

Graphic jokes and children's mind: An unusual way to approach children's representational activity

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The purpose of this study was to examine the development of representational activity through the comprehension of graphic jokes in 2, 3 and 4-year-old children. In experiment 1 we worked with three kinds of jokes, specifically *mentalistic* jokes, jokes based on *substitution* and *complex* jokes. We found differentiated performances on each kind of joke, as had been expected based on the semiological analysis of the jokes prior to the experiment. The earliest comprehension, at 3 years old, occurred with mentalistic jokes where more than 70% of the total sample was successful. The substitution jokes reached 47% in the three-year-old subjects, and the latest kind of joke to be understood by this group were the complex jokes, with only 31% comprehension. In experiment 2 we wanted to specify the cognitive functioning that was taking place in the comprehension of mentalistic jokes. We found similar successful performances in two mentalistic jokes with both the 3 and 4 year-olds in the study. Children's performances were analyzed from the point of view of processes of redescription which were involved in the understanding of the jokes. We conclude that humor tasks are appropriate instruments to examine development of children's representational abilities.

Key words: Graphic joke, semiological analysis, incongruity, representational activity.

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INTRODUCTION

The idea of studying children's representational activity from the point of view of humor may seem odd at first, especially for psychologists. Nevertheless, everyday life shows us that children enjoy and seem to be captivated by some kinds of humor. It may even be said that most children have specific preferences and likes in this respect. Thus, it appears reasonable for psychologists to take an interest in the development of the comprehension of humor and in the manner children learn particular kinds of humor and humorous objects (e.g. graphic joke). Indeed, the understanding of humor involves mental operations and cognitive processes, and studying these through jokes can be a way for psychologists to achieve a better understanding.

The aim of this study is to show the results of several studies conducted during the past five years and to show that humor constitutes a scenario where the child acts as a basic inquirer considering everyday situations as problem-solving tasks and continually tests hypotheses (Karmiloff-Smith, 1992). Specifically, in Experiment 1 we consider that there are different kinds of jokes and that each one gives rise to a particular understanding at a certain age. In particular, the objective is to emphasize a kind of mentalistic relationship that allows us to see the functioning of an intentional system. Using the results obtained in Experiment 1 about the relationship between humor and representational development as seen through mentalistic jokes, Experiment 2 continues with the identification of representational redescription processes (Karmiloff-Smith, 1992) as a framework for

understanding the activities involved in the comprehension of the graphic joke from the perspective of the mentalistic joke.

Humor and cognition

The current research report is focused on the relation between humor and representational activity. Rethinking humor as a way of accessing representational development is not a new idea. It was in a way suggested by Bergson's work (1940), in which he mentions that when a sequence is broken up (by inversion, interference, interruption or repetition), this produces surprise in children (laughter or playfulness). Yet, despite Bergson's insight of how important humor might be for the understanding of mental activity, the relation between humor and cognitive operations has not been considered seriously.

Early experimental studies of humor in psychology worked with graphic-humor stimulus (Zigler, Levine & Gould, 1966, 1967). In the 1970s, most of the significant studies were inscribed in this framework (McGhee, 1971a, 1971b, 1974, 1979, 1988; Shultz, 1972, 1974, 1996). Despite such a promising beginning, it is surprising to note the scarcity of studies on graphic-humor present in the current literature. It appears as if this field of research has been all but abandoned. Indeed, very few studies have been carried out since the 1970s, and no results presenting promising avenues for future research have been published. Most of the few studies available are repetitions of what has been already found (Johnson & Mervis, 1997; Brown, 1993).

Experimental studies that do address the learning of graphic humor seem to evidence a late understanding of humor by children, not before the fifth year (McGhee, 1971a, 1971b, 1979, 1989; Shultz, 1972; Shultz & Pilon, 1973; Bariaud, 1983, 1989; Brown, 1993). This might be because the experimental studies strive to apply more demanding criteria and ignore or omit essential characteristics of children's spontaneous and natural activity. Additionally, experimental researchers have considered verbal explication as the main proof of the comprehension of humor. As a result, comprehension criteria used by researchers have always been based on verbal explanations (Shultz, 1972; Shultz & Horibe, 1974; Brown, 1993).

Existing research on humor has been quite thorough in terms of methodology comparing different samples of subjects and using replicable stimulus. Yet, unfortunately these studies have remained quite general in terms of treating different kinds of humorous objects and events. Most of the studies we reviewed rarely acknowledge any difference between different kinds of incongruities (Huber & Leder, 1997). However, some studies do address the correspondence between the evolution of humor and the evolution of developmental stages (Zigler *et al.*, 1966, 1967; McGhee, 1971a, 1971b; 1988; 1989; Johnson & Mervis, 1997).

In general, specific cognitive operations are not identified, and no tracking of the different operations involved in humor is included. However, it is widely acknowledged that analyzing the mind in representational terms requires being able to identify the cognitive operations involved, in this case, the comprehension of humorous objects.

This introduction clearly shows that the bridge between graphic humor and representational activity has not been fully explored within the theory of research about the mind. Despite the apparent lack of studies in this area, we nevertheless believe it to be a promising field of research.

The graphic joke and representational development

Over the past years in the majority of our studies, we have chosen to adopt the graphic form of humorous objects as the tool to examine the representational activity involved in the comprehension of humor. As a whole, these studies have examined subjects' performance with differentiated humorous objects. For the purposes of this study, the graphic joke (one sketch) is differentiated from the comic strip (three or more sketches). In our early studies, the results based on comic strips were consistent through different samples, while for the graphic joke, the results were more heterogeneous. This difference led us to continue our research on graphic jokes in order to understand the complexity of their comprehension. The nature of some of the operations involved has been identified as well as the role of cognitive development itself (Puche-Navarro, 1998; Puche-Navarro & Lozano-Hormaza, 1995, 1998a, 1998b, 1999a, 1999b, 1999c). As a result of these earlier studies, analytic and comparative

operations have been identified as the keys for understanding graphic jokes, while narrative and attributive types of operations are involved in the understanding of comic strips (Lozano-Hormaza & Puche-Navarro, 1998). Subsequent studies allowed us to identify the use of empirical inferences in the understanding of comic strips and the use of logical inferences in the understanding of jokes.

Specifically, in order to comprehend the graphic joke, the subject must simultaneously consider two different representations of the same object or event – a conflictive and/or subversive representation, and a congruent one. Or, the subject can simultaneously consider two successive states of the same object. The ability to simultaneously consider two different representations, according to some authors, is the decisive moment in the representational development of the child (Mounoud, 1996).

With graphic jokes, the degree of dislocation between relations gives rise to different kinds of jokes according to the nature of incongruity, and each kind requires different cognitive functions in order to be understood. In order for the subject to understand the joke, it is necessary to have access to certain cultural and social knowledge about the object within the joke. From this knowledge, the subject understands what is funny about the graphic joke. Because of this, it is necessary to recognize that the subject understands and shares the so-called cultural encyclopaedia (Eco, 1972). Understanding the cultural contents of different relationships is what is needed to allow the comprehension of incongruent relationships within graphic jokes.

Semiological analysis

Semiological analysis allows us to understand the meaning of the relationships that make up the center of graphic jokes. We understand by semiological analysis, the making explicit of the required conditions (notions) in order to understand a joke or comic strip. This includes the identification of the kind of incongruity, the subverted relations and the consequences of this subversion. Semiologically, the diversity of incongruity comes from the richness of the joke. Some of our previous studies have shown more heterogeneous results with regards to the graphic joke in comparison to the results from studies about comic strips (Lozano-Hormaza & Puche-Navarro, 1998). This is the point from where this project comes; according to the semiological analysis, it is possible to distinguish the following three kinds of jokes. (There are other kinds of jokes, such as the hyperbolic joke, but they will not be analyzed in this study).

Mentalistic jokes. The nature of incongruity in mentalistic jokes functions as an intentional second order system. An intentional system is represented as "a being whose behaviour is predictable, with known states of knowledge and desires" (Perinat, 1995, p. 188). The thought bubble that appears in the mentalistic joke emphasizes what the protagonist

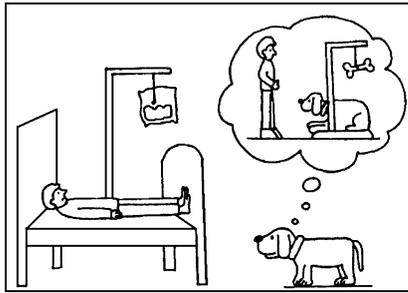


Fig. 1. Sick Dog Joke.

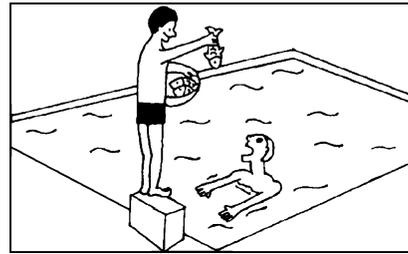


Fig. 4. Swimming Pool Joke.

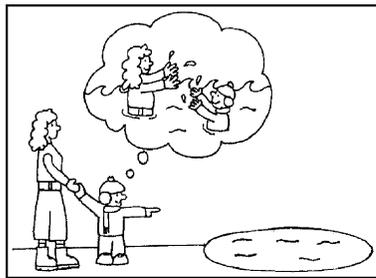


Fig. 2. Mom in the Lake Joke.

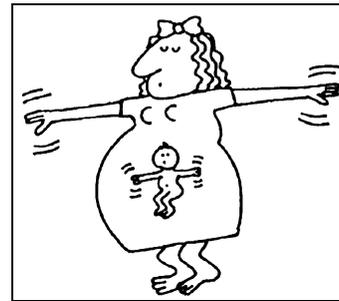


Fig. 5. Aerobics Joke.



Fig. 3. Superman Joke.

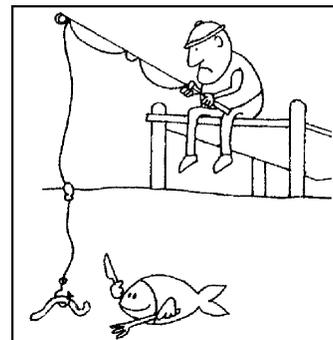


Fig. 6. Fisherman Joke.

thinks, feels, or desires. A good example of this kind is the Sick Dog Joke (see Fig. 1), where the dog watches his sick master and imagines himself with an intravenous drip from a bone. This shift implies an identification of the physical state of the owner with the dog's own potential physical state. The dog-master relationship is subverted, but the important thing here is that there is an identification between the "state" of the master and the dog. Another example of this kind of joke is the Mom in the lake (see Fig. 2).

Jokes based on substitution. The hallmark of this kind of joke is the substitution of the principal element to produce incongruity. In the Superman Joke (see Fig. 3), Superman's cape has been substituted by the wings. Similarly, in the Swimming Pool Joke (see Fig. 4), a dolphin in the water is substituted by a man and is represented by the way the man is swimming and waiting for the fish. In this second example, there is more than a simple element substitution. This joke substitutes the role that the element (the dolphin) plays in the joke's structure.

Complex jokes. Complex jokes are defined by subversion because the incongruity takes place not just in one element but in the relationships between the elements, and they may be incongruent in several different ways. The Aerobics Joke (see Fig. 5) presents various relationships among the elements. The first one is the baby-mother relationship which is represented from an unusual perspective from inside the mother's body. The second relationship is given by the symmetric activity between the mother and the baby (both exercising) which also constitutes an incongruity. Another example of this kind of joke is the Fisherman (see Fig. 6).

One of the purposes of this article is to provide empirical evidence that supports the proposal of the semiological analysis that we have previously developed about jokes as vehicles of high order mental operations. A series of two experiments was designed to show that different jokes demand

different operations, and one of the indicators is the appearance differentiated by age. The first objective and the first experiment come from a need to look at development (comprehension of the kinds of jokes in relation to age), and the second objective focuses on assessing cognitive change and representational functioning in the understanding of mentalistic jokes.

Comprehension of joke and its representational redescription

The other purpose of this study is to explore the relationships between second order intentional systems and representational redescription. *Mentalistic* graphic jokes apparently work as a second order intentional system (Dennett, 1987), and they make reference to a subject that not only thinks but also understands (attributes meaning) to the phenomena that are in the intentional system (Perinat, 1995). In this sense it is possible to study this capacity of attribution of mental states to others as well as the ability to elicit this capacity within a predictive system.

But what happens representationally to children at three years of age? What are the concepts and the representational possibilities that are opened up to the child? Traditionally, these representational possibilities have been dealt with from the emergence of the distinction between the dimensions of reality and fiction. Around 3 years of age, the child becomes more skilful in the representation of simulated worlds. This is possible because the child works from secondary representations, such as simultaneous models, means to an end differentiations, and physically present contexts (Perner, 1991). The child can use these representations, interpret them, and produce a model of the representational relationship between the image and the object represented. Gardner states that at this age, the child manages the distinction between fiction and reality (Gardner and Winner, 1987).

Karmiloff-Smith has identified a specific capacity within representational functioning. A child can take an element that has served as a means and transform it into an end element. According to her research, when an instrument has been mastered through use, it opens itself up to the possibility to become a tool for reflection. She illustrates this with examples of the correct use of multifunctional determiners such as the article *a* at an early age (*a* in French and Spanish has a double function; it can indicate a number, e.g. one, and also a non-specific referent, *alan*.) However, as children get older, they begin to use grammatically incorrect forms of *a*, although they used the two forms correctly at an earlier age. With time, this incorrect use is overcome, and the child once again manages the double function. This transformation reveals a child that has acquired a new conscience of this dual function. Each time the child develops a new tool that is adequate to represent his or her knowledge (the use of a unifunctional *a*) and once this functions well procedurally, then the tool becomes a problem to be solved (the consciousness of the dual function of *a*) (Karmiloff-Smith,

1979). In the terminology of the time, she said that the child first has a procedural use and then goes on to function in a metaprocedural system.

Karmiloff-Smith (1992) later formulated this transition from a tool in use to a tool that becomes a problem to be solved (from the procedural to the metaprocedural) within her Representational Redescription Model (RRM). Her argument is that a subject is capable of recursively representing knowledge that has been stored as part of an efficient procedure through a process of redescription that extracts the knowledge from the procedure. The model proposes different levels of functioning. Karmiloff-Smith hypothesizes that initially knowledge is embedded as part of an efficient procedure. The shift happens when this implicit knowledge is redescribed and explicitly represented. This knowledge stops being part of a system and starts being used by the system.

The idea is that a representational division is carried out "that makes us become conscious of our material actions, distancing us from them, extending them in their recent past, and also from our own conscious activity" (Perinat, 1995, p. 191). The transition from the control of a tool to the problematization of the same tool and to the redescription of it at another level may be the base of the process through which the capacity to understand the joke is constructed and evolves. What happens with the comprehension of the graphic joke has a lot to do with this metaprocess in which the control of an instrument leads to problematization of the instrument at a different level.

But what is the relationship between the explicit knowledge that is requested about the graphic joke and the model of the representational redescription?

Selection and semiological analysis of the jokes

From a semiological point of view, joke A-first version and joke A-second version (see Fig. 10 and Fig. 11), provide empirical information about an antecedent-consequence type inferable causal relation. This joke shows relationships among the members of a group of people with an event happening to an object implicit in the image. Specifically, the joke deals with a group of animals (first version) or children (second version) who try to place the blame on others for a broken lamp or vase.

But we must consider the cognitive competence that the child will require to understand this joke. In terms of the cognitive abilities needed to solve or explain Joke A (first and second version), a certain level of representational redescription is required. The explanation requires that the spectator clearly describe what joins the two representations (original and subverted) and read the intentional relationships of the characters. These intentions are inferred by looking at the animals or children pointing to the others to blame them for the broken object. Understanding these competencies is related to the redescription of the nucleus of

the joke and the capacity of the children to access an explicit level of the incongruent relationship from an understanding of the congruent and implicit relationship that underlies it.

EXPERIMENT 1

This study explores the hypothesis about the diversified nature of jokes, identified in the semiological analysis presented above as *mentalist* jokes, *substitution* jokes and *complex* jokes. Those three kinds of jokes require different levels of representational comprehension that can be translated and that are visible in the performance of the subjects.

Method

Subjects. The participants in this study were 150 children (half boys and half girls) aged 2 years old (30 subjects), 3 years old (60 subjects), and 4 years old (60 subjects). The participants came from two different samples, the first made up of 30 three-year-old children and 30 four-year-old children, and the second group made up of 30 two-year-old children, 30 three-year-old children, and 30 four-year-old children. All of the children were recruited from kindergartens in the city of Cali, Colombia. All families belonged to middle to upper-middle-class socio-economic groups, according to the Colombian Department of National Statistics (DANE), which is in charge of Colombian population stratification criteria and census. Children's participation was voluntary and in accordance with parental agreement.

Experimental material. The jokes used in the study were selected by a graphic material expert. After the initial selection, a pilot study with children validated the semiological classification of the six jokes chosen for the study. The final choice for the material was made on the basis of the validation of the analysis and children's choices. In other words, every joke was previously tested with children and with experts in order to ensure its functionality.

We worked with a consistent composition device in which each joke's central image was presented in a framed transparency sheet (17 cm × 15 cm). Additional elements of the image were presented in three alternative transparency sheets that could be superimposed on the central image. The children in the study were able to manipulate the images themselves. In this way, each joke was composed and de-composed (or destroyed) by each child. The transparencies could be manipulated to create three alternatives for each joke: neutral, congruent, and incongruent. The children had to choose among the three alternatives the one that made them laugh the most.

Transparency 1 (T1) (see Fig. 7): the neutral alternative consists of an element that although does not belong to the system does not create conflict and therefore is not humorous. The neutral element used in the Superman joke was a baseball bat.

Transparency 2 (T2) (see Fig. 8): the congruent alternative consists of an element that belongs to the system in such a way that when inserted completes the image. For example, Superman's cape produces the typical image of Superman.

Transparency 3 (T3) (see Fig. 9): the incongruent alternative consists of one element, which by inserting it in the system creates conflict. In other words, it puts the system in crisis and as a result is humorous. For example, the wings that are inserted on the body of Superman create a joke about Superman with wings.

Procedure. In order to understand the performance of the children in the study, brief individual interviews between the child and the

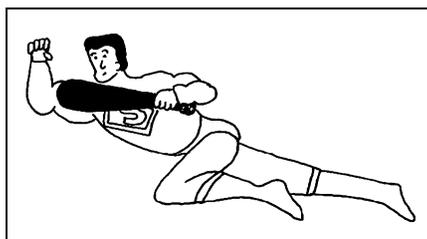


Fig. 7. Transparency 1 (T1), neutral alternative of the Superman Joke.

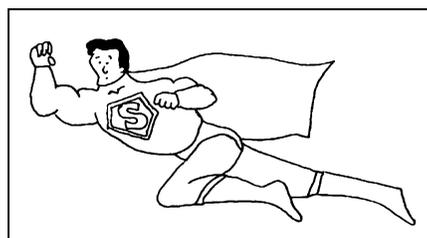


Fig. 8. Transparency 2 (T2), congruent alternative of the Superman Joke.



Fig. 9. Transparency 3 (T3), incongruent alternative of the Superman Joke.

experimenter were carried out. As a familiarization phase, the experimenter talked with each child to ensure that he/she understood what the word "funny" meant. Examples from TV shows, books, and newspaper comic strips were presented as illustrations. Once the experimenter was certain that the subject had understood the task, the experimental phase began.

In this phase, the experimenter sat next to the child and presented one of the framed transparency sheets. Once the child identified the elements that were in the image, he or she was invited to attach additional elements in the form of images on different transparency sheets that were superimposed on the original transparency. After the child put one of the additional elements onto the picture, the researcher asked how the drawing looked. The child and researcher continued until all of the additional elements had been examined individually and the child had observed how the combined image was different in each case. At the end, the researcher asked the child which of the three images was the funniest. After completing this process with the first joke, the researcher repeated this process with each of the six jokes in order to collect results about all of the jokes.

The order of presentation of the alternatives was counterbalanced as well as the order of the jokes. Variations and counterbalancing were applied strictly in order to avoid footprint effects. Each experimental session was recorded on videotape for subsequent analysis.

Methods for analysis. Two judges who were previously trained in observation tasks used a checklist recording method (see the Appendix for a sample checklist) to analyze the videotapes of the experimental interviews. The judges were unaware of the research goals, the working hypothesis and the children's ages. Correlation between the values of both experimenters was controlled by inter-rater comparisons. No significant differences were found in the analysis of the two judges.

Task solving and comprehension criteria. Children were asked to choose between three alternatives the one that "makes me laugh the most". The jokes offered a scene in which the child is considered an agent in the problem-solving process. The characterization of the joke in terms of problem solving implies that it is perceived by the child as a puzzle to be solved. Problem solving requires an understanding of the relations established in the joke and consequently, the choice of the proper solution. Although comprehension and problem solving cannot be considered as the same activity, the latter nevertheless implies a certain level of operationalization of the comprehension of the task.

The criterion used to assess the children's performances was the choice of the incongruent alternative from among the other alternatives. This criterion is the main evidence of the comprehension of the joke. The verbal responses offered by the children were analyzed in a different study and not taken into account in the present study.

The neutral alternative was used as the control condition to avoid having a 50% probability of random selection. Since results always favor the discrimination between congruent and incongruent versions, we will not include the neutral alternative in our result analysis.

Design

In the first study, two conditions were compared: the kind of graphic joke as differentiated in the semiological analysis (condition 1: mentalistic jokes, Mom in the lake joke, Sick dog joke; and condition 2: substitution joke, Swimming pool joke). A related design was used where the subjects themselves (30 three-year-old children and 30 four-year-old children) give performances for both conditions (both kinds of jokes). With this procedure, a Wilcoxon test was used to contrast the performance of each age group with regard to the two conditions.

In the second study, an additional sample of 2, 3 and 4-year-old children was collected (30 children from each age group). The two unrelated samples were compared in order to cover the three kinds of jokes (mentalistic, Mom in the lake joke, Sick dog joke; substitution, Swimming pool joke, Superman joke; and complex, Fisherman joke, Aerobics joke). The only change from the first study was the presence of the two complex jokes (Fisherman joke and Aerobics joke) and the addition of one substitution joke (Superman joke), as well as the presence of 2-year-old children in the sample. A chi-square was used to make a comparison between the jokes when the scores of the subjects were not related.

Results

The purpose of this first experiment was to reveal if the children are able to discriminate among the different kinds of jokes. The hypothesis is supported in the semiological

analysis that distinguishes among the three kinds of jokes. The purpose is to verify if the performance of the children when faced with these jokes is the same as the differentiation produced by the semiological analysis.

When comparing the different kinds of jokes, a Wilcoxon test reveals significant differences between mentalistic jokes (Mom in the Lake Joke) and substitution jokes (the Swimming Pool Joke), $p = 0.01 < 0.05$. Similar significant differences were found between the mentalistic joke (Sick Dog Joke) and the substitution joke (Swimming Pool Joke), $p = 0.015 < 0.05$. These two comparisons become apparent in the 3-year-old subjects. For the 4-year-old subjects the differentiation between the mentalistic jokes (Mom in the Lake Joke) and substitution jokes (the Swimming Pool Joke) is also significant, $p = 0.028 < 0.05$. Similarly, the differences between the mentalistic jokes (Sick Dog Joke) and the substitution joke (Swimming Pool Joke) are significant for this age group, $p = 0.016 < 0.05$. These results show that the mentalistic jokes are a different kind of joke than substitution jokes.

In order to complete the comparison of the performance data to the semiological hypothesis of the different kinds of jokes, complex jokes are added to the equation, and the children's performance is compared among the three kinds of jokes.

When comparing the mentalistic jokes (Mom in the Lake Joke and Sick Dog Joke) to complex jokes (Fisherman joke and Aerobics joke), the chi-square of unrelated samples shows significant differences at 3 years ($\chi^2 = 9.696, p < 0.01$), show these differences at 4 years ($\chi^2 = 4.8, p < 0.05$). Similarly, in a comparison of substitution jokes (Swimming Pool Joke) with the complex jokes (Fisherman and Aerobics jokes), significant differences are not found for the three-year-old subjects for any level of probability ($\chi^2 = 1.831$), but for the four-year-old subjects there was a significant difference ($\chi^2 = 11.63, p < 0.01$). So, from three years of age there is a significant difference between the comprehension of mentalistic and complex jokes, but a significant difference between complex jokes and substitution jokes that does not appear until 4 years of age.

The other experimental condition was to understand the evolution of jokes in terms of age. In Table 1 it is possible to visualize these differences with relation to age (with the averages next to the kinds of joke).

This table of descriptive percentages gives qualitative information that can be proven with the statistical treatment

Table 1. Performance of 2, 3 and 4 year-old children

Kinds of jokes	2 years old (%)	3 years old (%)	4 years old (%)
Mentalistic jokes	29	75	68
Jokes based on substitution	20	47	68
Complex jokes	20	31	90

of the chi-square among the different kinds of jokes. For the mentalistic jokes, between 2 and 3 years there is a significant difference in the performance of the children ($\chi^2 = 8.544$, $p < 0.01$). The same occurs with substitution jokes ($\chi^2 = 6.74$, $p < 0.05$). On the other hand, in the case of complex jokes, at these same ages the difference is not significant ($\chi^2 = 0.86$).

From 2 to 4 years, there is a significant difference in performance of all three kinds of jokes. For mentalistic jokes, $\chi^2 = 7.48$, $p < 0.01$, for substitution jokes $\chi^2 = 9.96$, $p < 0.01$, and for complex jokes $\chi^2 = 9.97$, $p < 0.01$.

Finally, between 3 and 4 years, the difference is not significant for mentalistic jokes ($\chi^2 = 0.3$), nor for substitution jokes ($\chi^2 = 0.532$). However, there is a significant difference for the complex jokes ($\chi^2 = 4.28$, $p < 0.05$). In all cases, the differences were significant to one degree of freedom.

Discussion

The purpose of the study was to verify if the semiological characterization that differentiated each of these three kinds of jokes is revealed by the performance of children in understanding the jokes. The differences in the performance can be taken to indicate the representational activity of the subjects in the study. The results reveal that the frequencies of correct solution of the jokes correspond to their semiological nature.

The mentalistic jokes (Mom in the Lake and Sick Dog) show the highest percentage of success at 3 years, and as such they appear to be the earliest to be understood. On the other hand, complex jokes (Fisherman and Aerobics jokes) appear to be the latest jokes to comprehend. Between the mentalistic and complex jokes, it appears that the substitution jokes (Superman and Swimming Pool Jokes) function as a transition.

The differences that were found among the different kinds of joke in relation to age in part proves the semiological division. For the mentalistic and substitution jokes, the crucial difference is found between 2 and 3 years of age (proven between 2 and 4 years). On the other hand, the significant difference for complex jokes appears between 2 and 4 years and not between 2 and 3 years. This affirms that the complex joke presents a higher level of difficulty than the mentalistic and substitution jokes.

There are two important accounts that come from this analysis. Why are the mentalistic jokes the earliest to be understood? One possible answer could be that they function with the identification of the desires of the protagonist. These desires can be used as a tool to enter into the representation that the joke proposes. The behavior of the dog or of the mother in the lake is understandable because it provides the attribution of states of knowledge and desires. The second account concerns the extent to which the later comprehension of the complex joke could be explained by the

fact that in this kind of joke the relationship is more subverted and there is a chain of at least two stratified transgressions (one first order and another more subtle transgression) that offer a small system with different kinds of subverted relationships. Understanding a joke's sense of this level requires considering simultaneously two representations of the same object: fish as possibly been eaten and as a fish-that-eats (see Fig. 6). A similar analysis can be made with the Aerobics joke.

In turn, to understand substitution jokes, the child needs to be able to understand the subversion based on a comparison with absent representations (Superman's cape or the dolphin). In this way, they seem related to a certain kind of metaphoric joke in which the change that is alluded to is supported by a similarity at a more abstract level. What is certain is that when looked at in relation to mentalistic and complex jokes, the substitution jokes are at an intermediate level in terms of difficulty.

The differentiated performances of the children in relation to the three kinds of jokes as a function of age proves the use of stratified graphic jokes as an alternative for the study of representational activity and of its identification in different levels of complexity. Mentalistic jokes reveal a differentiation between 2 and 3 years of age and not between 3 and 4, as the complex jokes do. Finally, the differences that the mentalistic jokes provide about the differentiations found between 3 and 4 years can be an interesting alternative for studies of theory of mind that would require a more detailed exploration.

In summary

The question of whether it is possible to describe in a discriminating way the representational activity involved in the understanding of graphic jokes, in terms of the data found in this study, can be answered positively. The range of the results reveals certain diversity in the representational functioning involved in the understanding of jokes. The hypothesis that we have been working on is that this diversity responds to the indicators and ways in which they are present in the nature of the incongruence.

EXPERIMENT 2

Comprehension of the mentalistic joke and its representational redescription

As has been described previously, mentalistic jokes are understood at an early age, and children are able to describe what is funny about the joke. With Experiment 2, the intention is to explore the relationships between second order intentional systems and representational redescription. Because this activity of making the joke explicit assumes an understanding of the relationship between the original representation and the subverted representation, it can become an object of reflection.

The research question that guides Experiment 2 is: Can we consider that when a child explicitly understands a mentalistic joke, it is because he or she has moved from one level to another, and in this second level the child is able to redescribe information that is not present or explicit?

Method

Participants. One hundred children participated in this study, 51 girls and 49 boys. Half of the total sample consisted of 3 year-olds while the other half was made up of 4 year-olds ($M = 3$ years 6 months, range 3 years 0 months to 4 years 5 months). As in Experiment 1, they were recruited from kindergartens in the city of Cali, Colombia. All families belonged to middle to upper-middle-class socio-economic groups, according to the Colombian Department of National Statistics (DANE). Children's participation was voluntary and in accordance with parental agreement.

Experimental materials. The jokes were presented on white poster board cards that measured 21 cm \times 27 cm each.

Experimental situation. The experimental situation depended on verbal comprehension. It consisted of presenting the jokes to the child and asking him or her to explain what was happening in the picture. The idea was to elicit a verbal production about the joke which was later analyzed. In contrast to Experiment 1, where the criteria were to choose one variable out of several in a problem-solving situation, Experiment 2 looked for verbal production from the children.

Procedure. The experimental procedure was just like that used in Experiment 1. The researcher sat next to each child and showed the joke while asking the child to explain it.

Evaluation, registers and judges. The verbal productions from the children were transcribed and noted in charts. This information was then given to three judges who classified each utterance according to two criteria regarding the explanation of knowledge: Level I and Level II. Level I is characterized by a description of actions, objects or events that can be seen in the images, but does not explain the relationship among the elements or behaviors of the characters. Thus, we classified this performance as a does not understand response. Level II is characterized by an explicit identification of the relationship that links the events of the joke, and in many cases it includes allusions to the mental state of the protagonist. Hence, we classified this performance as an understand response. By classifying each child's performance, it is possible to discover how each one understood the structure of the situation. The key is whether or not the verbal production signals an explicit relationship between the events and the characters.

Design

A 2 \times 2 experimental design was used for the statistical analysis. The first factor is the age of the children, and one group of 3-year-olds and one group of 4-year-olds are created. The second factor is intra-subject and corresponds to the version of the joke (first and second version). Each of the subjects is exposed the two versions of Joke A: Who was it? (One version with people and another version with animals). For this, a Wilcoxon range test was used. Table 2 explains how the versions of the joke were administered to the children.

Table 2. *Experimental plan of mentalistic joke in its two versions*

	First version Joke A	Second version Joke A Thirty days later
Thirty 3-year-old children	Animals and Lamp	Children and Vase
Thirty 4-year-old children	Children and Vase	Animals and Lamp

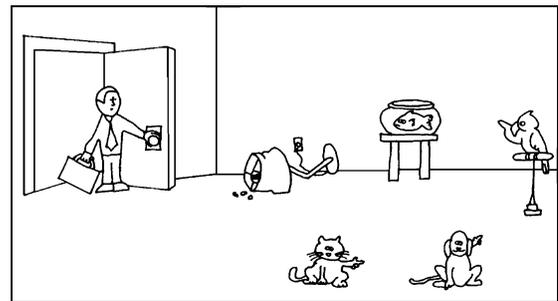


Fig. 10. Joke A, Animals and Lamp.

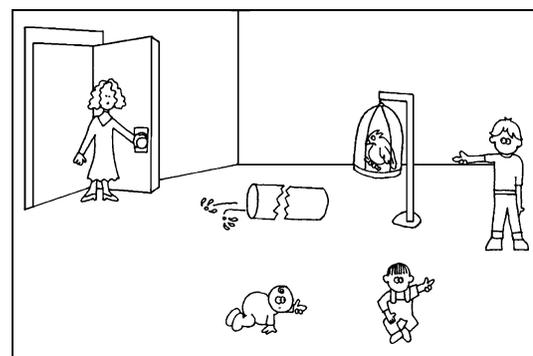


Fig. 11. Joke A', Children and Vase.

Another complementary methodological aspect is present in the design and should be discussed. One of the most common doubts in research about children's comprehension of graphic jokes is being able to determine how the child responds to what, structurally, makes the joke. To evaluate the consistency, one single joke has been produced with two versions. Each of these two versions shows a variation in the presentation of the joke, but they each have the same structure (see Fig. 10 and Fig. 11). This procedure allows the researcher to see if the child responds to the structure of the joke or to random variables.

Results

Composition of the joke: Comparisons between versions. This section will begin with the consistency of the jokes. Table 3 shows the percentages of the total sample of children from

Table 3. Percentage of children from 3 to 4 years old who understand and do not understand the jokes

	Percentage of children that understand	Percentage of children that don't understand
Joke A, first version	78	22
Joke A, second version	73	27

3 to 4 years old who understand the jokes, depending on their ability to explain them.

Table 3 shows that at 3–4 years old, there is a strong consistency in the behavior of the subjects with respect to these two versions. A Wilcoxon test shows that there are no significant differences between the two versions of Joke A ($p = 0.334 < 0.05$).

According to this data, the similarity of the children's performance reveals that the structure of the joke stands despite the differences in presentation. This test eliminates any possible doubts about the comprehension of the specificity of this joke. The 3–4 year olds responded equally to both forms of the joke, and as a result, we can claim that the performance of the children is not the result of random or arbitrary choice, but it is linked to the kind of joke. This consistency reveals a certain degree of success in the control of individual variables.

Table 3 shows the results for the whole group of 3 and 4 year-olds ($MA = 3.6$ years). For Joke A, 78% of the sample understands it, since they explained the relationships between the characters and the event. In contrast, 22% of the sample does not understand, since they simply described or listed the characters and events without giving any explanation of a relationship between them. A 95% confidence interval-test of these results shows that there is a significant difference between the number of children who presented verbal comprehension and the number that did not understand this joke (limit between 0.70 and 0.86, $p < 0.05$).

Results about the criterion for explanation of the jokes. The criterion to judge the successful understanding of the jokes was an explicit explanation. The children's productions were analyzed to identify explanations and descriptions of the relationship between the critical event and the actors in the scene as opposed to those that simply enumerated the characters and critical events in the joke without explanations of the relationship between them.

As has been shown, there is a great similarity between the results for Joke A first version and second version. Because of this similarity, we feel that it is not necessary to show the specific results of both versions of the joke. The following section presents only the results of Joke A-first version.

The transcripts of some of the children's responses can be very illustrative of the level of verbal comprehension. Some

of the responses of the 3-year-old subjects are presented below as examples of explicit explanations:

- The kitty and the child, the dog, the bird, the little fish. The lamp is broken. They are pointing (...) the cat points at the dog, the dog points at the bird, the bird points at the fish, the fish points at the lamp (...) the child is looking to see what broke the lamp. The animals say that it is broken (they are pointing) so that they see it. The child is thinking that the lamp was broken because they weren't careful.
- The dad got angry because the lamp fell. The cat says that the bird made it fall. The bird says that the fish made it fall.
- The cat is doing this (pointing) at the fish. The dog is pointing at the fish and the chicken is pointing at the fish. The animals say that the lamp was broken, and it was the fish. The chick says that the little fish was the one who knocked down the lamp.

These answers reveal the criteria used for classification. In these productions, the child relates the action and the result and identifies the intention to blame someone else for what happened. Some children even point out that it could not have been the last animal (the fish). In some cases the mental states and successive inferential chains are explained.

In contrast, and at the other extreme of the productions, the following are typical examples of responses from 3-year-old subjects who did not give explicit explanations. On the one hand, we have children who simply give a list of animals.

- The cat, the dog, the parrot and the little fish. The animals are looking. The child points at the parrot who points at the child who points at the man.

Others relate the animals and the action, but from a different position.

- The cat, the dog, the parrot, the fish, a lamp. It fell.
- The man is opening the door. The cat is looking, is doing this (pointing). The dog is pointing at the bird, at the fish. (Why?) To show him the parrot.
- The child finds a cat, a monkey, a bird and a fish.

As can be seen in these examples, the difference between the subjects who explained and those who did not explain is that the first group identified the cause-effect relationship within the joke, while the second group simply described the characters without relating them to what happened.

In summary, what is important about this analysis is that it is possible to reveal the distinct levels of comprehension of the joke through these verbal productions. This element is fundamental, especially because some critics consider that with the methodology of choice, as used in Experiment 1, the child does not necessarily respond to the structure of the

joke. With this body of productions we believe that there is no doubt that the child is responding to the specific nature of the incongruence. It is worth it to be surprised at the transparency of the criteria of argumentation in the children as they realize the operations involved.

Discussion

From a methodological point of view, the duplication of the same joke in two different presentations can assure that the child responds to the specific elements of the structure of the joke, rather than responding randomly. The similarity of the performance of the children with regards to Joke A-first version and Joke A-second version eliminates any doubt about the interference of other aspects in the children's responses.

It has been suggested that jokes representationally require that the child move from an original latent meaning to a subversive meaning. A passage is created between the two. The data reveal that when the child explains the relationships that are illustrated by the mentalistic joke, he or she redescribes the original implicit relation at a different level. When one child states that "the animals say that it was broken . . . they are pointing so that they can see", that child is literally redescribing from one level to another. Could it be risky to claim that the child redescribes the original congruent relationship at a more complex level such as that demanded by the incongruent relationship? The answer is simple. The implicit knowledge of the joke is explained in the verbalization and hence shifts to a different level of explication. If there is any doubt, another child adds "The child is thinking that the lamp was broken because they weren't careful." Through this clear identification of a mental state, the child has explained the information recorded by the joke, which implies that at least at some initial level, the child understands the implicit information.

On the other hand, a different child stated, "The cat points at the monkey, the monkey at the bird. The bird is laughing at the fish. The animals say they want to play." This response does not explain relationships or the implicit information, in contrast to the representations that the other children described.

The last level of explication within the Representational Redescription Model (RRM) is characterized by explicitly represented knowledge (Karmiloff-Smith, 1992). The child who says, "Because the lamp broke; somebody made it fall," explains the relationship between the elements that make up the joke. The same can be said for the child who claimed that "The animals made it fall." These children do not treat the information in a segmented manner, like information that is *in* the system. Instead, they treat it as information that is *for* the system. According to Karmiloff-Smith, the children create a redescription of the previous level in such a way that the knowledge that defines level I is now accessible as data to the system (last level of explication).

In summary, what does representational redescription have to do with creating explicit knowledge about the joke? The answer can be simple, and maybe for some, bold. At the risk of seeming too enthusiastic, creating explicit knowledge about the mentalistic joke can be an indicator that the subject goes through the representational redescription process when using implicit representations. Making the information proposed within a mentalistic joke explicit indicates that the child is capable of understanding and functioning between two representational levels, one implicit and the other explicit. The child passes through the implicit level and establishes connections with explicit information in order to return to the original narrative line.

GENERAL DISCUSSION

The main purpose of this study has been to look at unusual ways to observe representational behavior. Some of the first studies about humor were based on graphic jokes (McGhee, 1971a, 1971b; Shultz, 1972; Zigler *et al.*, 1966, 1967), while later studies were focused on verbal humor (McGhee, 1974; Shultz, 1974, 1996; Shultz & Horibe, 1974; Shultz & Pilon, 1973; Johnson & Mervis, 1995). Considering this history, the alternative developed by our team has been concentrated on graphic humor and the ability to specifically account for the nature of the incongruity involved. A previous study showed us the difference between the comic strip with three vignettes without text and the graphic joke with one vignette without text (Lozano Hormaza & Puche Navarro, 1998). Our continued work has shown that it is a worthwhile area to study. It has given evidence of the differences between mentalistic jokes and substitution jokes, and within the classification of mentalistic jokes, it has shown some differentiations based on the nature of the incongruity.

Two issues seem important at the moment for relating the discussion of the two experiments. The first is the interest in the semiological characterization as a reasonable method to unfold the mind and to understand the functioning of the mind. Based on the semiological analysis, it is possible to show the diversity of the joke and the necessity to define the nature of the incongruity more precisely. This diversity is a point of departure to determine and to understand the distinct forms that mental activity takes. It is not enough to allude to the incongruity as such, but it is necessary to define it as a condition of identification of the diverse operations involved in or demanded by the comprehension of the joke. In general, the literature on graphic humor by semiologists (for example, Huber and Leder, 1997) and by psychologists shows the lack of analysis in this area.

The second issue is the evidence that supports a differentiated understanding of certain kinds of jokes throughout development, which implies the use of diverse cognitive operations and varied representational functioning. Based on this study, it is possible to conclude that the subject identifies at a very early age at least three kinds of jokes

(mentalistic, substitution, and complex). However, presumably it is possible to identify other kinds of jokes, such as hyperbolic jokes, among others (Puche-Navarro & Lozano-Hormaza, 1999c). This point has not been explored much in the literature, but the scarcity of interest contrasts with the richness of information that can be collected to understand the representational functioning of the child. In other words, the semiological analysis constitutes an economical, agile, and effective tool to approach representational development.

Returning to the main point, this study has illustrated the utility of using the graphic joke as a means to study representational activity. A good part of the success of using the joke specifically comes from choosing this unusual means in the exploration of representational functioning. Representational activity has been studied in psychology from the point of view of game scenarios, pretend play (Leslie, 1987, 1991; Roth & Leslie 1998; Perinat, 1995, to cite only two lines of research), and more recently, in the form of verbal ironies (Dews *et al.*, 1996; Dews & Winner, 1995; Winner & Gardner, 1993), as well as from the well-known false belief task to study theory of mind (Wimmer & Perner, 1983). Considering the most well-known studies about humor (from McGhee's cited classical studies of 1971 and 1974, to Johnson & Mervis, 1997, including Bariaud, 1989 and Jalongo, 1988) in which verbal performances were the best indicators, this study establishes graphic humor as a good strategy to detect early precocity in representational abilities that, when studied through different means, appear to emerge at a later age.

At the beginning of Experiment 1, we suggested that understanding graphic jokes requires simultaneously considering two different and in some cases conflicting representations of the same object or event. For some authors (Mounoud, 1996) this ability is determining for representational development. It could also be the ability to consider two successive phases of the same situation at the same time. One phase is present in the joke and is subverted. The other is implicit and is the original. This approach implies that to understand the joke, the subject not only "has representations" but also, as Rivière (1998) says, the subject "knows that he or she has them" and is capable of attributing them to others. Our proposal is that this comes from the experience of transiting the distance between representational formats, managing two levels, and differentiating one from the other.

It is clear that the heart of the problem resides in the fact that the joke, understood as a second order intentional system, contains non-explicit (not present) information that the subject must make explicit in order to understand the joke. The proposal is that in order to make this information explicit, the child must go through a representational redescription process. For example, choosing the sick dog alternative as the funniest from three alternatives (a neutral one, a placebo, and the incongruent version) is a methodological modality that shows the shift from an implicit to an explicit format that resulted from representational activity. The different statistical treatments that were applied coincided

in revealing the same tendency. Based on these findings, the second study was initiated using another methodological modality: verbal explanation of knowledge. In addition, more controls were included (the design of two versions of the same joke with equal structure but different presentations). The results point to the same tendency. The children explain the jokes, and in this way there is no doubt that the incongruent alternative is not only understood but also is considered the most funny from the three alternatives.

At one point, we understood one of the weaknesses of our research was the necessity of "opening up" the representational activity. Because of this, we designed the two versions of the joke for Experiment 2. They allowed us if not to get at the mind directly, at least to strengthen the evidence that supports the solidity of the choices of the children as shown in their verbal productions. Identifying the location of the subject within the various levels of explanation allows us to show an essential regularity: the great tendency (78% of the sample) is found in the same levels and as a result we can be sure that this is not simply due to chance.

CONCLUSION

One of the primary objectives of this study has been the introduction of the semiological analysis as a way to study jokes that is complimentary to typical psychological studies. Experiments 1 and 2 provide evidence that the semiological analysis applied to graphic jokes was an excellent methodological instrument to identify the representational functioning of the subjects and to anticipate their performance. The semiological analysis revealed the necessity to detail the nature of the incongruity. The information collected in Experiment 1 shows that the child discriminates between *mentalistic* jokes and *complex* jokes. But it also found a stratification of distinct kinds of jokes according to the complexity of incongruity. This stratification showed that the mentalistic joke is the most and best understood.

In Experiment 2, the question is about the functioning of representational competencies with regard to the jokes. This experiment has provided empirical evidence that suggests that being able to make the understanding of a mentalistic graphic joke explicit is an indicator that the subject has flexible reasoning and uses representational redescriptions.

Working with graphic humor to explore representational activity is not very common among psychologists. In this sense, one of the interests of this article has been to discuss the methodological issues. We have worked with two distinct modalities, one method of study based on the choice of the incongruent alternative and taken as problem solving (Experiment 1), and the other based on the explanation of the verbal knowledge about the joke (Experiment 2). The experimental plan included the duplication of the same joke in two presentations. The role of these two versions of the same joke is a methodological aspect that is crucial in the logic of the test that has been constructed. Several jokes have

been created, and many subjects have been tested. Statistically, more than one treatment has been implemented. All of these distinct strategies coincide to show regular tendencies in the performance of the child with relation to the joke.

There are possibly other questions that have not been answered, but we consider that the results presented here support our enthusiasm for considering that the graphic joke is transparent, economical, and useful in the exploration of the representational capacity of young children. The studies presented here open a door in this direction, and although they are only the beginning, this seems to be a promising area of further research.

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APPENDIX

Sample checklist for the A' Joke

Kindergarten ___ Gender: F ___ M ___ Age: 3 years ___
 months, 4 years ___ months. Date: ___ / ___ / ___
 Child's name: ___ Observer's name: ___ Joke's presentation
 order: ___

1. What is the picture about?

Child's spontaneous verbal responses

Observer utterance

Type 1: Observer's discrete support in the identification of elements.

Question: What characters do you see?

Verbal response

Type 2: Continuous support from the observer. It is not the child but the observer that describes the situation and identify elements.

2. What is this? Who is this?

Mom: ___ Baby: ___ Young child: ___ Old child: ___

Vase/flowers: ___ Broken vase: ___ Bird: ___ Bird Cage: ___

Pointing

The child points out while identifying the principal elements of the picture:

Points out and then speaks

Points out solely

Speaks solely

Speaks and then points out

Simultaneously speaks and points out.

3. What are children doing?

Showing: ___ pointing out: ___ watching: ___

standing up: ___ playing: ___

Other verbal responses

Why are the characters pointing themselves out?

I do not know: ___

So she believes they were responsible: ___

Because it is that way: ___

Because they are saying that the bird was responsible: ___

Because the vase was broken/ was dropped: ___

Other verbal responses: ___

4. Do you think this is a funny picture?

Yes: ___ No: ___

How do you know that it is a funny picture?

Because I know: ___

Because I think is funny: ___

Because he is saying that it was him, nor him, nor him, that it was the bird: ___

Other verbal responses: ___