardment and its efficacy are as follows. The decrease in the use of phonological processes only proves what has already been proven--that minimal pair therapy is effective in the remediation of phonological processes. The fact still remains that there is limited research in the area of auditory bombardment. A study with a larger n and perhaps a longer time frame could assist us in further

determining the effectiveness of auditory bombardment in phonological therapy.

If auditory bombardment is proven to be effective a further study could examine the effects of target words in a natural context, such as stories, songs or poems, on the children's language skills.

In summary, the results of this study suggest that auditory bombardment is not an effective remedial technique in the suppression of phonological processes. The control group which did not receive auditory bombardment, did reduce its deviancy scores on the APP-R. Speech-language pathologists may not be using their therapy time wisely. The profession needs to question seemingly comprehensive therapy programs, such as Hodson's, for research has not been conducted to support all the steps involved.

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APPENDIX A

Letter of Intent to SLP's

Dear :

For completion of my Master's Thesis in the Department of Communication Disorders and Sciences at Eastern Illinois University, I am conducting a study designed to research the effectiveness of the auditory bombardment stage in phonological therapy, as described by Hodson and Paden in Targeting Intelligible Speech (1983). This therapy approach which is typically used in the school setting has not been conclusively researched to establish its efficacy. My research project will attempt to clarify whether this stage of phonological therapy is being administered in the most effective manner, or if it is even necessary in the remediation of phonological processes.

I am looking for subjects to include in this study. Having been involved in preschool screenings and having worked in the preschool setting, I am hoping that you will be able to provide names of children that may prove to be possible subjects in my experiment.

The subjects must meet the following criteria to be included:

1. Age 3 to 4 years old
2. Appear to have hearing within normal limits

3. No speech or language therapy prior to this study
4. Must demonstrate phonological simplification processes
5. May have a language delay

If you know of any children that may meet even some of these criteria, please include their names and parents addresses and/or phone numbers on the attached sheet. A Self-addressed stamped envelope is provided for your convenience. I assure you that the utmost confidentiality will be maintained.

Additionally I would appreciate your participation in a survey concerning the current use of phonological therapy in the school setting. You will find the questionnaire and a SASE enclosed. Please take the time to respond to the questionnaire even if you do not have any possible subjects' names to contribute. This questionnaire will help me to identify current practices of the SLP in the school setting.

Thank you.

Lisa Gangloff

Graduate Candidate

Appendix B

Initial Phone Contact with Day Care Centers

1. Hello, may I speak with _____.
2. My name is Lisa Gangloff. I am a graduate student at Eastern Illinois University. I acquired your name from the Charleston Chamber of Commerce where they provide a listing of day cares in the area.
3. I am conducting research for my master's thesis and I am currently looking for children to use in my study. The children must be between the ages of 3 and 5 and have speech that is difficult to understand. Does this describe any of the children that you care for?
4. I would like to contact the child's parents by sending a letter home with the child from your day care center.
5. I will be sending a letter outlining the study for you to give to the parents. Thank you for your time.

Appendix C

Letter to Parents Through Daycare Centers

Dear Parents:

I am a graduate student at Eastern Illinois University in the department of speech pathology. For completion of my master's degree, I am conducting research on children whose speech is difficult to understand. I have contacted Charleston area day care centers to help me in my search for children to test. Your child's day care has offered to forward this letter to you.

I would like to meet with you and your child to further explain my research project. If following our visit I find that your child would be an asset to my study, I would appreciate your considering his/her participation at a future date.

Please contact me so that I can explain my research and address any questions you may have. My number is 345-3829 (evenings) or you may leave a message at the Eastern Illinois University Speech and Hearing Clinic at 581-2712 and I will return your call. Your cooperation is greatly appreciated.

Sincerely,

Lisa Gangloff

Appendix D

Parental Permission Form

Date: _____

I, _____, give permission for _____ to participate in a research study investigating the effectiveness of speech therapy in preschool children. The time period of the study will be from _____ to _____ . My child will be seen on the following days and times: _____. I understand that this study poses no risks to my child. I further understand that my child may benefit from this study, through an improvement in his or her speech skills.

Name: _____

Address: _____

_____

Phone: _____

Appendix E

Oral Peripheral Screening

Teeth

Structure:

_____ Occlusion (note_____)

_____ Bite (open, closed, normal)

_____ Continuity of biting edge

Tongue

Structure:

_____ Size

_____ Symmetry

Function:

_____ Curl tongue up and back

_____ Touch corners of mouth with tongue

_____ Restrictiveness of lingual frenum

Hard Palate

Structure:

_____ Intact

_____ Palatal contour (note _____)

Velopharyngeal Port Mechanism

Structure of Soft Palate

_____ Intact

_____ Symmetry

_____ Length

Uvula:

_____ Intact (note bifid or deviations from midline

_____)

Fauces

Structure:

_____ Tonsils (note _____)

Appendix F

Sample Story: A Day at the Beach

Today is Saturday and Aunt Sophie and I are spending the afternoon at the beach. This will be a super duper day for just us. Aunt Sophie is my favorite aunt. She knows just what little boys like! Best of all, she never ever gets mad at you if you make a mistake like spilling your chocolate milk.

It is a perfect day for the beach. The ocean sparkles and shines in the bright sunlight. Aunt Sophie lets me carry the super duper beach umbrella while she carries the basket filled with everything we need for the beach.

The sand feels warm as it squeezes between my toes.

"Should I build a sand castle, Aunt Sophie?" I ask.

"Of course," says Aunt Sophie, "there is your sand pail and shovel--just what you need to build super duper sand castles. First we need to put on suntan lotion so we don't get sunburnt." Aunt Sophie rubs lotion on me, and then on herself. "The beach is the best place for getting a super duper suntan," says Aunt Sophie, as she lays her beach towel on the sand. Soon I am building a magnificent sand castle as Aunt Sophie

sleeps on her beach towel and gets a suntan. My sand castle has five towers and a moat. As I build my sand castle, I watch the other people who are at the beach.

Some teenagers are playing volleyball. The players shout and scream as they hit the volley ball back and forth across the net. They are having a super duper time! Finally one boy misses and falls with his face in the sand, Everyone laughs, even the boy with sand in his face!

Soon the sun is so hot that I am sweating. "Aunt Sophie, please wake up. Let's go for a swim," I say.

"I could use a swim myself," says Aunt Sophie. "There's your mask, snorkel and swim fins." We run into the water and jump as a wave splashes us.

In the ocean is a mother with her baby, Chip. The baby is riding his plastic sea horse. He is also having a super duper time splashing his mother and laughing.

A man, in a sailboat with a bright orange sun painted on the sail, waves to us as he slips by on the waves.

Using my mask, I dive into the ocean. I can see the fish swimming . One even touches my nose. Super duper! I can see his eyes watching me. He is so close that I can see his gills move as he breathes. There are other fish in the ocean too. Seals, dolphins, fish

of different colors, even fish with spiky head dresses and fins.

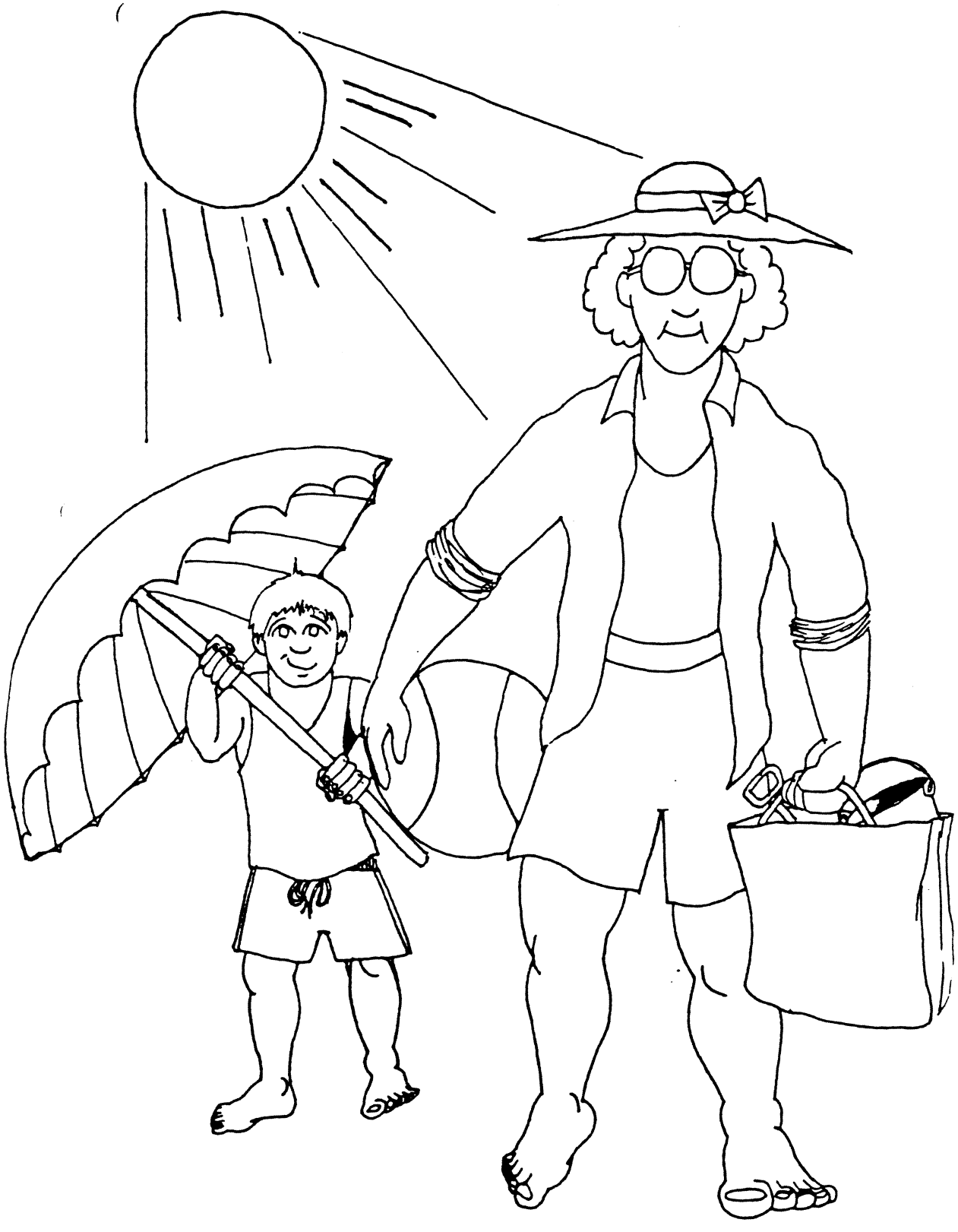
Soon our swim is over, Aunt Sophie and I eat a lunch of sandwiches and juice. I also munch on some carrot sticks.

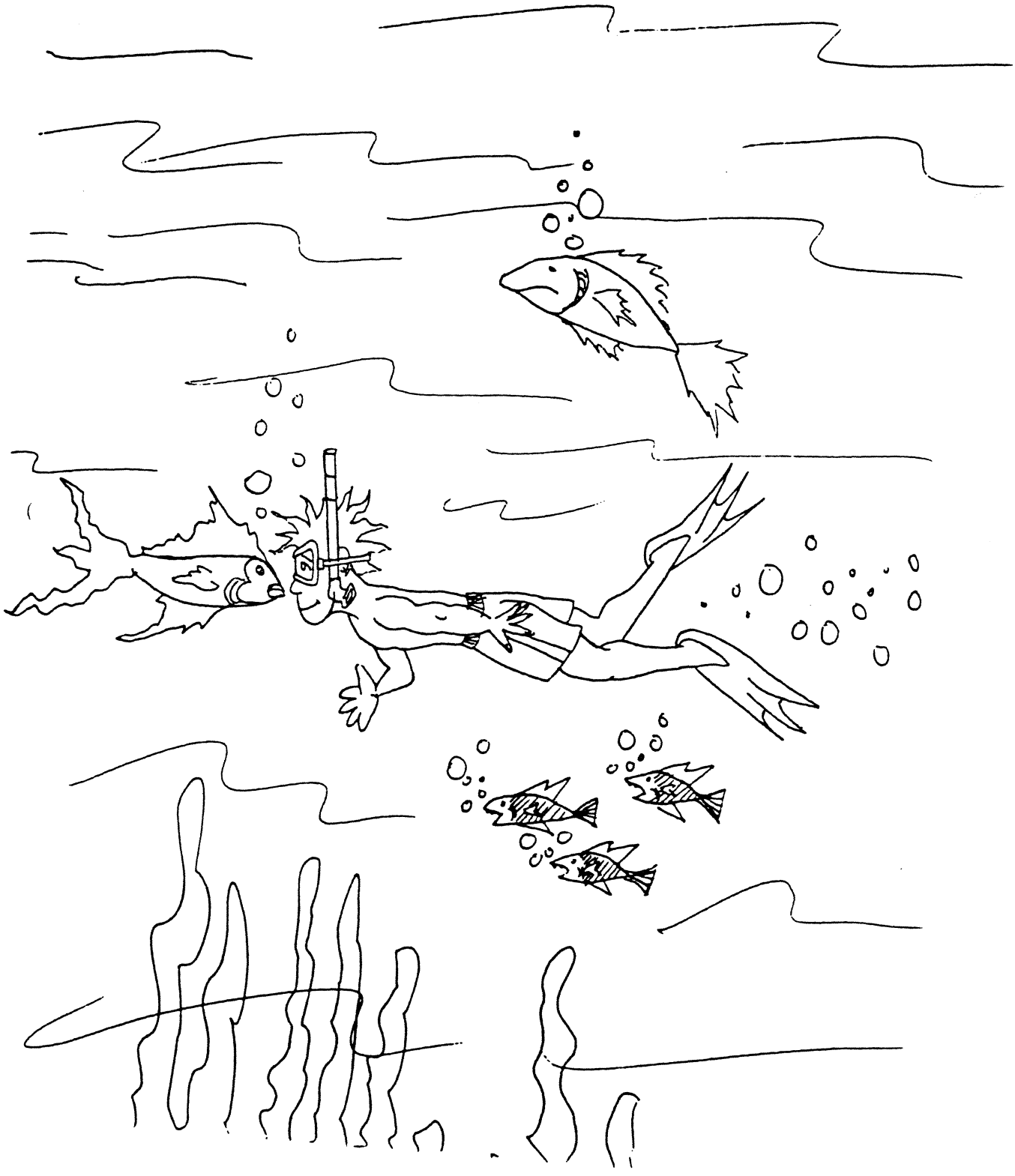
After lunch Aunt Sophie and I decide to dig for clams because we love to eat them. Clams are hard to find because they live in the sand. You must watch carefully for a squirt of water shooting up from the sand. This squirt of water tells you where to dig for that clam. I find the most clams! Super duper! I also find a starfish with five arms and lots of sea shells on the beach.

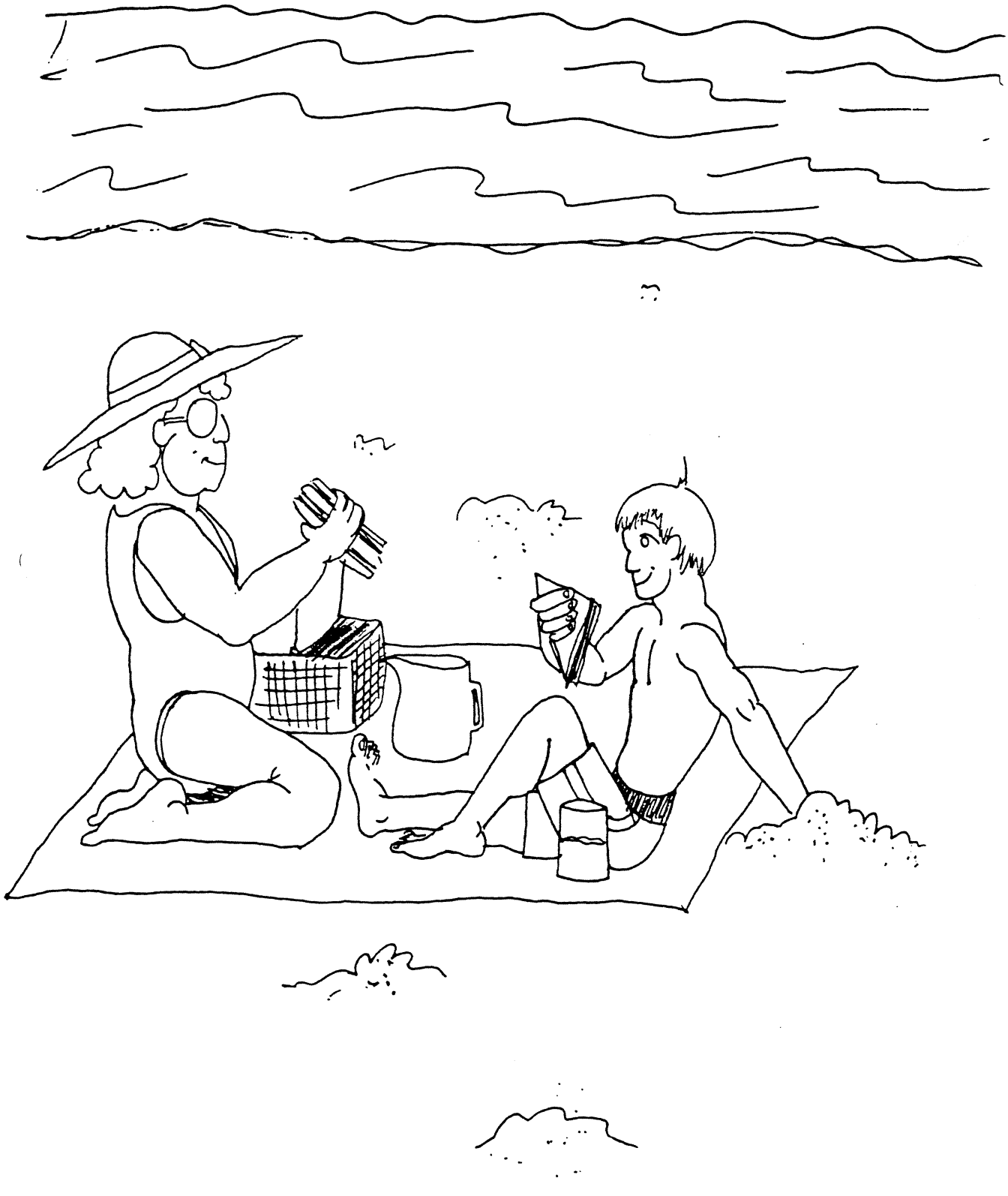
"Aunt Sophie, I think I'll give the starfish to my brother to keep and give the pink shiny seashell to my mother."

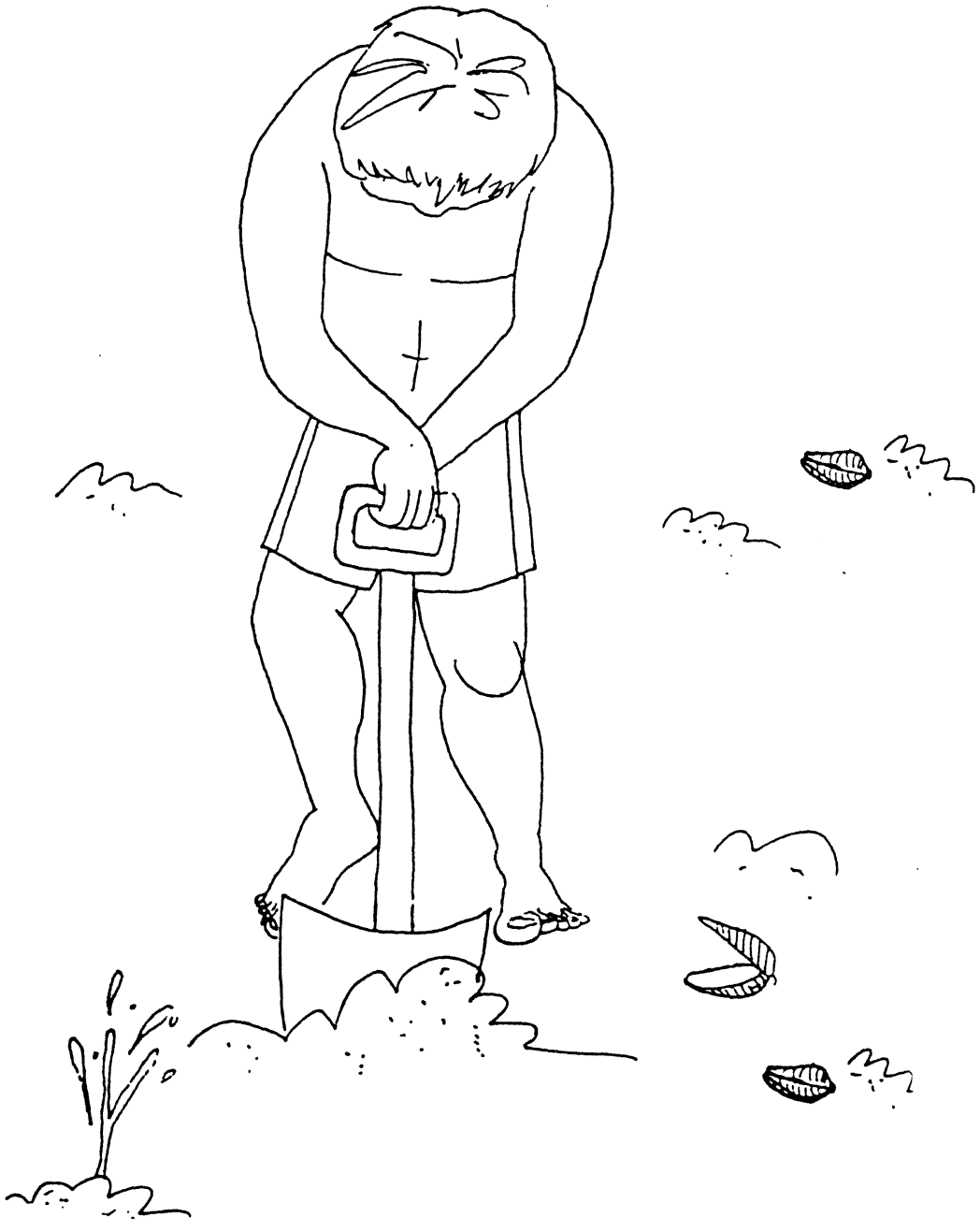
"What a wonderful idea," said Aunt Sophie. "It's been a super duper day at the beach, but it's time to go home now. We'll come back another day."

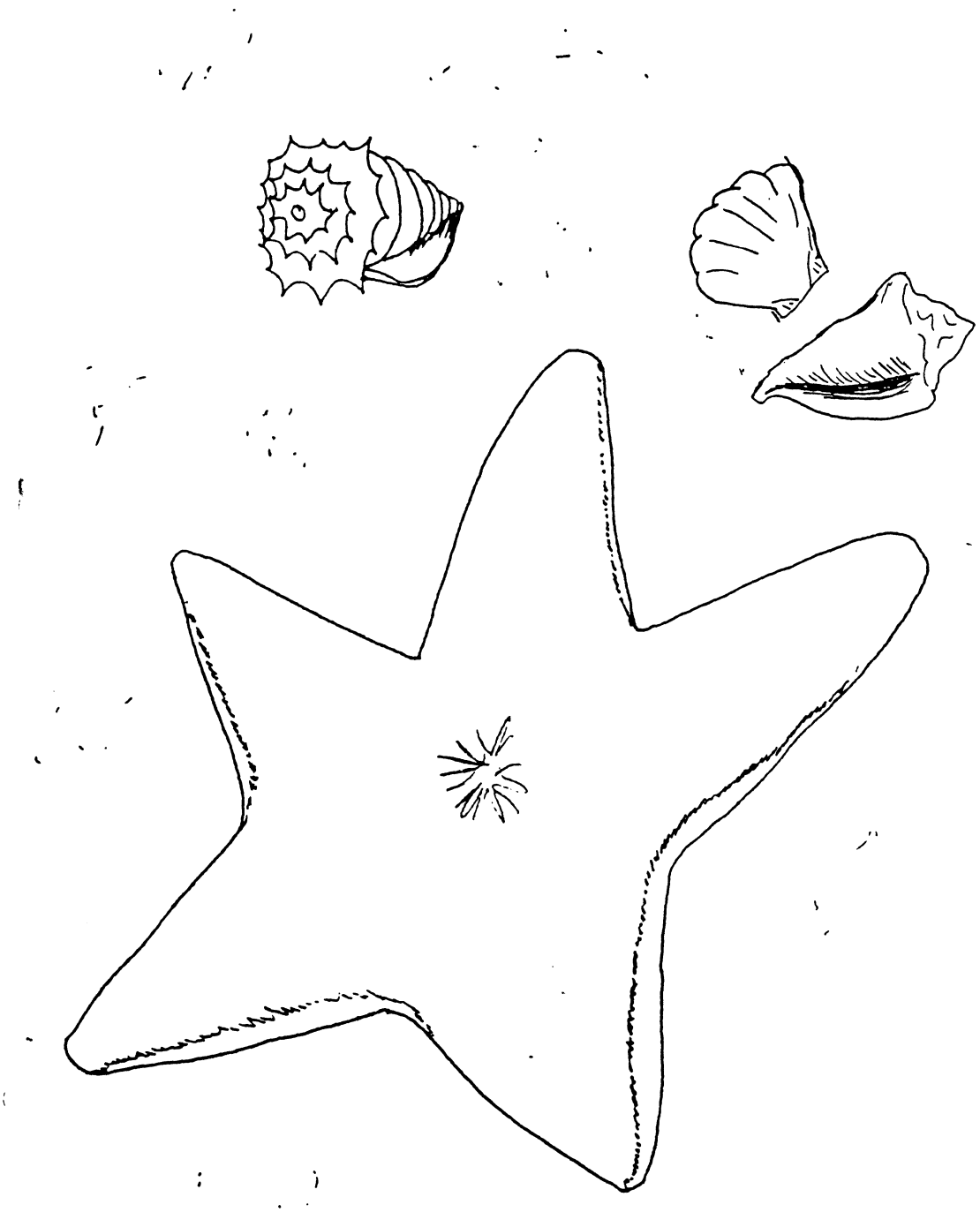
It had been a fun day at the beach. Next time we come, I'll find a shiny pink sea shell for my super duper Aunt Sophie.

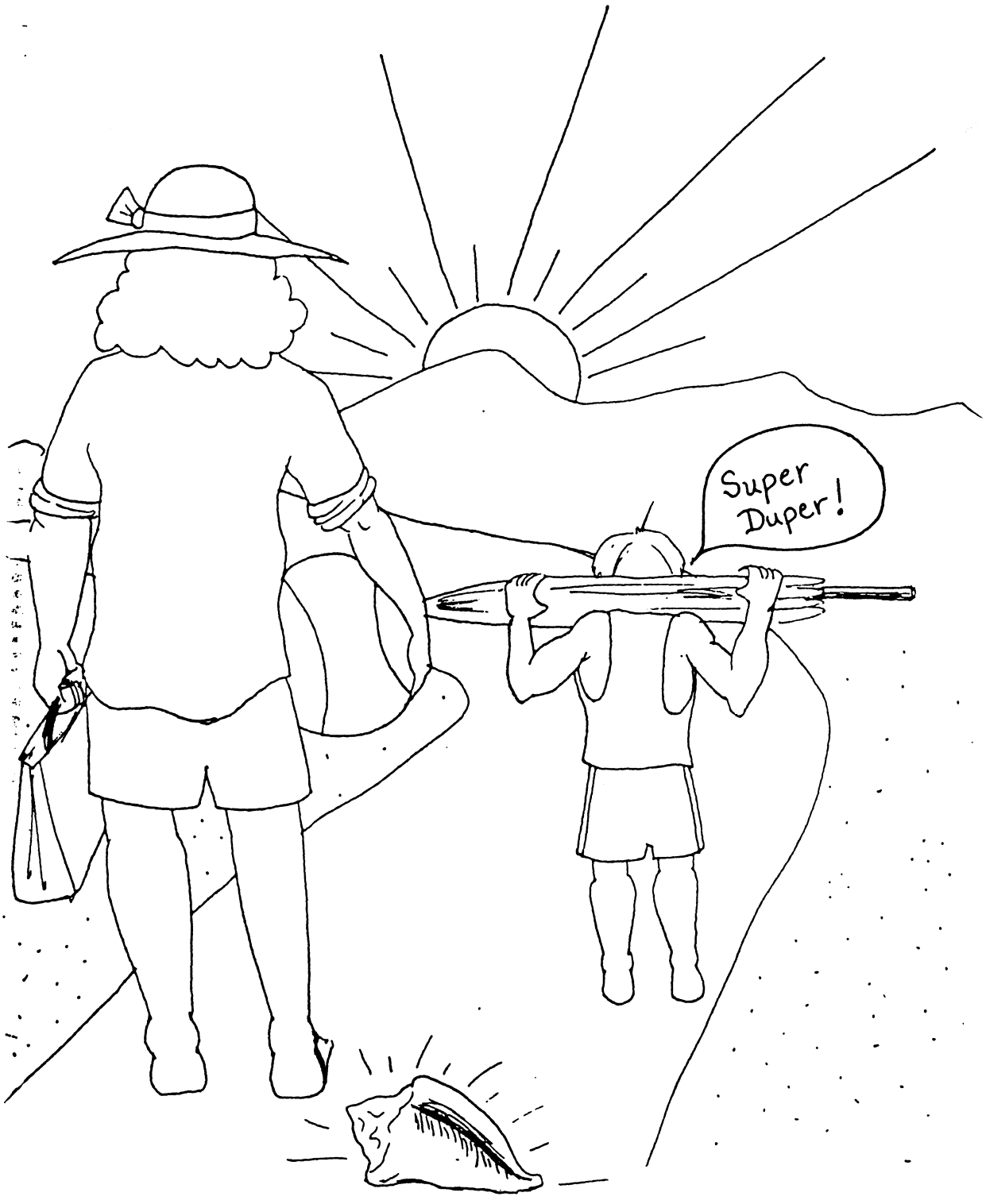











Super
Duper!

Appendix G
Lesson Plans

Session 1

Objectives	Methods
1. To introduce minimal minimal pairs.	1. Clinician will explain the concept of with the use of Tic Tak Talk Cards. (Communication Skill Builders)
2. Clients will produce target phoneme and its minimal pair	2. Clinician will play Bingo with Tic Tak Talk cards.
3. Clients will drive a car over the cards and produce the words as they drive over it.	3. Clinician will provide minimal pair cards and cars.

Session 2

1. Clients will produce target phoneme in words and repeat each 5 times.	1. Clinician will provide fishing activity.
2. Clients will find cards on the floor with a flashlight and repeat them 5 times using the carrier phrases: "I spy . . ." "I see . . ." "Look a . . ."	2. Clinician will provide cards and flashlight.

Session 3

1. Clients will toss bean bags on word cards and produce each word 5 times.	1. Clinician will provide bean bags and picture cards.
2. Clients will take cards from a lunch sack and say each word 5 times.	2. Clinician will provide sack and picture stimuli.

Session 4

1. Clients will repeat stimulus words 5 times after bowling.	1. Clinician will provide picture stimuli and bowling activity.
2. Clients will repeat stimulus words 5 times.	2. Clinician will provide picture stimuli and motivational elephant game.

Session 5

1. Clients will repeat stimulus words 5 times after a turn at a game.	1. Clinician will provide motivational game (Hi Ho Cherrio).
2. Clients will jump onto paper lily pads and repeat each word 5 times.	2. Clinician will set up frog pond to jump and provide picture stimuli.

Session 6

1. Clients will shop for stimulus words and repeat each word 5 times.	1. Clinician will set up store and provide picture stimuli.

The 2 boys became bored with shopping, so they played a matching game.

Session 7

1. Clients will play hide seek with items using carrier items. phrases: "I found. . ." "Look a . . ."	1. Clinician will provide picture stimuli.
2. Clients will construct a candy airplane, repeating each word 5 times to earn a piece of candy.	2. Clinician will provide candy and picture stimuli.

Session 8

1. Clients will repeat stimulus words 5 times each.	1. Clinician will provide a motivational game (Nerf basketball).
2. Clients will repeat stimulus words 5 times each.	2. Clinician will provide puzzles and picture stimuli.

Session 9

1. Clients will produce target phoneme and its minimal pair.	1. Clinician will play Bingo with Tic Tak Talk cards.
2. Clients will repeat stimulus words 5 times each.	2. Clinician will provide fishing activity.

Session 10

1. Clients will toss bean bags on word cards and produce each word 5 times.	1. Clinician will provide bean bags and picture cards.
2. Clients will repeat stimulus words 5 times each	2. Clinician will provide motivational game (Concentration)

Session 11

1. Clients will repeat stimulus words 5 times each.	1. Clinician will provide shopping activity.

Session 12

1. Clients will repeat stimulus words 5 times after bowling.	1. Clinician will provide picture stimuli and bowling activity.
2. Clients will repeat stimulus words 5 times each.	2. Clinician will provide motivational game (Candy Land).