COGNITIVE STAGE, CREATIVITY LEVEL, AND THE COMPREHENSION AND SELF-GENERATION OF HUMOR

by

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ABSTRACT

An investigation into the relationships among cognitive phase, creativity level, and humor comprehension and self-generation was conducted with seven year olds. Experiment I examined the importance of the degree of acquisition of concrete operational thinking in the comprehension of novelty and incongruity humor stimuli. Experiment II was an investigation of the role of high vs. low creativity in the production of novelty and incongruity humor.

The results of Experiments I and I and the correlational analyses comparing these two experiments indicated these conclusions: The degree of acquisition of concrete operational thinking was not significantly positively related to the comprehension of incongruity cartoons; creativity level was a better predictor of the ability to produce humor than level of cognitive development; and high generation scores tended to correspond to high comprehension scores.

INTRODUCTION

In the earliest attempts at investigation of children's humor, theory played a minimal role in guiding research, resulting in a lack of coordination among researchers with respect to the methods employed, variables studied, and interpretations drawn (McGhee, 1971a). Most of the investigations of children's numor responses were naturalistic observations of children in laughter-provoking situations, as opposed to experimental manipulations of variables to determine the cognitive structures operating in the perception of humor. Consequently, the understanding of the development of the humor response and its relationship to general cognitive development remained limited.

Only in the last decade has a developmental theory of cognitive humor emerged (McGhee, 1971a). McGhee uses the term "cognitive humor" to designate humor based on violations of expectation, as opposed to vicarious gratification of salient impulses wherein laughter serves as a socially acceptable outlet for aggressive or sexual tendencies, as proposed in the Freudian concept of tendentious humor. In cognitive humor, emotions are of minimal importance with the appreciation of the humor stimulus being primarily an intellectual function. Typically, according to McGhee, this type of humor is experienced as "clever," and results in a milder form of affective expression than tendentious humor.

One of the first cognitive theories of humor was the cognitive congruency principle advanced by Zigler, Levine, and Gould (1967). In an investigation of the role of cognition in the appreciation of humor,

Zigler, Levine, and Gould (1966) presented a series of cartoons to children in the second through fifth grades. The authors felt that since cognitive structures are still evolving in early childhood, the role of cognition should be most clearly demonstrated in children of this age. Children were asked to rate the cartoons as funny or not funny, and each child's facial mirth response was recorded for each cartoon. Comprehension scores were obtained by asking each child to explain why he rated each cartoon as he did, although it is not clear how such responses were categorized for statistical analysis. Based on the mean comprehension score for each grade, cartoons were ranked from least to most difficult. The authors found the level of difficulty of each cartoon to be consistent across grades. Zigler et al. (1966) found that for second grade subjects there was no clear association between difficulty level and facial mirth response. Either second grade children were responding to some aspect of the stimulus other than that judged to be correct by the investigators, or they found even the easiest cartoons beyond comprehension and were laughing because cartoons are supposed to be funny. For third and fourth graders, the easiest cartoons elicited the greatest facial mirth responses, and this was interpreted as an indication that the least difficult cartoons were still presenting a challenge to the cognitive abilities of subjects at these grade levels. For fifth graders, the authors noted that while children's comprehension scores were increasing and they were laughing at more difficult cartoons, mirth responses to the easier cartoons decreased dramatically between the fourth and fifth grades. The authors explained this bridge between comprehension and appreciation as

cognitive congruency, meaning that stimuli at the upper limit of the individual's cognitive abilities should require greater effort in comprehension, and therefore result in greater pleasure upon mastery (Zigler et al., 1967).

McGhee (1971a) noted that as a measure of appreciation, a facial mirth response may not be as acceptable as a funniness rating, since the child's overt facial response may be inhibited by anxiety produced by the unfamiliar experimental setting or enhanced by the social demand characteristics of the same setting. According to McGhee, the laughter evoked by a humor stimulus does not reflect a humor response until the child has acquired certain conceptual capacities. Prior to the onset of conceptual thought, characteristic of the pre-operational stage of cognitive development in the Piagetian theoretical framework, expectancy violations are experienced simply as novel. In order to perceive these stimuli as humorous the child must realize they are, in addition to being novel or different, impossible. According to McGhee (1972), the child must engage in a process of "fantasy assimilation" in order to perceive a novel stimulus as humorous. During this process of fantasy assimilation, those aspects of the stimulus which are discrepant to the child's expectation are compared to the relevant cognitive concept or schema. If the child is able to determine exactly how the novel stimulus has violated a cognitive concept or rule, then no change in the relevant conceptual category is required in order to assimilate the stimulus. That is, accommodation of the schema is not required in order to incorporate the novel stimulus into that schema. Instead, the child can assimilate the stimulus in a pretend or fantasy

manner, without having to alter the violated schema so that the novel stimulus will fit.

In order for fantasy assimilation of a novel stimulus to occur and result in a humor response, the child must feel confident that the inconsistency presented can not really happen. For example, when presented with a cartoon depiction of an elephant sitting in a tree, the child will not emit a humor response unless he is certain that this event could not happen in reality. If the child can locate the source of expectancy violation as the depiction of elephants as tree-climbers or tree-dwellers and is confident in his concept of "elephant" as a ground-dweller incapable of tree-climbing, then this particular inconsistency will require no accommodation of the schema "elephant" to the new information presented in the cartoon, and may thereby result in a humor response. If, however, the child is not certain of the impossibility of the event depicted, he will engage in the Piagetian process of "reality assimilation." The child will first attempt to assimilate or incorporate the new information into the relevant schema without modifying the schema. If the new information is too discrepant to fit, the schema must be altered to accommodate that information. When a balance between assimilation and accommodation has been achieved, there is a state of equilibration between the child's cognitive schema and the real world event. It is this entire process of arriving at equilibration as a means of elimination of discrepancy that McGhee (1972) calls "reality assimilation."

In summary, there are two alternative processes available to the child in order to resolve a discrepancy between expectation and

reality. If the child is not certain that the depicted event is impossible, he will engage in reality assimilation, altering his cognitive schema to the extent necessary to incorporate the new information. This process of reality assimilation will not result in a humor response. If the child is confident that the depicted event could not really happen, then the method by which a rule has been violated is assimilated into the relevant schema without modifying that schema. If the child engages in this process of fantasy assimilation, a humor response is made possible through his understanding of how a rule was violated in a pretend manner. As noted by McGhee (1972), fantasy assimilation is necessary but not always sufficient for the occurrence of a humor response. Even though a child is engaged in the fantasy assimilation of a novel stimulus, an overt humor response may not occur without external cues indicating the appropriateness of laughter. However, given that fantasy assimilation has occurred, the potential for laughter exists.

During the preoperational period of cognitive development, the child's conceptual thinking is limited to symbolic visual representations as his confidence and mastery of his environment and his language mastery increase. During this period of cognitive development, identification of humor in stimulus discrepancy is restricted to stimuli that are perceptually discrepant. Since the preoperational child relies on visual images to test the real world against his conception of the real world, stimuli which show no perceptual inconsistency with the child's prior knowledge will result in reality assimilation, thus precluding a humor response. A child at this phase of cognitive development will

be able to fantasy assimilate an elephant sitting in a tree by constructing a symbolic visual representation of the event, whether it is presented as a cartoon or verbal joke.

With the beginning of the concrete operational period, the child becomes increasingly more capable of logical thinking in concrete situations. This period of concrete operations is marked by the acquisition of logical rules of conservation. The child demonstrates an increasing understanding of quantitative equality of an object through various transformations of two or more physical dimensions simultaneously. Thus, a plasticine ball will contain the same amount of plasticine, will weigh the same amount, and will displace the same amount of water after it is flattened into a thinner but wider pancake, as long as none of the plasticine is removed in the process. With this new understanding, the child is able to transcend his exclusive reliance on visual representation of information, and a new source of humor becomes available to him. Stimulus discrepancies need no longer be physically or perceptually discrepant. For the concrete operational child, humor potential exists in the identification and fantasy assimilation of violations of logical rules (McGhee, 1972). For example, a concrete operational child will be able to identify the violation of the rule of conservation of quantity when Fat Ethel asks the waitress to cut her whole cake into four pieces instead of eight because she is on a diet. The preoperational child by contrast will construct an image of a fat lady eating cake, not at all inconsistent with his concept of "fat."

McGhee (1971a, 1971b) felt that the Zigler et al. studies failed to specify how the cognitive demands of the humor stimuli

differed across the various levels of difficulty and how subjects in different grades vary with respect to their cognitive abilities. For this reason, and because McGhee felt that the studies defining cognitive capacity in terms of scores on standard measures of intelligence were contaminated with inherent methodological weaknesses, the author chose to define cognitive ability in terms of scores obtained on Piagetian tasks of conservation. Subjects in the study were five, seven, and nine year old boys. Elkind's (1961a, 1961b) procedures for the administration of conservation of mass and lateral discrimination tasks, in addition to a class inclusion task were used to determine the degree of acquisition of concrete operational thought (McGhee, 1971b).

McGhee was concerned with the importance of the degree of acquisition of concrete operational thinking in the comprehension and appreciation of both novelty and incongruity humor. Novelty humor was defined as representing perceptual discrepancy with respect to previous experience. As an example of novelty humor, one cartoon used in the McGhee investigation to depict novelty humor showed a very large dog fetching a normal-size car complete with human occupants, as the dog's owner sat watching from his lawn chair. Incongruity humor, by contrast, was defined as representing abstract logical discrepancies without physical violations of expectation. An example of this type of humor may be seen in the joke about the woman who bought dog shampoo because it was on sale, and then had to buy a dog to use up the soap.

McGhee's general hypothesis was that concrete operational thinking is necessary for comprehension of incongruity humor but not for novelty humor. McGhee felt that a preoperational level of functioning

would be sufficient for the comprehension of novelty humor, so that preoperational and concrete operational children should not differ with respect to this type of humor. If the acquisition of logical thinking were important for the understanding of incongruity humor, then for seven year olds in a state of transition between preoperational and concrete operational thinking, the degree of acquisition of logical thought would be positively related to the ability to comprehend incongruity humor (McGhee, 1971b).

McGhee used two different methods of assessing humor comprehension: subjects' explanations for why the stimuli were funny, and the subjects' abilities to remove the humorous aspect of each stimulus. McGhee felt that true comprehension would allow subjects to reverse the cognitive input by removing the humorous elements without changing the whole cartoon. This prediction was made for incongruity humor only, since the perception of novelty humor does not require logical thought capacities. McGhee felt that since most seven year olds are in a transitional phase between preoperational and concrete operational thinking, this age group would provide the critical test of the above predictions (McGhee, 1971b).

McGhee found that for seven year olds, the degree of acquisition of concrete operational thought was not related to the perception of novelty humor, but was significantly related to the ability to understand incongruity humor. Statistical analysis demonstrated that in no case did similar correlations for five and nine year olds reach significance. McGhee also noted that more cognitively advanced seven year olds gave significantly more interpretive explanations for incongruity

humor, as opposed to the descriptive explanations of the less cognitively advanced seven and five year olds. This finding did not hold for novelty humor. There were also no significant relationships at any age level between the level of cognitive development and the children's appreciation of humor, as measured by funniness ratings. McGhee interpreted this finding as a disconfirmation of Zigler et al.'s cognitive congruency principle, since this principle should most clearly be demonstrated in humor based on violations of cognitive expectations were it a genuine phenomenon (McGhee, 1971b).

In a review of the literature on children's humor, McGhee (1974a) notes that there has been a dearth of research on the creative aspect of children's humor. McGhee calls this lack surprising, since young children frequently generate humor in their social interactions. Among the questions yet unanswered with respect to children's self-generation of humor are whether some necessary level of cognitive functioning must be achieved before a child is capable of creating humor, whether the same cognitive structure utilized in the perception of other-initiated humor is needed in self-generation of humor, and whether different types of humor require different levels of cognitive development for self-generation to be possible (McGhee, 1974a).

The present study employed a Piagetian theoretical framework in an attempt to investigate the relationships between the cognitive structures mediating the comprehension and self-generation of humor. Of particular interest was the relationship between scores obtained on a standard measure of creativity and preoperational, transitional, and concrete operational children's abilities to create humor. If tests of

creativity are measures of some concept other than general intelligence, then it was expected that scores on creativity tests would prove to be better predictors of the ability to create humor than level of cognitive development. Given that the same cognitive structures operate in both the comprehension and self-generation of humor, then level of cognitive development should be as reliable a predictor of a child's ability to create humor as his level of creativity.

Experiment I represents a replication of McGhee's (1971b) investigation into the relationship between cognitive stage and humor comprehension. In the present study, however, all subjects were seven years old to avoid any possible confounding of age and stage, and because seven years is the expected age in Piagetian theory for transition into concrete operational thought. Seven years is also the only age for which McGhee (1971b) expected and obtained specific relationships between cognitive level and humor comprehension.

In the present study, all humor stimuli were presented in cartoon form. Novelty humor was specifically defined as the presentation of events that are physically discrepant to past experience and expectation. This discrepancy is immediately visually apparent, whether the cartoon is captioned or not. For example, one of the novelty cartoons used in this study showed an elephant sitting in a tree, with no apparent explanation of how that event came to be. The departure from expectation is immediately obvious: the elephant should be on terra firma, not in the tree. Incongruity cartoons, however, were much more dependent upon the presence of a caption to convey the nature of the expectancy violation. For these cartoons, no apparent

physical violation occurs. Instead, the violation of expectation occurs in the form of abstract logical discrepancies. Rather than depicting physical impossibilities in terms of the relationships between objects or events as did novelty cartoons, incongruity cartoons portrayed the juxtaposition of impossible or incompatible ideas. As an example, one of the incongruity cartoons depicted a woman being physically restrained by firemen as she watched the fire in her house being extinguished. The caption for this cartoon read: "The phone is ringing ... let me go ... I have to answer the phone" (after McGhee, 1971b). In this example, the source of humor lies in the incompatibility of the house on fire-answer the phone themes, as opposed to any salient violations in terms of physical-perceptual expectancy.

In Experiment I, it was hypothesized that the degree of acquisition of concrete operational thinking would be an important factor in the comprehension of incongruity cartoons, but not novelty cartoons. Specifically, both transitional and concrete operational children were expected to perform equally well in the comprehension of novelty cartoons, but concrete operational children should demonstrate superior performance in the comprehension of incongruity cartoons, since these incongruity stimuli require the acquisition of logical thinking.

Experiment II represents an extension of the methods outlined by McGhee (1971b) to an investigation of children's ability to create humor. The relationships between cognitive development and level of creativity as predictors of performance in a humor self-generation task were the foci of this experiment. Since creativity and general intellectual functions are believed to involve some separate processes, it

was expected that level of creativity would be a better predictor of performance on a humor creativity task than level of cognitive development.

METHOD

Subjects

All subjects were seven year old second grade students attending public elementary schools in middle class neighborhoods in Tucson, Arizona. The original subject pool consisted of ninety-two children for whom parental consent to participate in this study had been obtained. No attempt was made to control for sex or ethnic heterogeneity of subjects, and as a result of the coding system used to protect the anonymity of subjects, no statement about the subject sample composition with respect to these two variables can be made.

Procedure

From the original sample of ninety-two children, sixty were selected to participate in this study on the basis of their scores on a test of creativity and a test of Piagetian cognitive development. Since only ten children obtained cognitive scores on the Piagetian tasks placing them in the preoperational phase, these children were eliminated from the subject pool. The remaining eighty-two children comprised two groups of fifty-two transitional subjects and thirty concrete operational subjects. Within each of these groups, the fifteen highest and lowest scoring children on the test of creativity were selected to participate in this study. The final subject sample consisted of sixty children, fifteen in each of the following groups: transitional high creatives; transitional low creatives; concrete operational high

creatives; and concrete operational low creatives (Trans.-hi C, Trans.-low C, Concrete-hi C, and Concrete-low C, respectively).

Subjects were divided into four experimental groups (Trans.-hi C, Trans.-low C, Concrete-hi C, and Concrete-low C) on the basis of their scores on the Torrance Tests of Creative Thinking Figural Form B Circles Test (CIRCLES TEST) and a set of Piagetian tests of cognitive development. The CIRCLES TEST was administered to all subjects in groups of fifteen according to the directions and instruction set given in the test manual (Torrance, 1974a). Subjects were seated a desk apart to minimize copying. Each child was given a pencil with an eraser and a mimeographed copy of the CIRCLES TEST.[1] The CIRCLES TEST was administered by the same experimenter to all subjects in the first of two sessions with subjects. The CIRCLES TEST consists of thirty-six circles, each one inch in diameter, presented on two pages in the test booklet. On the first page are six circles in two rows of three each, along with the instructions for the test. The second page contains thirty circles in six rows of five each. Subjects are instructed to construct as many different objects as they can in ten minutes, using as many of the circles as they can (Torrance, 1974a). Because of the time constraints imposed by the classroom teachers, the entire battery of the Torrance Tests of Creative Thinking could not be used. The CIRCLES TEST was selected to assess creativity because it was consistent with the humor stimuli in the sense that both were visual presentations,

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1. Written permission to reproduce the Torrance Tests of Creative Thinking Figural Form B Circles Test was obtained from Torrance (1974a).

and because the CIRCLES TEST demonstrated both the highest intercorrelations with the other subtests and the highest degree of interscorer reliability (Torrance, 1974b; Yamamoto, 1964).

Following the administration of the CIRCLES TEST, subjects were randomly assigned to one of five experimenters (four female and one male college students). Once assigned to a specific experimenter for the Piagetian tasks in session two, the same experimenter continued to administer all subsequent tasks in Experiment I and Experiment II within the second session. Experimenters were kept naive of the purposes and hypotheses of this study.

At the beginning of the second session with subjects, four Piagetian tasks were administered individually to each child in sequence: a conservation of mass task, a conservation of weight task, a lateral discrimination task, and a class inclusion task. The first three tasks were administered according to the procedures provided by Elkind (1961a, 1961b). For the conservation of mass and weight tasks, Playdoh, a malleable clay compound, was used. For the conservation of mass, the subject was given a lump of Playdoh and asked to divide it into two balls, each containing the same amount of clay. When the subject had done so, he was asked if he was sure each ball had the same amount of clay. The subject was allowed to manipulate the clay balls until he was certain that both contained the same amount of Playdoh. The subject was then asked whether the two balls would still have the same amount of clay if one were rolled into a sausage shape (prediction response). Upon responding, one of the balls was rolled into a sausage by the experimenter, and the subject was asked whether the two balls

still contained the same amount of clay now that one was a sausage (judgment response). The subject was then asked to explain his judgment response (explanation response). For each correct prediction, judgment, and explanation response, one point was available for a total of three points. For the conservation of weight task, a similar procedure was followed. The subject was again given a lump of Playdoh, and was asked to make two balls that weighed the same according to his own judgment. Each subject was asked to predict, judge, and explain the weight of the two balls according to the same procedure used for the conservation of mass task. Again, each response was worth one point for a total of three points.

For the lateral discrimination task, subjects were required to distinguish between their own right and left, the experimenter's right and left, and right and left for two objects from opposite sides of the table upon which the objects were placed. The lateral discrimination task yielded a total of four responses each worth one point. The class inclusion task was worth one point for correctly responding that there were more wooden beads than red beads on a string containing six red wooden beads and four white wooden beads. The total number of points possible based upon the total number of correct responses across the four Piagetian tasks was eleven. A score of zero to three points indicated preoperational thought, between four and nine points indicated transitional thought, and a score of ten or eleven points placed the subject in the concrete operational stage.

Interscorer reliability was assessed for the CIRCLES TEST through the random selection of twenty protocols for independent scoring by two judges. Pearson's r was carried out for Fluency (r =

+1.00), Flexibility (r = +.98), Originality (r = +1.00), and Elaboration (r = +.99). Fluency, Flexibility, Originality, and Elaboration raw scores were converted to T-scores based on all sixty subjects, and for each subject a composite mean T-score was obtained across all four CIRCLES TEST response categories. Mean T-scores for the CIRCLES TEST for the four experimental groups were: Trans.-hi C $\bar{X}$ = 59 (SD = 4.56); Trans.-lo C $\bar{X}$ = 41 (SD = 3.37); Concrete-hi C $\bar{X}$ = 59 (SD = 4.67); Concrete-lo C $\bar{X}$ = 46 (SD = 5.25).

Interrater reliability was assessed for the Piagetian tests through the random selection of fifteen protocols scored by two independent judges. Pearson's r was computed for subjects' total scores across all four tests of cognitive development (r = +1.00). Group means for Piagetian total scores were: Trans.-hi C $\bar{X}$ = 7.20 (SD = 1.47); Trans.-lo C $\bar{X}$ = 7.26 (SD = 2.50); Concrete-hi C $\bar{X}$ = 10.33 (SD = 0.49); Concrete-lo C $\bar{X}$ = 10.33 (SD = 0.49). Group means for age were: Trans.-hi C $\bar{X}$ = 7 yrs 9 mos (SD = 2.12 mos); Trans.-lo C $\bar{X}$ = 7 yrs 8 mos (SD = 2.69 mos); Concrete-hi C $\bar{X}$ = 7 yrs 9 mos (SD = 1.97 mos); Concrete-lo C $\bar{X}$ = 7 yrs 9 mos (SD = 1.66 mos).

Experiment I

A test of humor comprehension was administered to each subject individually in session two immediately following completion of the Piagetian tasks. Ten cartoons, each 8" x 10" and mounted on posterboard served as the humor stimuli. All cartoons were black line drawings on a white background. Cartoons were selected from children's books and magazines and other cartoon books. All ten cartoons in the

comprehension test were captioned. Five of the cartoons portrayed novelty humor and five portrayed incongruity humor (see Figures 1 and 2 for examples).

The experimenter first introduced herself/himself and spent a few minutes establishing rapport with the subject, who was seated across from the experimenter at a low table. Upon completion of the Piagetian tasks, each subject was told that the experimenter was interested in what the children think of different kinds of cartoons, so he would be shown some cartoons and then asked to tell why they were funny. The captioned cartoons were presented in an independent random order for each subject for the test of humor comprehension. The following instruction set was used:

> (Child's name), I'm going to show you some cartoons now, and after you see each cartoon I will ask you if you think it is funny. Then I will ask you why you think it is funny and how you could change it so it would not be funny any more. Do you understand what we're going to do?

At this time, the first cartoon was presented and the caption was read to the subject. After responding as to whether the cartoon was funny, the following instructions were repeated:

> What is it about this cartoon that makes it a cartoon instead of just an ordinary picture? What makes this cartoon funny? (After McGhee, 1971a).

The experimenter immediately recorded the subjects verbatim response, which was later rated on a scale of one to four by two independent judges as follows: 1 = no response, or responses mentioning only congruous aspects of the stimulus; 2 = responses mentioning the discrepancies only in the process of a general description of the stimulus, or responses mentioning discrepancies only in minor aspects

Figure 1. An Example of a Novelty Comprehension Cartoon from Experiment I -- From Zeis (1960).

Figure 2. An Example of an Incongruity Comprehension Cartoon from Experiment I -- From Thurber (1943).

of the stimulus; 3 = identification of the main point only; and 4 = identification of the main point with an account of why the situation pointed out made the cartoon funny (McGhee, 1971a).

After the subject reported why he thought the cartoon was funny, he was asked to remove the humor with the following instructions:

> How could you change this cartoon so that it would be just an ordinary picture? How can you make this cartoon not funny any more? You don't have to change the whol cartoon, just the part that makes it funny (after McGhee, 1971a).

Responses were again recorded verbatim, for later coding as successful or unsuccessful. A score of one point was given for each successful response, indicating that the subject removed the humor element without changing the whole cartoon. A score of zero indicated an unsuccessful response. A composite comprehension score was obtained for each subject for novelty cartoons, and another such score was obtained for incongruity cartoons by computing the mean T-score of the two rating scales across all five cartoons within the novelty and incongruity categories. Pearson r calculated for total comprehension scores across novelty and incongruity cartoons using fifteen randomly selected protocols yielded an interrater reliability of +.94.

Experiment II

Immediately following the presentation of the cartoons for the comprehension test, ten new and uncaptioned cartoons were presented in an independent random order for each subject in the humor self-generation test. As in Experiment I, there were five novelty and five incongruity stimuli, also 8" x 10" and mounted on posterboard. These cartoons were also black line drawings on white backgrounds (see

Figures 3 and 4). The following instruction set was delivered upon presentation of the humor self-generation task:

> O.K. (child's name), we just looked at some cartoons, and you told me how funny you thought they were. Now we're going to play a game. Do you remember how the cartoons we just saw had a title written across the bottom like this one? (demonstrating the presence of the caption on one of the comprehension cartoons). Now I'm going to show you some more cartoons, but these don't have any words. When you see the cartoon, I'll give you some time to think and then you can tell me your own funny title. The object of the game is to make up the funniest title you can. Are you ready to start?

The experimenter recorded the subject's verbatim response, for later coding on appropriateness and originality by two independent judges. In scoring each response for appropriateness, a three point rating scale was used: 0 = no response, or a response unrelated to the events portrayed in the cartoon; 1 = a response which is appropriate to the cartoon, but purely descriptive of the events portrayed; 2 = an appropriate response which gives an interpretive or explanatory account of the events portrayed. Appropriateness of a response was determined by the judge's ability to relate the response to the cartoon. Originality of responses was determined using Torrance's (1974a) statistical uniqueness method: 0 = responses with a frequency of 10% or more; 1 = responses with a frequency of 5-9%; 2 = responses with a frequency of 2-4%; 3 = responses with a maximum frequency of 1%. A composite generation score was obtained for each subject for novelty and incongruity cartoons in a manner similar to the procedure used in Experiment I. Mean T-scores were obtained for novelty and incongruity across appropriateness and originality total scores across all five cartoons within each category of novelty and incongruity. Pearson r calculated

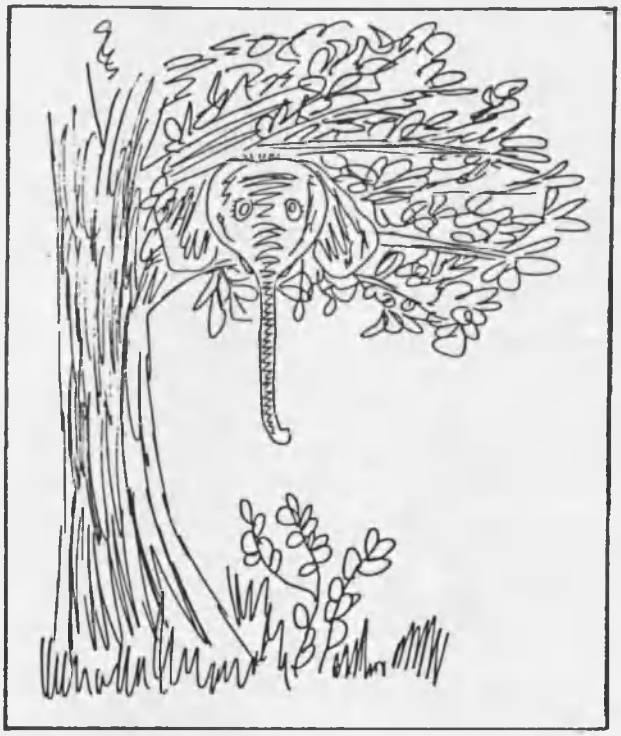

Figure 3. An Example of a Novelty Generation Cartoon from Experiment II

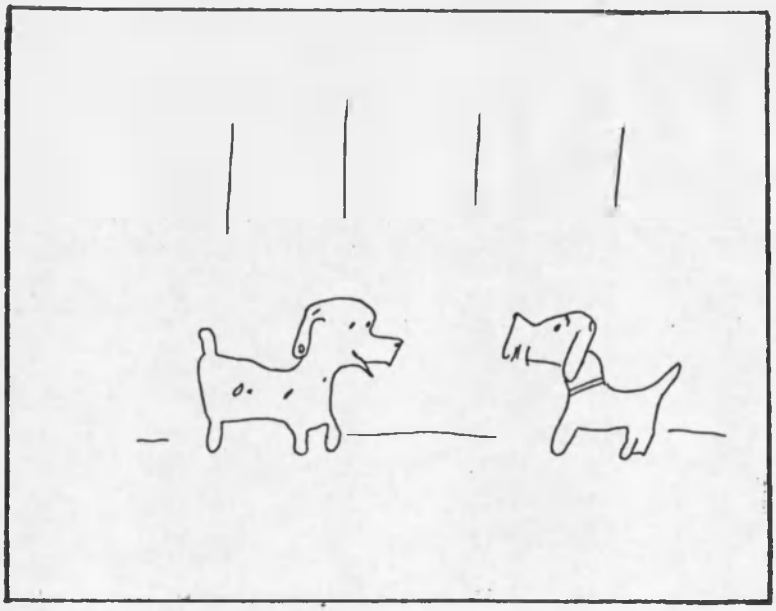

Figure 4. An Example of an Incongruity Generation Cartoon from Experiment II -- From Thurber (1943).

for total generation scores across novelty and incongruity cartoons for fifteen randomly selected protocols indicated an interrater reliability of +.95.

RESULTS

Experiment I

Subjects' composite comprehension socres for novelty and incongruity cartoons were compared, using a mixed design 2 x 2 x 2 (cognitive phase x creativity level x humor type) analysis of variance. The results are presented in Table 1. There is no evidence to support the hypothesis of stage trends in the comprehension of novelty and incongruity humor. The only significant main effect obtained was humor type ($F = 62.46$, df 1/56, $p < .001$), indicating that novelty cartoons differed from incongruity cartoons as determined by subjects' performance. Subjects demonstrated greater comprehension of novelty than incongruity cartoons.

Table 1 also shows a significant interaction between cognitive phase and level of creativity ($F = 4.83$, df 1/56, $p < .05$). It was hypothesized that the performance of concrete operational children would surpass that of transitional children regardless of subjects' creativity levels. However, the interaction between cognitive phase and creativity level indicated that the best performance in the comprehension of novelty and incongruity humor was demonstrated by children in the concrete operational-low creative group. The lowest performance was exhibited by the concrete operational-high creative group. For transitional children, this trend was reversed, with those subjects with high creativity scores performing better on the comprehension task than the low creative subjects (see Figure 5).

Table 1. A Summary of the Analysis of Variance in Experiment I (N = 60)

Source	df	SS	F	p
Cognitive Stage	1/56	.00	.00	--
Creativity Level	1/56	17.63	.19	--
Humor Type	1/56	3224.03	62.46	<.001
Cognitive Stage x Creativity Level	1/56	440.83	4.83	<.05
Cognitive Stage x Humor Type	1/56	172.80	3.35	--
Creativity Level x Humor Type	1/56	86.70	1.68	--
Cognitive Stage x Creativity Level x Humor Type	1/56	30.00	.58	--

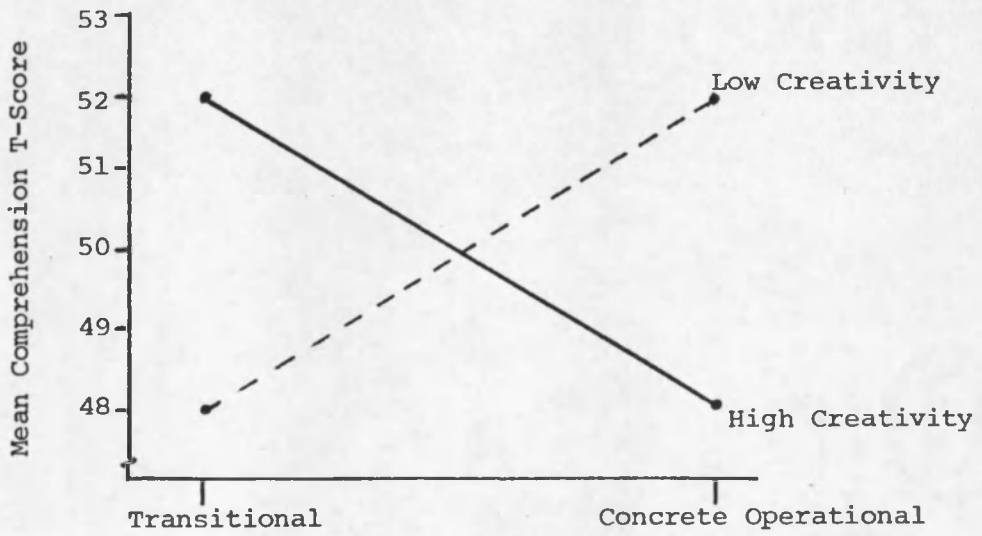

Figure 5. Cognitive Phase x Creativity Level Interaction in Experiment I ($p < .05$)

Application of the Newman-Keuls procedure (Myers, 1972) to this interaction revealed no significant mean differences.

No other main effect or interaction approached significance. As hypothesized, creativity level did not significantly affect performance. Both high and low creative subjects demonstrated better comprehension of novelty cartoons than incongruity cartoons. Although not significant ($p < .10$), this interaction does indicate a trend: whereas high creatives performed better than the low creatives on the incongruity humor task, the opposite is true for novelty cartoons.

Contrary to expectation, the interaction between cognitive stage and humor type indicates better performance for transitional children on novelty comprehension than for concrete operational children. It was hypothesized that concrete operational children would demonstrate greater understanding of incongruity stimuli than transitional subjects, but transitional children's performance surpassed the concrete operational children's for both novelty and incongruity, although this interaction did not approach significance ($p < .20$).

The cognitive stage x creativity level x humor type interaction, although not significant ($p > .25$), is of interest. As hypothesized, there is no apparent difference between high and low creative children within a given cognitive stage in comprehension of novelty cartoons. Similarly, level of creativity within a cognitive stage appears to be unrelated to comprehension of incongruity stimuli. Contrary to expectation, concrete operational children failed to demonstrate superior comprehension of incongruity cartoons as compared to transitional subjects. Instead, all subjects tended to perform better on the

comprehension of novelty cartoons that incongruity cartoons as shown in Figure 6. In summary, there does not appear to be any support for the hypothesis of stage trends in the comprehension of novelty and incongruity humor.

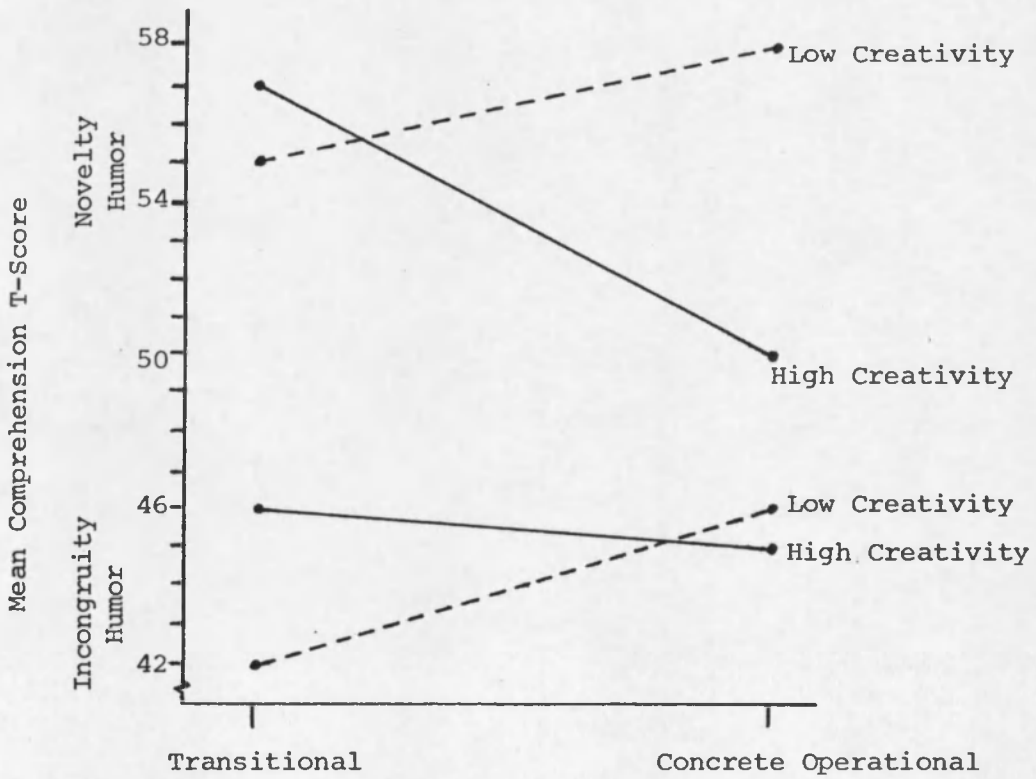

Figure 6. Cognitive Phase x Creativity Level x Humor Type Interaction in Experiment I (N.S.)

Experiment II

Subjects' composite generation scores for novelty and incongruity cartoons were compared, using a mixed design 2 x 2 x 2 (cognitive phase x creativity level x humor type) analysis of variance. The results are presented in Table 2. Results indicate some support for the hypothesis that highly creative children would demonstrate superior performance on a task of humor production than low creative children. There was no evidence for cognitive stage trends in the self-generation of novelty and incongruity humor, and there were no significant main effects.

Table 2. A Summary of the Analysis of Variance in Experiment II (N = 60)

Source	df	SS	F	p
Cognitive Stage	1/56	3.33	.04	--
Creativity Level	1/56	120.00	1.41	--
Humor Type	1/56	40.83	1.31	--
Cognitive Stage x Creativity Level	1/56	45.63	.53	--
Cognitive Stage x Humor Type	1/56	34.13	1.10	--
Creativity Level x Humor Type	1/56	182.53	5.86	<.025
Cognitive Stage x Creativity Level x Humor Type	1/56	24.30	.78	--

The only significant interaction obtained was the creativity level x humor type interaction ($F = 5.86$, df 1/56, $p < .025$). Figure 7 shows that highly creative subjects exhibited superior performance on the incongruity humor production task as compared to low creative subjects' performance on the same task. There is little difference between high and low creative subjects on the generation of novelty humor task, with low creative children performing better than high creatives. Application of the Newman-Keuls test (Myers, 1972) to this interaction indicated three significant mean differences. Low creative subjects' performance on the self-generation of incongruity humor ($\bar{X} = 47.33$, SD = 7.20) was significantly poorer than their performance on the novelty generation task ($\bar{X} = 50.97$, SD = 7.46), and than high creative subjects' performance on both novelty ($\bar{X} = 50.50$, SD = 8.10) and incongruity ($\bar{X} = 51.80$, SD = 7.46) self-generation. Significance was not obtained for the differences in mean performances of high and low creatives on the novelty generation task ($\bar{X} = 50.50$, SD = 8.10; $\bar{X} = 50.97$, SD = 7.45 respectively).

The non-significance of the cognitive phase x creativity level x humor type, the cognitive phase x creativity level, and the cognitive phase x humor type interactions lends support to the hypothesis that a child's cognitive development would not be as important a factor in determining success in a humor creativity test as his score on a standard test of creativity. Although these three interactions did not approach significance, some performance trends are of interest. Regardless of cognitive stage, highly creative subjects tended to perform better in the self-generation of humor than low creative

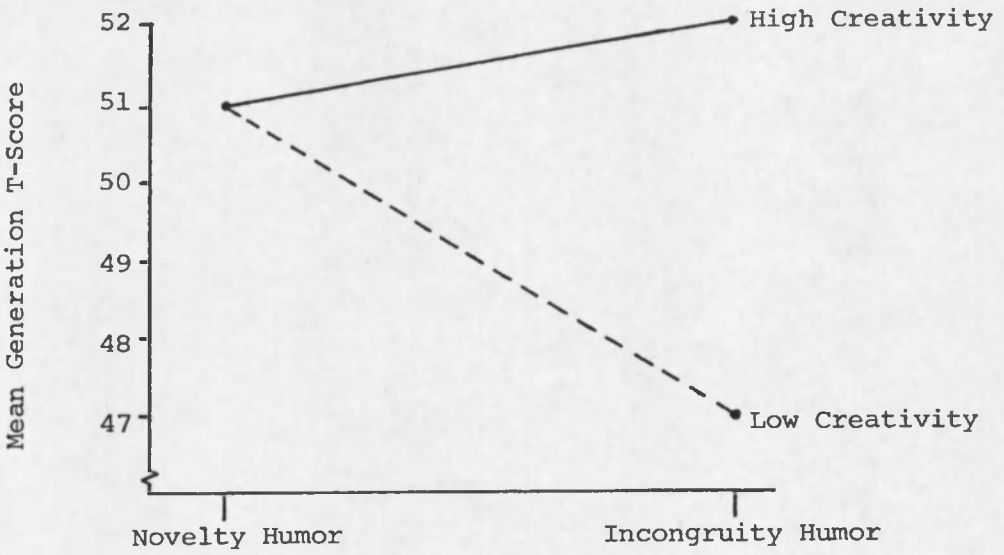

Figure 7. Creativity Level x Humor Type Interaction in Experiment II ($p < .025$)

subjects. All subjects tended to demonstrate greater success with the novelty generation task than the incongruity generation task. Figure 8 indicates that regardless of cognitive stage, highly creative subjects tended to perform better on the incongruity task than low creatives. In summary, the obtained results support the hypothesis that level of creativity is the most important factor in determining performance on a humor self-generation task.

Correlational Analyses

Pearson's correlation coefficients were obtained for eight comparisons across Experiments I and II. For each experimental group, novelty comprehension was compared to novelty generation, and incongruity comprehension was compared to incongruity generation. The

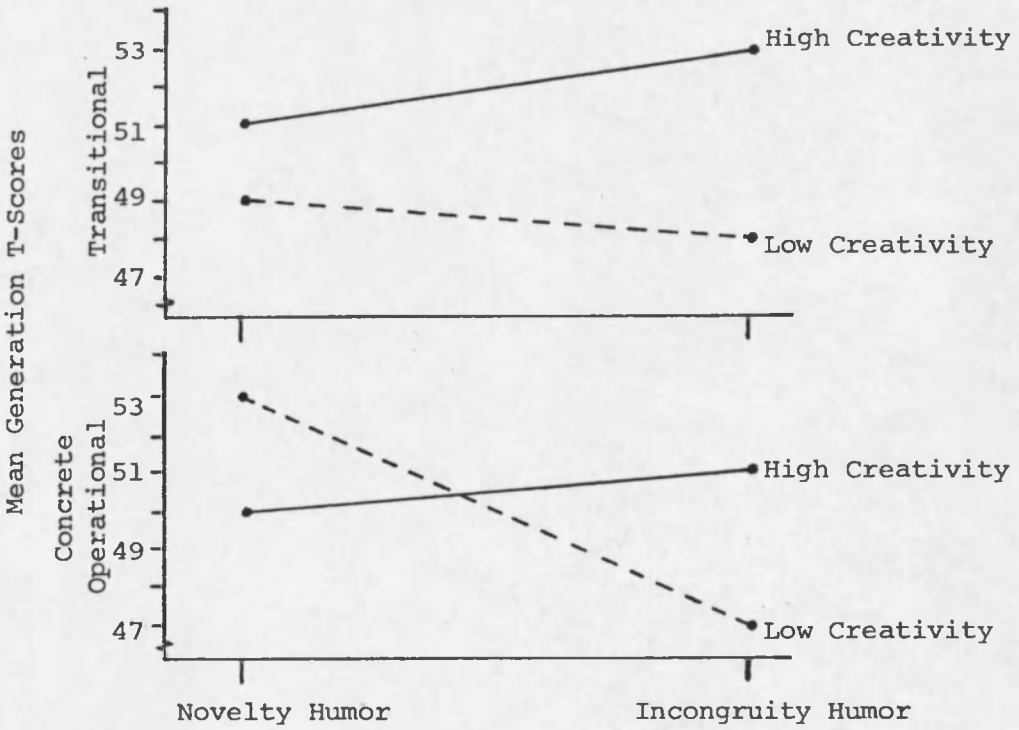

Figure 8. Cognitive Phase x Creative Level x Humor Type Interaction in Experiment II (N.S.)

results are presented in Table 3. Three of the eight comparisons yielded significant results. Transitional children, regardless of creativity level, demonstrated a positive correlation between comprehension and self-generation of incongruity humor. This relationship was not significant for either group of concrete operational children.

A Pearson's correlation coefficient of .51 ($N = 15$, $p < .05$) was obtained for the relationship between incongruity comprehension and incongruity self-generation for the transitional-high creative group. The mean T-scores for this group were 46 for incongruity comprehension and 52 for incongruity generation. A Pearson's r of +.84 ($N = 15$,

Table 3. A Summary of the Pearson's Correlation Coefficients Obtained Across Experiments I and II

Comparison	r^a	P
Transitional Hi Creatives:		
Novelty Comprehension x Novelty Self-Generation	+.02	--
Incongruity Comprehension x Incongruity Self-Generation	+.51	.05
Transitional Low Creatives:		
Novelty Comprehension x Novelty Self-Generation	+.25	--
Incongruity Comprehension x Incongruity Self-Generation	+.84	.001
Concrete Operational Hi Creatives:		
Novelty Comprehension x Novelty Self-Generation	+.68	.006
Incongruity Comprehension x Incongruity Self-Generation	+.27	--
Concrete Operational Low Creatives:		
Novelty Comprehension x Novelty Self-Generation	+.26	--
Incongruity Comprehension x Incongruity Self-Generation	+.40	--

[a]Each correlation coefficient is based on 15 children.

$p < .001$) was obtained for the same comparison for the transitional-low creative group. The mean T-scores for the transitional-low creative group were 42 for incongruity comprehension and 48 for incongruity generation. The only significant comparison for the concrete operational children was between novelty comprehension and novelty generation for the concrete-high creative group ($r = +.68$, $N = 15$, $p < .006$).

No hypotheses were specified for comparisons between Experiment I and Experiment II, since in each experiment different factors were expected to determine performance. In Experiment I, it was expected that a subject's cognitive phase would be a more salient factor in

determining performance success than his level of creativity, while the opposite was expected for Experiment II. The correlational analysis indicates that for transitional phase children, self-generation of incongruity humor is significantly positively related to comprehension of incongruity humor, regardless of level of creativity. As a group, transitional subjects performed better on the generation task, as demonstrated by the group means obtained from the analyses of variance in Experiments I and II. As indicated by the obtained Pearson's coefficients, transitional subjects who scored high on incongruity comprehension also tended to obtain high scores on the incongruity generation task. Low scoring transitional subjects also demonstrated performance consistency across the two incongruity tasks. Concrete operational children also tended to perform better as a group on the incongruity generation task than on incongruity comprehension, but, unlike transitional subjects, there was no significant relationship between incongruity comprehension and generation for either the concrete-high creative or concrete-low creative groups.

DISCUSSION

Experiment I

As the analysis of variance in Experiment I indicates, there is no support for the hypothesized stage trends in novelty and incongruity humor comprehension. The degree of acquisition of concrete operational thinking was not significantly related to humor comprehension for either novelty or incongruity cartoons. This finding is surprising in light of the Piagetian theoretical framework and the results previously obtained in similar experiments by McGhee (1971a, 1971b, 1974a). McGhee found the degree of acquisition of concrete operational thinking to be significantly positively related to comprehension of incongruity humor, but this result was not replicated in this study.

McGhee (1971a) found that for seven year old boys, the degree of acquisition of concrete operations was significantly positively related to the comprehension of incongruity humor. This relationship was not found for novelty humor, nor was it replicated with five or nine year old boys. Nine year olds tended to perform equally well in the comprehension of novelty and incongruity stimuli, and five year olds demonstrated no performance differences in humor comprehension across novelty and incongruity stimuli. However, as McGhee noted, no five year old subjects obtained more than nine points on a fourteen point scale used to assess the level of cognitive development, and no nine year olds obtained less than five points on the same scale. Only two seven year olds out of thirty obtained cognitive scores of five points

or less on the fourteen point scale. Consequently, the humor comprehension differences observed across age groups by McGhee may have been a function of age rather than cognitive stage, or an interaction of age and stage. Since all subjects in the present study were seven years old, any influence of age which may have contributed to the results obtained by McGhee has been eliminated in the present study.

Another major difference between the present study and earlier studies can be found within the humor stimuli. Whereas the humor stimuli in the present study were all presented in cartoon form, and all cartoons used in the assessment of humor comprehension were captioned, McGhee (1971a) used verbal jokes in addition to captioned and uncaptioned cartoons to assess children's comprehension of novelty and incongruity humor. Perhaps the age differences in humor comprehension observed by McGhee reflect older children's superior verbal, vocabulary, and reading skills as compared to younger children's, rather than the effects of the degree of acquisition of logical thinking. In the present study, an attempt was made to reduce the confounding of level of cognitive development, age, and academic skills by holding the latter two constant. All subjects in this study were of the same age and in the same grade, and cartoon captions were read to students by experimenters when subjects demonstrated difficulty in the oral reading of captions.

One possible explanation for the failure to obtain stage trends in the comprehension of incongruity humor in the present study lies in the fact that "transitional" and "concrete operational" are not two separate stages of cognitive development, but two phases of one

stage. Transitional and concrete operational children differ in their degree of acquisition of concrete operations, and this difference is quantitative not qualitative. In this study, the mean cognitive score for transitional subjects was 7.23 as compared to 10.33 for concrete operational children. Although application of the t-test for independent means indicated a significant difference between transitional and concrete operational children on the Piagetian tasks ($t = 11.08$, $df\ 58$, $p < .0005$, one-tailed), the means indicate that both groups have acquired concrete operations to some degree, concrete operational children more so than transitional children. According to Piaget (1950), the acquisition of concrete structures necessary for conservation is a gradual process in which the occurrence of a conservation response becomes more probable as the equilibration of assimilatory and accommodation processes increases, and as such cognitive-structural properties as reversibility and identity become more organized into a cognitive system with the child's experience in his environment. Thus, the acquisition of "concrete operations" is not a sudden spurt across a threshold, before which none of the cognitive operations of the concrete operational period are possible and after which all are possible. For each group of transitional and concrete operational subjects, therefore, there is a certain probability that a concrete operational response will be given to any one humor stimulus, indicating comprehension of the source of humor and the capacity to reverse or remove that source so that the cartoon is no longer funny.

In this study, only five stimuli per humor type were used to assess the comprehension of novelty and incongruity humor, as compared

to ten per humor type in the investigation conducted by McGhee (1971a). Since transitional children are in the process of acquiring concrete operations and are therefore capable of giving some concrete operational responses, a significant difference between transitional and concrete operational children in the comprehension of incongruity humor becomes more likely to occur as the number of responses required increases. Alternatively, the inclusion of subjects whose cognitive operations are qualitatively rather than quantitatively different from concrete operational children's operations might have produced cross-stage differences in the comprehension of incongruity humor. No preoperational children were included in this study. According to McGhee (1971a), the critical cross-phase comparison in terms of comprehension of incongruity stimuli is that between transitional and concrete operational children. However, it may be that a comparison of pre-operational and concrete operational children's humor comprehension would have produced the stage trends not found in a comparison of transitional and concrete operational subjects when the extraneous variables of age, differences across stimuli in terms of mode of presentation, and increased academic skills of older children were controlled.

An alternative explanation for the lack of stage trends in the comprehension of incongruity humor may lie in the possibility that the system used in this study to classify children as transitional or concrete operational thinkers was not refined enough to be representative of the complete set of cognitive abilities characteristic of concrete operational thought. Various studies of Piagetian cognitive development have employed different numbers and kinds of conservation

tasks in order to determine a child's level of cognitive development. Although the four Piagetian tasks used in the present study for the assessment of level of cognitive development have been empirically validated by Elkind (1961a, 1961b) as useful in the identification of concrete operational children, there is no single accepted set of conservation tasks consistently employed in the literature.

Pinard (in Flavell, 1963) carried out a systematic replication of Piaget's work using a standardized administration procedure with 700 French-Canadian children aged two to twelve years. Pinard's research represents an attempt to construct a Piagetian scale of mental development through the use of a test battery containing 62 subtests requiring a total administration time of ten hours. The results of this work indicated support for Piaget's stage sequences with few exceptions (Flavell, 1963). A more recent attempt at test construction for the assessment of Piagetian cognitive development was made by Goldschmid and Bentler (1968). The concept Assessment Kit-Conservation (Goldschmid and Bentler, 1968) contains six content areas: mass, weight, number, two dimensional space, continuous quantity, and discontinuous quantity. Goldschmid reported inter-item correlations ($r = +.16-+.72$, $N = 102$) and item-test correlations ($r = +.35-+.85$, $N = 102$). All intercorrelations reported were significant beyond the .05 level. Goldschmid and Bentler did not include lateral discrimination and class inclusion among their content areas, but the conservation of mass and weight yielded the highest inter-item and item-test correlations (Goldschmid, 1967).

Although the evidence to date indicates that the Piagetian tasks used in this study are adequate measures of a child's ability to conserve quantitative invariance, DeVries and Kohlberg (1969) state that conservation responses to a set of conservation tasks do not necessarily imply the acquisition of concrete operational thought. According to Piaget (1952), a conservation response serves as a behavioral index of concrete operational thinking, inasmuch as all concrete operational thinkers are capable of quantitative conservation. However, given that the transition into concrete operations is uneven and gradual, children who have not yet attained the level of concrete operational thinking may, on some occasions, be able to maintain quantitative invariance. During the transitional period between pre-logical thought and concrete operational thought, the child may conserve in one content area but not in another (e.g., mass but not weight) or he may conserve in one area at one time but not at another time. It is also important to remember that a conservation task requires only two logical operations (quantitative invariance and reversibility) from an entire set of logical, infra-logical, and arithmetic grouping operations which are organized and equilibrated into a structural cognitive system at the level of concrete operations (DeVries and Kohlberg, 1969). A frequent misunderstanding of Piaget's theory of cognitive development is that of equating product (conservation behavior/response) with process (internal logical operations).

It is most surprising that the concrete operational-high creative group in this study demonstrated the lowest performance of all four experimental groups in comprehension across both novelty and

incongruity stimuli. It was expected that concrete operational children would demonstrate superior performance in the comprehension tasks, regardless of level of creativity. Since the application of the Newman-Keuls procedure to this cognitive phase x creativity level interaction yielded no significant mean differences, the unusual performance of the concrete-high creative group presents problems with respect to interpretation. Without the information generally obtained from a Newman-Keuls test, it is impossible to discuss the location of the significance obtained through the analysis of variance.

The analysis of variance procedure did not reveal a significant effect for level of creativity. As expected, comprehension performance was not related to high vs. low creativity. All subjects demonstrated better comprehension of novelty than incongruity cartoons. This result supports the conclusions of McGhee (1971a, 1971b), in which he stated that the cognitive abilities required for the comprehension of novelty humor wherein a violation of perceptual expectancy provides the humor base are acquired during the preoperational phase of cognitive development. Accordingly, preoperational children should not differ from concrete operational children in novelty comprehension. Since the cognitive skills acquired within the Piagetian theoretical framework are cumulative, there is no reason to expect that transitional children should differ from concrete operational children in their comprehension of novelty humor. Also, since creativity and cognitive or logical intellectual functions are theoretically distinct aspects of general intelligence, there was no reason to expect a performance distinction between high and low creative subjects.

Discussion to this point has proceeded on the acceptance of Piaget's theory of cognitive development stages. From a cognitive social learning theory perspective, the failure of this study to demonstrate cognitive stage trends in the comprehension of incongruity humor stimuli may be interpreted as an example of the inadequacies of stage theories per se. According to Bandura (1977), a stage theory concept of cognitive development in terms of uniform thought structures at any given level tends to ignore individual differences in thinking and behaving. Instead, individuals are categorized and then viewed in terms of the category. Another weakness of stage theories, according to Bandura, is that they tend to ignore situational determinants of behavior. Not only do individuals within a given cognitive stage differ with respect to their thought and response patterns, but certain aspects of a given situation or circumstance may differentially influence individuals' responses.

For example, Bandura and McDonald (1963) noted that individuals classified in any given stage of moral development gave differing moral judgments depending upon the circumstances surrounding the moral violation. Similarly, Uzgiris (1964) found that children's conservation responses varied with different substances such as clay, metal nuts, and coils of metal wire, when these items were used in the same conservation task. The absence of stage trends in humor comprehension in this study may reflect the inadequacy of a stage theory defined in terms of quantitative conservation, as opposed to the inadequacy of particular tasks employed in the assessment of conservation. That is, it is possible to interpret the lack of stage trends in this study in

terms of the utility of a stage theory for describing cognitive development, rather than accepting the validity of a cognitive stage approach and then questioning the representativeness of the response domain sampled (conservation) or of the sample of tasks within the domain (mass, weight, lateral discrimination, and class inclusion).

Experiment II

Results of Experiment II demonstrate some support for the expectation that highly creative subjects should perform better than low creative subjects on a humor generation task, regardless of cognitive stage. On the whole, the humor self-generation task was easier for high creative children than for low creative children. The Newman-Keuls procedure applied to the creativity level x humor type interaction indicated that low creative children's performance on the incongruity self-generation task was significantly poorer than the performance of highly creative children on the same task. This significant mean difference combined with non-significant cognitive stage interactions indicates support for the hypothesis that a score on a standard creativity test should be a better predictor of performance than a score on an instrument measuring cognitive development, when the application of creative abilities is required for performance success.

That there were no significant cognitive stage main effects or interactions in Experiment II seems to lend support to a theoretical conception of creativity in which creative abilities are seen as distinct and separate from general intelligence (Thorndike, 1966). The

significant mean differences obtained through the Newman-Keuls procedure applied to the creativity level x humor type interaction would also appear to support a distinct-and-separate abilities approach to creativity, especially considering that both high and low creativity groups included both transitional and concrete operational subjects. In addition to the significant high vs. low creative subjects mean difference on the incongruity self-generation task, the Newman-Keuls procedure yielded two other significant mean differences for the creativity level x humor type interaction. Low creative subjects' performance on the incongruity generation task was shown to be significantly poorer than their own and high creative subjects' performance on the novelty generation task.

The incongruity humor generation task was significantly more difficult than the novelty generation task for the low creative group, whereas this relationship did not occur for high creative subjects. This result seems to be more consistent with a convergent-divergent thinking approach to creativity, such as that advanced by Guilford (1967, 1971). Novelty cartoons provided more structure than incongruity cartoons, since they were already humorous before a child's caption was applied. The novelty cartoons used in Experiment II portrayed incongruous events, although they, like the incongruity cartoons, were uncaptioned. By contrast, the incongruity cartoons were abstract in that they portrayed no expectancy violations. The incongruity stimuli used in Experiment II provided no a priori humor base as did the novelty cartoons. Whereas the novelty cartoons already contained expectancy violations before the child's caption was added,

incongruity cartoons were completely dependent upon the child's caption to acquire an expectancy violation and thereby a humorous aspect. Since the novelty cartoons were more highly structured than the incongruity stimuli, the range of possible appropriate caption responses was restricted as compared to the range of possible responses for the incongruity stimuli. Such restrictions would be more conducive to convergent thinking responses than to divergent thinking. The opposite effect would appear to hold for incongruity stimuli, for which there were no apparent single correct responses or response themes. For example, one of the novelty cartoons for the self-generation task showed an elephant perched in a tree. The responses given by subjects indicate a suggested fear theme, as demonstrated by the frequency of responses such as "yikes, a mouse!" Incongruity cartoons, however, did not appear to suggest a recurrent response theme as a humor base, although no statistical analyses were carried out. For example, one incongruity cartoon used in Experiment II simply showed two dogs facing each other. Responses to this stimulus were generally descriptive in nature: "two dogs"; "hi, my name is Frank"; and "woof."

There is also a greater similarity in terms of response requirements between incongruity humor generation and the CIRCLES TEST than for the novelty humor generation task. Whereas the novelty generation cartoons appear to point the subject in a specific and narrow direction in eliciting responses, both the CIRCLES TEST and the incongruity cartoons place minimal limitations on response possibilities. For the CIRCLES TEST, the only requirement is that the circle should be "part of whatever you make" (Torrance, 1974a). Although not assessed

in this study, it is possible that low creative subjects would self-impose restrictions on the CIRCLES TEST by attempting to maintain the structural completeness of the circle. This could be accomplished by drawing primarily inside the circle, producing faces, flowers, wheels, balloons, balls, or any of the other similar responses given by at least ten per cent of subjects and earning Originality scores of zero. This would be consistent with the fact that low creative subjects did significantly better on the novelty than on the incongruity humor generation. If such restrictions were self-imposed, the result would necessarily be a low creative score, since the number and types of possible responses would be reduced, the amount of elaboration would be decreased, and the originality of such responses would generally be zero or one. If low creative subjects differ from high creative subjects in terms of self-imposition of response restrictions on the CIRCLES TEST, then the obtained performance differences between high and low creative subjects on the novelty and incongruity humor self-generation tasks can be interpreted in terms of a convergent vs. divergent thinking model of creativity.

Correlational Analyses

In a recent study of children's ability to create humor, McGhee (1974b) concluded that creating a joking relationship is more difficult than successfully identifying an already created one. McGhee reported that the ability to discriminate joking and non-joking verbal statements and the ability to create joking relationships appear to be acquired during the concrete operational period of development. On

the basis of this observation, McGhee concluded that the same cognitive structures mediate both the identification and the creation processes. However, since some children who are able to identify joking relationships are conversely unable to produce them, it seems reasonable to conclude that the comprehension of a particular humor type is a prerequisite but insufficient condition of production of the same type of humor.

The correlational analyses comparing Experiments I and II are consistent with the above conclusions. Positive relationships were obtained in all of the eight Pearson's correlation coefficients computed, but only three of the eight coefficients reached statistical significance. In general, subjects who scored high on the comprehension task for a particular cartoon type tended to obtain high scores on the humor production task for the same cartoon type. This suggests support for the conclusion that the same cognitive structures mediate the comprehension and generation processes. However, since only three of the comparisons between comprehension and generation within a humor type reached significance, other factors must be operating in determining performance success in producing humor, in addition to the cognitive structures mediating comprehension of humor. Contrary to a notion of creativity as a separate entity distinct from general cognitive or intellectual ability, the data from this study seem more consistent with a concept of creativity as one aspect of general intellectual ability. Comprehension of a particular humor type does not guarantee the ability to produce examples of the same humor type. However, since there were no negative relationships between comprehension and

generation of humor, it may be that comprehension is necessary for production. The results of this study confirm the hypothesis that a child's score on a test of creativity should prove to be a better predictor of success on a humor production task than his score on a test of cognitive development. Creativity level appears to play a more important but not exclusive role in determining the ability to create humor.

Summary

The results of Experiments I and II and the correlational analyses comparing these two experiments indicated three conclusions: the degree of acquisition of concrete operational thinking was not significantly positively related to the comprehension of incongruity cartoons; creativity level was a better predictor of the ability to produce humor than level of cognitive development; and children who obtained high scores in humor comprehension tended to also score high in humor production. Before the implications of these conclusions can be fully determined, a need for standardized procedures for research in this area as well as acceptably validated measures of cognitive development and creative ability must be met.

In addition to the questionable utility of the Piagetian tasks previously discussed, a great deal of controversy rages in the field over the utility of the Torrance Tests of Creative Thinking or any other "creativity test" in measuring creativity. The Torrance Tests are criticized for several reasons: low test-retest reliabilities, especially as the test-retest interval increases; minimal differences

obtained in comparing subtest intercorrelations within the Torrance Tests of Creative Thinking to intercorrelations between the Torrance Tests and standardized intelligence tests; and a questionable construct and concurrent validity (Barid, p. 836; Hoepfner, p. 841; Thorndike, p. 838; Wallach, p. 839; in Buros, 1972). In addition, only one subtest of Torrance's complete battery of three verbal and three figural subtests was used in the present study. The CIRCLES TEST was selected because it demonstrated both the highest intercorrelations with the other subtests and the highest degree of interscorer reliability (Torrance, 1974b; Yamamoto, 1964). In addition to the above reliability and validity issues, a figural test was considered more appropriate than a verbal test, since the stimuli in this study were cartoons. However, whereas the CIRCLES TEST requires figural responses to figural stimuli, the comprehension and generation tasks in this study required verbal responses to figural stimuli. This discrepancy would have been more important if a significant interaction between creativity level and humor type had not been obtained, since the predictive ability of figural stimuli to verbal performance is lower than when verbal indices are used to predict verbal performances (Guilford, 1971).

The development of the humor response is just one aspect of cognitive development which may be studied within the Piagetian theoretical framework. Joking relationships provide tests of a child's confidence in his mastery of his environment, and they occur regularly in everyday life. Piaget has frequently stressed the importance of social interactions in cognitive development. Children learn about the world by listening to and trying to understand adults' and other

children's explanations of observed events, as well as through self-discovery. Cognitive growth and mastery is not a process that occurs independent of the child's experience in his environment, rather, it is enhanced and facilitated by a greater variety of experiences. Play and laughter are among the first social interactions shared by children. It is surprising that there is so little systematic investigation of the implications of these interactions for cognitive development.

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