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The development of comprehension of physiognomic metaphor in photographs

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The study examined child and adult responses to physiognomically suggestive visual metaphor in photographs. Preschoolers, 3 and 4 years of age, normal and high IQ schoolchildren, 6 and 8 years of age, and adults were shown 10 photographs and their responses categorized by type of metaphor (based on physiognomic characteristics, physical similarity, orientation; and gestural/facial, intertextual and allegorization responses). Preschool and 6-year-old children demonstrated significant levels of physiognomic responding, although high IQ, older children and adults showed even higher levels of response. All groups displayed high consistency in physiognomic object responses and were equally good in categorizing a photograph using orientational metaphors as bases. Explanations given indicated that the youngest children used self-referential metaphors exclusively, older children used perceptual and action-based metaphors as well, and adults added context-independent metaphors.

The study of 'physiognomic' aspects of experience has had a long career in developmental research. Werner (1948) made the distinction between literal perception in which objects are perceived according to their objective geometrical–technical qualities and physiognomic perception, in which objects are perceived through the motor and affective attitudes of the subject. Developmentally, physiognomic perception emerges early in development and thus children should show relatively higher rates of physiognomic responding than adults. Moreover, physiognomic qualities may be perceived in both animate and inanimate objects in contrast to anthropomorphism and personification, in which only the expressive* features of inanimate objects are realized. The latter are presumed to arise out of ostensibly more primitive physiognomic experience. Physiognomic properties, of course, may be specified at least in part according to the geometric–technical or physical properties of visual experience. Moreover, responding to the physiognomic properties of objects involves an act of metaphor (Wallach & Kogan, 1965, p. 144; Kogan *et al.*, 1980, p. 2) in that two disparate domains of experience are brought together, the visual pattern and the affective state of the subject. An example is the response by a child to a photograph of a pretzel (a figure-8 shaped brittle biscuit), that 'the pretzel is smiling'.† In I. A. Richards' (1936) terminology, the *tenor* (or topic) of the metaphor in this context is the pretzel or visual object, the *vehicle* is the affective smile, and the *ground* is the common expressive quality of faces and face-like objects.

As the term is used here, 'physiognomic' refers to the attribution of a human or animal quality to animate and inanimate objects such as trees and rocks, e.g. calling the

*The use of the word 'expressive' is to denote a showing of feeling or character.

†To use language to describe an aspect of visual experience is not to say that only the language is metaphorical and not the visual experience. Rather, we would emphasize that metaphor is defined here as a thought process (Miall, 1979) that is brought to bear on its different representations, whether in language, music, painting, photography or dance (Goodman, 1976). In the present study, language is a second-order datum used to describe the 'novel perception of resemblances' (Verbrugge, 1977). That is to say, metaphor involves the perception of similarity between disparate domains of experience, and it is the perceived relationship between these domains that we represent in different symbol systems as metaphorical. We have supplemented linguistic data, moreover, with gestural and facial information in the present study.

photograph of a tree's shadow 'a person's hand' or the photograph of a rock 'a dinosaur'. The attribution of physiognomic properties to the picture constitutes its metaphorization, provided the subject correctly identifies the literal denotation of the picture, i.e. in the above examples, the shadow of the tree, or the rock (Winner, 1979).

Whereas there has been a number of accounts of the similarity or ground between the tenor and vehicle, there is little in the extant literature regarding the dissimilarity or tension between the two. The investigation of physiognomic metaphor offers the opportunity to study these relations. Tourangeau & Sternberg (1981) claim that the best linguistic metaphors involve two conceptual domains that lie far apart but show a close correspondence between respective concepts within the domains. Their claim for conceptual correspondence, however, is limited to a small class of analogical-type metaphors and ignores the role of metaphor outside language (Aldrich, 1968; Goodman, 1976; Thomas, 1985). They assert that some kind of cognitive 'tension' is produced in highlighting aspects of the topic in terms of the vehicle; but how this is brought about, what, if any, is the role of affect in producing this tension, and how affect is implicated in metaphor's important role in creating novelty is glossed over. Their position is a derivative of Black's (1962), who maintains that metaphor not only highlights an antecedent similarity but actually creates the similarity between two respective domains, a view that we share.

For language, Ortony and his associates (Ortony, 1979; Vosniadou & Ortony, 1983) suggest that non-salient features of the topic are perceived in terms of salient features of the vehicle. Whereas 3-year-olds display only undifferentiated similarity distinguishing metaphorical and literal statements from anomalous ones, 4-year-olds differentiate conventional from unconventional categories, the hallmark of metaphorical comparisons. They suggest, however, that non-verbal tasks that highlight perceptual and functional similarity should enable 3-year-olds to make metaphorical comparisons. Gardner and his associates (Wagner *et al.*, 1981) present evidence that young infants possess protometaphorical abilities insofar as they are able to cross-classify sensory modalities, research supported by other studies (e.g. Spelke, 1981; Stern *et al.*, 1985). The research by Stern and his colleagues suggests that affective 'tuning' is modulated by auditory kinesthetic feedback between infant and mother. Moreover, Michotte (1950) showed many years ago that perception and action are inextricably intertwined, and adult subjects will impart emotional reactions even to inanimate objects, such as two coloured rectangles moving together and then apart. It is possible that the animistic bias found in younger children (e.g. Dolgin & Behrend, 1984; Bullock, 1985) may be due, at least in part, to physiognomic predication of inanimate objects that resemble animates, e.g. a face-shaped pretzel. Carey (1985) claims that young children 'interpret what for adults are biological phenomena in terms of psychological causal notions' (p. 194). The early developing ability to link affective states with visually perceived objects may be a precursor of later developing psychological–physical metaphors as well (e.g. Asch & Nerlove, 1960; Cicone *et al.*, 1981).

An important aspect of metaphor seems to be the feeling of surprise, an affective dimension that presumably is a significant ingredient of the tension felt in reading poetry or viewing a painting. Scheff (1985) argues that affect may be a necessary prerequisite for accurate and rational cognition. He showed, in a 'Candid Camera'-type experimental paradigm, surprise preceded understanding of the contrived situation, i.e. an appropriate emotional reaction may be a necessary condition for rational understanding. Tomkins (1982) has long maintained that surprise and interest in its more sustained form 'orients the individual to turn his attention from one thing to another' (p. 363), signalling a resetting of emotional state. As Tomkins notes, 'interest is . . . a necessary condition for the formation of the perceptual world. . . . Without such an underlying continuity of motivational

support, there could indeed be no creation of a single object with complex perspectives and with some unity in its variety' (p. 365–366).

In our view, there is an affective resonance between an object viewed in a photograph and a subjectively felt state and this produces the 'tension' in a physiognomically based metaphor, whether in language, e.g. 'the old man was a gnarled tree' or pictorially, e.g. a picture of a gnarled tree that is said to resemble an old man. The advantage of pictorial metaphor (Kennedy, 1982) is that it can present similarity more directly, excepting more conceptually based metaphorical relationships that may be more easily represented in language.

Previous 'physiognomic' studies link the perception of constructed figures with nonsense words (Kohler, 1947), and the representation of non-spatial referring sentences by line drawings to suggest the metaphorization of space (Werner & Kaplan, 1963). Despite considerable research with line drawings, paintings, sounds, unfamiliar faces and words (Wallach & Kogan, 1965; Schlesinger, 1980; Lindauer. 1984*a*, *b*), few have studied the attribution of expressive qualities to pictures. In those studies that are pictorial, emphasis is usually put on conventionalized line drawings or stick figures in predominantly matching or forced-choice formats (Wallach & Kogan, 1965; Schlesinger, 1979). There is evidence, however, (Friedman & Stevenson, 1975) of substantial learning in the highly stylized representations of human forms in line drawings that may depress the physiognomic effect. Still, Schlesinger (1979) reports a significantly lower rate of physiognomic responding in 4-year-olds than 8-year-olds and adults. Further training in physiognomic reponding with the younger age group was unsuccessful. In spite of this, Wallach & Kogan (1965) believe that higher rates of responding in adults could be due to task demands, vocabulary skills and creativity/intelligence factors that inhibit younger children's performance. It is not clear then that young children are less able to make physiognomic attributions in all tasks and in different media. Nonetheless, those language studies (Nathan & Hass, 1970) that have looked at age increases in physiognomic reponding, report an increase from 4 to 10 years in consensus among children as to which line drawings represent given words. The result is attributed by Nathan & Hass (1970) to synesthetic tendencies to touch the lines, to feel which are 'softer', or to smell the drawings to determine which are more 'fragrant'. It is more likely, however, that during preschool and school age years there is increasing integration of information from visual and verbal channels to account for the superior performance of older children (Reznick, 1977, p. 159).

The present study was designed to clarify these issues by studying the developmental course of physiognomic responding to pictures and by doing so in a medium that has a high degree of fidelity to reality. Since photographs are on the whole more naturally faithful to reality than other pictorial media and are perceived as such by children (O'Connor *et al.*, 1981), they should heighten physiognomic responding, particularly in younger age groups. In order to make the task as easy as possible for young children, the study was designed in an open-format free-response style with a series of verbal probes used to elicit physiognomic attributions to the photographs and tap children's explanations of their metaphors. Since previous work has linked physiognomic responding to creativity and intelligence (Wallach & Kogan, 1965), normal-range IQ child subjects were matched for chronological age with a group of high IQ children. Inasmuch as physiognomic responding could also be a function of the type of objects represented, these were varied in the photographs. Particular attention was given in the analysis of the recorded verbal output to the frequency of 'hedges' in subject protocols. Hedges are words such as 'sort of' or 'somewhat' that have unclear meanings but may pick out certain metaphorical properties of the words they modify (Lakoff, 1972). Hedges function to delimit the predicates they modify by undermining the literal meaning of the word. This follows from

the belief that concepts have unclear boundaries and that adults as well as children perceive category membership as a matter of degree (Mervis & Rosch, 1981). It was expected that hedging by subjects in the face of ambiguous stimuli would indicate conventional categories were being challenged, and would parallel the frequency of physiognomic responding across the age ranges examined.

It was predicted then that (1) photographs would *facilitate* physiognomic responding in the younger age groups studied compared with reports of responding to other media, although significantly less than in an adult comparison group. (2) Children's explanations of their physiognomic attributions would parallel the developmental progression of metaphors based on action to those based on perceptual grounds and finally to conceptual bases, i.e. a progression toward more highly context-independent explanations (Winner *et al.*, 1980). (3) High IQ children in contrast to normal IQ children in the 6–8-year-old groups would approach adult levels of physiognomic responding, and (4) there would be high consistency across all groups, regardless of age, in the kinds of objects subjects physiognomized. Lastly, (5) there would be less use of hedges by preschoolers indicating unfamiliarity with the linguistic use of 'hedging', but moderate metaphorization in these groups suggesting wide but relatively unstructured category boundaries (Mervis & Rosch, 1981; Markman, 1983). School age children would show increased hedging, suggesting stricter category boundaries in real-world knowledge and moderate levels of metaphorical responding. Adolescents and adults would show a decrease, reflecting a return to a loosening of category boundaries, increased metaphorization and relative stabilization of physiognomic attributions. This developmental argument for U-shaped behavioural growth with school age children engaged in a 'literal' stage is detailed by Gardner (Gardner *et al.*, 1978; Winner *et al.*, 1980).

Method

Subjects

The subjects consisted of 70 middle- and working-class multi-ethnic subjects with English as their first language divided into seven groups of equal number. Groups A (3 years) and B (5 years) were drawn from two day-care centres in a large US metropolitan area: Group A (range = 2·83 to 4·17 years; $\bar{X} = 3{\cdot}60$) and group B (range = 4·75 to 5·25 years; $\bar{X} = 4{\cdot}98$). Groups C1/C2 (6 years) and D1/D2 (8 years) were drawn from two separate urban elementary schools from the same city: Group C1 (range = 5·67 to 6·92 years; $\bar{X} = 6{\cdot}37$), group C2 (range = 5·10 to 6·50 years; $\bar{X} = 6{\cdot}18$), group D1 (range = 8·50 to 9·33 years; $\bar{X} = 8{\cdot}90$) and group D2 (range = 7·60 to 8·50 years; $\bar{X} = 8{\cdot}03$). Groups C2 and D2 had reported IQs averaging 155. Group E was drawn from an urban college in the same city (range = 18·40 to 33·00 years; $\bar{X} = 23{\cdot}30$).

Materials

Stimulus materials consisted of 10 photographs, approximately 12·5 × 17·5 cm (4·9 × 6·9 in), commercially prepared. They consisted of photographs of everyday objects such as frontal views of cars, trees, flowers and rocks. The 10 photographs were derived from an original pool of 16 photographs that were presented to a separate group of 10 subjects between the ages of 3 and 11. Since it is nearly impossible to define the population of physiognomic objects (Lindauer, 1984*a*), another group of eight adults rated the original pool of photographs on a Likert-type scale from least (1) to most (5) physiognomic. Those photographs that satisfied the dual criteria of a Likert rating of 4 or 5 and elicited physiognomic and metaphorical responses without difficulty from the separate group of children, constituted the 10 photographs used in the present study (see Appendix). The photographs were mounted and centred on black, 27·5 × 35·0 cm (10·8 × 13·8 in), heavy art supply mounting board. Subjects' verbal responses were recorded on an AIWA TPS-30 portable audio recorder.

Procedure

Each subject was presented with 10 photographs, one at a time, in one of nine possible serial orders. The photographs were held no more than 40 cm (16 in) from the subject's face with the subject and experimenter seated across a small table. The photographs were placed directly in front of the subject, vertical but slightly inclined towards the experimenter. Instructions to the subject were as follows: 'Now (child's name) I am going to show you some pictures and ask you some questions about them. I want you to tell me the first thing that comes in your mind . . . Okay? Remember, there are no right or wrong answers, this is not a test. So say whatever comes into your mind. Are you ready? Good! Here's the first picture. . . .'

Verbal probes. The subjects were first asked: 'What is this a picture of?', or 'Tell me what you see in this picture', in order to establish that the content of the picture could be identified correctly. This was followed by the question: 'Does this picture look like anything else to you?', or from the content of their first response: 'Does (object named) look like anything else to you?' For the youngest subjects (groups A and B) this was sometimes followed by the question: 'Is this a happy (object named) or a sad (object named)?' Depending upon the physiognomic characteristics of the photograph, 'angry' was substituted for 'sad' in the preceding sentence. It was sometimes necessary to use this additional question with younger subjects in order to elicit a physiognomic response.* Explanatory questions included the following: If the subject physiognomized an object in the photograph, the experimenter then asked the subject, e.g. 'How can a pretzel look like a face?', 'How can animals be made out of rocks?', or 'How can asparagus look like a snake?' In each case the child's initial identification of an object in the photograph contrasted with his physiognomic predication of the object.

Verbalization coding. Probes and responses were transcribed verbatim. Although photographs of objects were chosen to maximize physiognomic responding, they could in fact elicit more general metaphors. Thus the classification of responses was in respect to six possible categories, only one of which was physiognomic:

1. *Physiognomic.* Defined as predicating an animal or human quality to an inanimate or animate object in the photograph, such as, calling the photograph of a pretzel 'mickey mouse' or 'he's smiling'.
2. *Physical similarity.* Defined as a response to an inanimate or animate object in the photograph with another inanimate object that resembles the object physically in some way, such as, calling the photograph of a sunflower 'a fan' or the shadow of a tree 'an earthquake'.
3. *Orientational.* Applicable to photograph number 1 only, which was turned upside-down for all subjects. If the subject responded differently when the photograph was turned upside-down from when it was rightside-up, and it could be recorded as either a physiognomic or physical similarity response, it was tallied as an orientational metaphor. An example would be calling the pretzel in photograph number 1 when presented rightside-up 'a face' and when it was turned upside-down 'now it looks like a heart' (adapted from Lakoff & Johnson, 1980).
4. *Gestural/facial.* Accompanied and appeared to support the physiognomic predication, such as, 'The car is going arrhh!' (subject grimaces and raises his voice), or 'It has teeth . . . like this' (subject puts her fingers out in front to demonstrate).
5. *Intertextual.* Statements by the subject that referred to other pictorial 'texts', such as, 'It reminds me of a movie that I saw a very long time ago, "Thriller", and this hand would come out and grab some letters', or 'It looked like an abstract painting'.
6. *Allegorization.* Subject symbolically refers to some personal experience related to the photograph, such as, 'This is the way they always picture somebody if you want to scare your friend. Lock them in a dark place and put on a white sheet. Usually they bury them in white when they're dead . . . they will come back in white' (told by a Haitian-born subject).

Coding of explanations. There were eight categories used to define the type of explanations used by subjects. They were mutually exclusive and some were drawn from the six categories above.

1. *Shape.* Responses, such as, 'It's shaped that way' and 'The shape of it'.
2. *Properties of object.* Non-shape explanations, such as, 'because that's straight' or 'if they're long'.
3. *Ontological.* Included references that focused on identifying aspects of the object(s) in the photograph, such as, 'It looks that way', or 'It's only in a picture' (adapted from Lakoff & Johnson, 1980).
4. *Personification.* Those that specified a physical object as having a human quality, such as, 'a sad pretzel . . . because it wants to get back'.
5. *Outside agent.* Those that specified an effector outside the photograph that somehow was connected with the physiognomized object, such as, 'That's how they make the car', or 'They just made it with a saw'.
6. *Perspectival.* Included comments by the subject that focused in on the way one looked at the object, such as, 'From this perspective, I feel like I'm walking towards the barn'.
7. *Intertextual.* Included statements by the subject that referred to other pictorial texts, such as, 'Makes me think of chains . . . there are pictures like these in libraries where they chain slaves'.
8. *I don't know.* No response to verbal probe, or an 'I don't know' response.

Also recorded were the frequency of hedges occurring in the subject's linguistic protocols (adapted from Lakoff, 1972) and particular objects in the photographs to which physiognomic and metaphoric responses were given.

Inter-rater reliability. Twenty-eight per cent of the protocols were scored for physiognomic and physical similarity responses by a second judge. There was 97·7 per cent agreement on physiognomic responses and 88·3 per cent agreement on physical similarity responses. Differences between judges were adjudicated by discussion.

* For group A approximately 50 per cent of the physiognomic responses were *elicited* from the subjects using one of the affective adjectives 'happy', 'sad', or 'angry'. The other half were *spontaneous* responses to the photographs. For group B there was a higher rate of spontaneous responding and the elicitation procedure was used in only 41 per cent of probed responses of subjects.

Results

Physiognomic responses

A one-way ANOVA was performed on group scores for each photograph across all seven groups. The analysis of variance indicated a significant main effect for group ($F = 8{\cdot}28$, d.f. = 6, 63, $P < 0{\cdot}01$). Scheffé's method for *post hoc* comparison of means ($P < 0{\cdot}05$) yielded a significant difference between the adult/high IQ groups and the preschool/school age groups, i.e. the former gave significantly more physiognomic responses than the latter. Group D1 (8 years) was also significantly different from group C1 (6 years) but not from groups A (3 years) and B (5 years). A repeated measures ANOVA, using photographs as the repeated measure, indicated a significant main effect for group ($F = 13{\cdot}12$, d.f. = 6, 54, $P < 0{\cdot}01$). A more conservative min F' value (Clark, 1973, but cf. Cohen, 1976, and Keppel, 1976) was calculated from the separate ANOVAs both by subjects and photographs. The analysis of variance yielded a significant main effect for group ($F = 5{\cdot}08$, d.f. = 6, 106, $P < 0{\cdot}01$) (see Table 1).

Table 1. Frequency of metaphoric responses by group and type[a]

Type	Group (years)[b] A(3)	B(5)	C1(6)	C2(6)	D1(8)	D2(8)	E(Adult)
Physiognomic	105	109	85	194	137	219	232
Physical similarity	22	12	25	36	40	41	18
Totals	127	121	110	230	177	260	250
Orientational	8	7	9	10	6	10	9
Gestural/facial	1	7	0	2	2	4	1
Intertextual	1	6	1	4	7	2	16
Allegorization	7	15	7	5	9	5	25
Hedges	0	1	3	30	36	8	6

[a] 10 subjects in each group
[b] Groups C2 and D2 are high IQ.

Physiognomic objects

There were common attributions for both physiognomic and physical similarity responses to the photographs across all seven groups regardless of age. For example, many subjects in each group attributed a 'face' to photograph number 1 of a pretzel and a 'heart' when it was turned upside down. For photograph number 2 most subjects said the front of the car looked liked teeth or in photograph number 5 of a flower that it looked like the sun. A common physical similarity response to this photograph was a 'fan' or 'record player'. This consistency of physiognomic and physical similarity responses was maintained across all 10 photographs.

Physical similarity response

A one-way ANOVA was performed on group scores for each photograph across all seven groups. The analysis of variance yielded a non-significant main effect for group ($F = 1{\cdot}12$, d.f. = 6, 63, n.s.) (see Table 1).

Hedges

A one-way ANOVA performed on group scores for each photograph yielded a significant main effect for group, ($F = 21{\cdot}69$, d.f. = 6, 63, $P < 0{\cdot}01$). Although Scheffé's method for *post*

hoc comparisons of means ($P<0{\cdot}05$) did not reach significance, groups C1 (6 years) and D2 (high IQ, 8 years) had large mean differences from the other five groups whose means were all very low, reflecting little use of hedges (see Table 1).

Other responses

For photograph number 1, almost all subjects in all seven groups attributed either a different physiognomic or physical similarity response to the photograph when it was oriented upside-down. Gestural/facial responses were very low in frequency for all seven groups. A one-way ANOVA performed on group scores for intertextual responses indicated a significant main effect for group ($F=4{\cdot}54$, d.f. $=6, 63$, $P<0{\cdot}01$). Duncan's method for *post hoc* comparisons of means ($P<0{\cdot}05$) did not reach significance but there was a large mean difference between the adult group and the other six groups. A one-way ANOVA performed on group scores for allegorization responses yielded a significant main effect for group ($F=7{\cdot}74$, d.f. $=6, 63$, $P<0{\cdot}01$) and a large but non-significant mean difference for the adult group using Duncan's method ($P<0{\cdot}05$) (see Table 1).

Explanations

Explanations for subjects' metaphoric responses revealed consistencies across and within groups. From the original nine categories, seven high-frequency categories were derived which occurred three or more times in any one group. The younger preschool group had a high frequency of perspectival, ontological and personification explanations. These were designated self-referential metaphors because they referenced the subject's relation to the photograph in the above ways. Moreover, at least two of the three occurred frequently, i.e. greater than or equal to three, in the remaining six groups. Likewise, in addition to self-referential metaphors, groups B through D2 (5 through 8 years) based their metaphoric attributions on both shape and properties of the object other than shape. This class of responses was therefore identified as perceptually based metaphors. These middle groups also invoked explanations based on an outside agent, which effected an action on a person or thing, and thus were identified as action-based metaphors. The adult group, in addition to self-referential, perceptual and action-based metaphors, gave intertextual explanations. They were of high frequency and since they referred to experiences outside the photograph proper were classified as context-independent metaphors.

Discussion

The most consistent finding and in keeping with experimental hypotheses (1) and (3) was the ability of preschoolers, without instruction, to produce physiognomic and physical similarity metaphors. The frequency of physiognomic responses by school age children and adults was significantly greater, however, with both 6- and 8-year-old high IQ groups performing at adult levels. The finding runs counter to the Wernerian hypothesis that physiognomic responding decreases with age. All groups made a different physiognomic attribution when a photograph was oriented upside down.

One might expect older chidren and adults to refer more often to outside the picture itself, based on what semioticians call 'intertextuality'. However, this trend was only found with adults and may reflect the open-endedness of the series of verbal probes eliciting responses. Allegorization responses, in which the subject personalizes his relation to the photograph in a symbolic narration, although most frequent in the adult group, were nonetheless found consistently in school age and preschool groups. Peterson & McCabe (1983), who collected over 1000 narratives (defined as relations of events over time) of children between $3\frac{1}{2}$ and $9\frac{1}{2}$ years, have shown simple narration to be a robust phenomenon after the child masters the fully formed sentence at about 3 years of age.

As predicted in hypothesis (2), results paralleled developmental trends in other metaphoric domains. However, the youngest age group did not use shape as a basis for their explanations, unlike Winner *et al.* (1980), who found in a metaphoric renaming task 75 per cent of responses of 3- and 4-year-olds to be based on shape. This may be entirely due to the fact that they used three-dimensional objects in contrast to two-dimensional photographs. The preschoolers stuck to fairly simple attributions, such as personification or attributing animate qualities to things, as is common in young children (Piaget, 1960), as well as simple ontological assertions, such as 'No, it's a pretend tree'. With the older preschoolers and the school age groups there was increasing use of explanations based on shape, properties of the object and outside agency. With the sole appearance in the adult group of intertextual responses, the latter explanations may reflect the ability to more easily provide a context for their responses culled from outside the photograph proper. In this regard, Hadley (1982) reports that younger children need more contextual support in interpreting figurative assertions than older children.

Consistent with hypothesis (4), preschoolers, school age children and adults categorized objects in photographs in similar ways. For those photographs that embody physiognomic cues, young children as well as adults were able to utilize this presumably primitive element in representation to organize incoming visual information.

The predictions of hypothesis (5) were partly born out. The low frequency of hedges in the preschool groups suggests that they deal with photographs analogically, i.e. they take them perceptually at face value, whereas school age children when confronted with ambiguous stimuli 'hedge' their explanations in ways that indicate stricter category boundaries of real-world knowledge. By school age there is a marked rise in the use of hedges peaking at 8 or 9 years, which may reflect school emphasis on precise and literal language use (Scribner & Cole, 1981). The high IQ groups appear to achieve this earlier, at about the 6th or 7th year of age. The older high IQ group and adults return to a lower frequency of hedges but the overall age trend on this variable may reflect, to some extent, its task-specific nature. It would be of interest to examine this developmental trend within other kinds of media.

One advantage of pictorial metaphor over linguistic metaphor, particularly visual metaphor which draws on physiognomic characteristics of objects, is that it may be more accessible and hence comprehensible to younger children, due in large part to its perceptual immediacy, and as Gombrich (1982) emphasizes, to the primacy of the visual image in experience. This also suggests the need for further research to investigate the affective basis of metaphor, which has been a neglected aspect of metaphor study. Physiognomic metaphors presumably arise in part from an affective base although it may be that all metaphorical assertions have some affective components as some have suggested (R. M. Billow, personal communication, 10 April 1985; Henle, 1958).

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References

Aldrich, V. C. (1968). Visual metaphor. *Journal of Aesthetic Education*, **2**(1), 73–86.

Asch, S. E. & Nerlove, H. (1960). The development of double-function terms in children. In B. Kaplan & S. Wapner (eds), *Perspectives in Psychological Theory*. New York: International Universities Press.

Black, M. (1962). *Models and Metaphors: Studies in Language and Philosophy*. New York: Cornell University Press.

Bullock, M. (1985). Animism in childhood thinking: A new look at an old question. *Developmental Psychology*, **21**(2), 217–225.

Carey, S. (1985). *Conceptual Change in Childhood*. Cambridge, MA: MIT Press.

Cicone, M., Gardner, H. & Winner, E. (1981). Understanding the psychology in psychological metaphors. *Journal of Child Language*, **8**, 213–216.

Clark, H. H. (1973). The language-as-fixed-effect fallacy: A critique of language statistics in psychological research. *Journal of Verbal Learning and Verbal Behavior*, **12**, 335–359.

Cohen, J. (1976). Random means random. *Journal of Verbal Learning and Verbal Behavior*, **15**, 257–266.

Dolgin, K. G. & Behrend, D. A. (1984). Children's knowledge about animates and inanimates. *Child Development*, **55**, 1646–1650.

Friedman, S. L. & Stevenson, M. B. (1975). Developmental changes in the understanding of implied motion in two-dimensional pictures. *Child Development*, **46**, 773–778.

Gardner, H., Winner, E., Bechhofer, R. & Wolf, D. (1978). The development of figurative language. In K. E. Nelson (ed.), *Children's Language*, vol. 1, pp. 1–38. New York: Gardner Press.

Gombrich, E. H. (1982). *The Image and the Eye: Further Studies in the Psychology of Pictorial Representation*. Oxford: Phaldon Press.

Goodman, N. (1976). *Languages of Art: An Approach to a Theory of Symbols*, 2nd ed. Indianapolis, IN: Hackett.

Hadley, M. (1982). A realization of metaphor in context: A developmental study of interpretation. Unpublished doctoral dissertation, City University of New York Graduate Center, New York.

Henle, P. (1958). Metaphor. In P. Henle (ed.), *Language, Thought and Culture*, pp. 173–195. Ann Arbor, MI: University of Michigan Press.

Kennedy, J. M. (1982). Metaphor in pictures. *Perception*, **11**(5), 589–605.

Keppel, G. (1976). Words as random variables. *Journal of Verbal Learning and Verbal Behavior*, **15**, 263–265.

Kogan, N., Connor, K., Gross, A. & Fava, D. (1980). Understanding visual metaphor: Developmental and individual differences. *Monographs of the Society for Research in Child Development*, **45**(1, serial no. 183).

Kohler, W. (1947). *Gestalt Psychology*. New York: Liveright.

Lakoff, G. (1972). Hedges: A study in meaning criteria and the logic of fuzzy concepts. Paper presented at the Eighth Regional Meeting, Chicago Linguistic Society, Chicago, IL, April.

Lakoff, G. & Johnson, M. (1980). *Metaphors We Live By*. Chicago: University of Chicago Press.

Lindauer, M. S. (1984*a*). Physiognomic perception. In R. J. Corsini (ed.), *Encyclopedia of Psychology*, pp. 42–43. New York: Wiley.

Lindauer, M. S. (1984*b*). Physiognomy and art: Approaches from above, below, and sideways. *Visual Arts Research*, **10**, 52–65.

Markman, E. M. (1983). Two different kinds of hierarchical organization. In E. K. Scholnick (ed.), *New Trends in Conceptual Representation: Challenges to Piaget's Theory*? pp. 165–184. Hillsdale, NJ: Erlbaum.

Mervis, C. B. & Rosch, E. (1981). Categorization of natural objects. *Annual Review of Psychology*, **32**, 89–115.

Miall, D. S. (1979). Metaphor as a thought-process. *Journal of Aesthetics and Art Criticism*, **38**(1), 21–28.

Michotte, A. E. (1950). The emotional significance of movement. In M. L. Reymert (ed.), *Feelings and Emotions*, pp. 114–126. New York: McGraw-Hill.

Nathan, S. W. & Hass, W. A. (1970). Age-development in the linear representation of words and objects. *Journal of Genetic Psychology*, **117**, 197–204.

O'Connor, J., Beilin, H. & Kose, G. (1981). Children's belief in photographic fidelity. *Developmental Psychology*, **17**(5), 859–865.

Ortony, A. (1979). Beyond literal similarity. *Psychological Review*, **86**(3), 161–180.

Peterson, C. & McCabe, A. (1983). *Developmental Psycholinguistics: Three Ways of Looking at a Child's Narrative*. New York: Plenum Press.

Piaget, J. (1960). *The Child's Conception of the World*. Totowa, NJ: Littlefield, Adams & Co.

Reznick, H. M. (1977). Developmental changes in children's strategies for processing pictorial information. *Merrill-Palmer Quarterly*, **23**(3), 143–162.

Richards, I. A. (1936). *The Philosophy of Rhetoric*. London: Oxford University Press.

Scheff, T. J. (1985). The primacy of affect. *American Psychologist*, **40**(10), 849–850.

Schlesinger, L. B. (1979). Physiognomic sensitivity: Its development and modification. *Journal of Genetic Psychology*, **134**, 107–123.

Schlesinger, L. B. (1980). Physiognomic perception: Empirical and theoretical perspectives. *Genetic Psychology Monographs*, **101**, 71–97.

Scribner, S. & Cole, M. (1981). *The Psychology of Literacy*. Cambridge, MA: Harvard University Press.

Spelke, E. S. (1981). The infant's acquisition of knowledge of bimodally specified events. *Journal of Experimental Child Psychology*, **31**, 279–299.

Stern, D. N., Hofer, L., Haft, W. & Dore, J. (1985). Affect attunement: The sharing of feeling states between mother and infant by means of inter-modal fluency. In T. Field & N. Fox (eds), *Social Perception in Infants*. Norwood, NJ: Ablex.

Thomas, W. J. (1985). An exposition of visual metaphor (Doctoral dissertation, The Pennyslvania State University, 1985). *Dissertation Abstracts International*, **46,** 1488A.

Tomkins, S. S. (1982). Affect theory. In P. Ekman (ed.), *Emotion in the Human Face*, pp. 353–395. New York: Cambridge University Press.

Tourangeau, R. & Sternberg, R. J. (1981). Aptness in metaphor. *Cognitive Psychology*, **13,** 27–55.

Verbrugge, R. R. (1977). Resemblances in language and perception. In R. Shaw & J. Bransford (eds), *Perceiving, Acting and Knowing: Toward an Ecological Psychology*, pp. 365–389. Hillsdale, NJ: Erlbaum.

Vosniadou, S. & Ortony, A. (1983). The emergence of the literal metaphorical anomalous distinction in young children. *Child Development*, **54,** 154–161.

Wagner, S., Winner, E., Cicchetti, D. & Gardner, H. (1981). 'Metaphorical' mapping in human infants. *Child Development*, **52,** 728–731.

Wallach, M. A. & Kogan, N. (1965). *Modes of Thinking in Young Children*. New York: Holt, Rinehart & Winston.

Werner, H. (1948). *Comparative Psychology of Mental Development*. Chicago: Follet.

Werner, H. & Kaplan B. (1963). *Symbol Formation*. New York: Wiley.

Winner, E. (1979). New names for old things: The emergence of metaphoric language. *Journal of Child Language*, **6,** 469–491.

Winner, E., McCarthy, M. & Gardner, H. (1980). The ontogenesis of metaphor. In R. P. Honeck & R. R. Hoffman (eds), *Cognition and Figurative Language*, pp. 341–361. Hillsdale, NJ: Erlbaum.

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Appendix A