BALANCE AND AGREEMENT IN CHILDREN'S SOCIAL PERCEPTION

by

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ABSTRACT

The primary purpose of this study was to investigate the structural bases of pleasantness and consistency ratings and to determine the relationship between the two types of judgement in children ranging in age from 5-12 years. A secondary purpose of the study was to determine whether the results of studies by Atwood (1969) and by Storm and Knox (1969) using a prediction procedure to investigate the developmental course of cognitive balance would generalize to a different dependent measure.

Subjects in the study were 80 children, 20 (10 males and 10 females) from each of the following age groups: 5-6, 7-8, 9-10, and 11-12 years. They rated hypothetical social situations both for pleasantness and for consistency. The situations were of the P-O-X type, consisting of the subject, another person, and an unspecified, but important "thing."

On the assumption that affect influences the social perceptions of younger children more than considerations of consistency it was predicted that in their ratings of social situations younger children would differentiate little between pleasantness and consistency (i.e., situations rated as pleasant would also be rated as consistent). Relative to the youngest children, older children were expected to differentiate more between pleasantness and consistency. Thus, it was predicted that as a function of increasing age, correlations between pleasantness and consistency ratings would monotonically decrease across the successive age groups in the study. Further, it was predicted that children at all age levels would attach greater weight to agreement than to balance when making pleasantness ratings and that younger children would also base consistency ratings more on agreement than on balance. However, balance was expected to exert greater in-

fluence than agreement on the consistency ratings of older children. This follows from Zajonc's (1968) review and its extension which suggest that agreement is more important than balance when the dependent measure relates to affect whereas balance exerts greatest influence when the task relates to psychological consistency.

The results failed to yield evidence of age differences in differentiation between pleasantness and consistency. Correlations between the two types of ratings were high in all groups. These were also no age differences in the relative weighting of balance and agreement. Children in all groups utilized balance to a slightly greater extent than agreement when pleasantness was the criterion; agreement was used to a slightly greater extent than balance when the children rated for consistency. The effects of balance and agreement were very small, however, in comparison to those of attraction. Children in all age groups appeared to base both pleasantness and consistency ratings primarily on attraction (i.e., on the sign of the P/O bond).

A cross-validation study conducted concurrently with the principal study by an independent and "naive" E yielded the same pattern of results.

Differences in results obtained with children in the rating situation vs the prediction situation were tentatively attributed to differential task complexity. It was suggested that differences between adults (cf., Zajonc, 1968) and children in the rating situation may be due to differences in information processing abilities and/or to differences in the strength of the balance "schema." That is, the "schema" or implicit code for balance may be more firmly established in adults than in children. This could perhaps account for the fact that although adults utilize balance to a greater extent than agreement or attraction in the prediction situation and when

rating for consistency, strong balance effects among children are obtained only in the easier prediction situation. The balance "schema" in children, in other words, may not be of sufficient strength to withstand the competition of alternative biases such as attraction, agreement, and positivity when the more complex rating task is used.

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CHAPTER I

INTRODUCTION

Considerable attention has been focused, in recent year, on the development and extension of theories of "cognitive consistency." Abelson and Rosenberg (1958), Cartwright and Harary (1956), Festinger (1957), Heider (1946, 1958), McGuire (1960), Newcomb (1953) and Osgood and Tannenbaum (1955) are among those who have proposed theories of this type. Common to all is the postulation of tendencies toward meaningful and harmonious organization of the individual's thought, beliefs, attitudes, and behaviour. In common also is the postulation of tendencies toward reduction of inconsistencies between elements of the individual's cognitive system. These theories differ, however, in terminology, in rigor of definition, and in the type of situation to which they most typically apply.

The present study relates most directly to the formulations of Heider (1946, 1958). In Heider's Balance model, analysis is focused on the P-O-X triad, consisting of P (the perceiver), O (another person) and X (either a third person or an impersonal entity). Relations between triadic elements are of two types: sentiment relations (like or dislike) and unit relations (associated with or not associated with).

> . . . separate entities comprise a unit when they are perceived as belonging together. For example, members of a family are seen as a unit; a person and his deeds belong together.
>
> (Heider, 1958, p. 176)

Units are formed on the basis of perceived similarity, proximity, familiarity, ownership, causality, or kinship. Balance is defined in terms of the number of positive and negative relations in the P-O-X triad. Like (L) and associative relations (U) are classified as positive; dislike (DL) and non-

associative relations (not-U) are classified as negative. A triadic system is considered to be in a state of balance if three relations are positive or if two are negative and one is positive. Structures 1, 2, 7, and 8 in Figure 1 satisfy the criteria for balance. Triads consisting of two

Figure 1

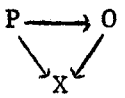
positive and one negative relation are considered imbalanced. Heider states, though with some equivocation, that imbalance also exists if all three relations are negative.

> . . . Four [structures] are balanced, containing three positive relations, or one positive and two negative. Four are unbalanced, with three negative or two positive relations.
>
> . . . If two negative relations are given, balance can be obtained either when the third relation is positive or when it is negative; although there appears to be a preference for the positive alternative.
>
> (Heider, 1958, Pp. 204-206)

The fundamental assumptions of Balance Theory are (a) that sentiment and unit relations tend toward balance, and (b) that imbalanced states produce tension and generate forces to restore balance. Heider views the balanced state as "a situation in which the perceived units and experienced sentiments co-exist without stress; there is thus no pressure toward change either in the cognitive organization or in the sentiment" (Heider, 1958, p. 176).

Cartwright and Harary (1956) have extended the range of situations to which Balance Theory is applicable by defining balance in graph theoretical terms. According to their formulation, a system is balanced

Balanced structures



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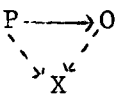

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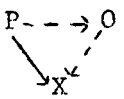

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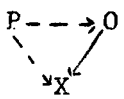

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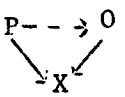
Imbalanced structures



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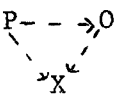

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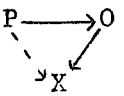

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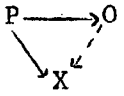

(6)

Figure 1: Diagrammatic representation of balanced and imbalanced structures. (Solid lines indicate positive relations; dashed lines indicate negative relations.)

if all the semicycles within the system are positive. (A semicycle is defined as a collection of two or more lines forming a closed path in a graph. For example, the structure  contains three semicycles: $P\vec{O},\vec{P}O$; $P\vec{O},O\vec{X},\vec{X}P$; and $P\vec{O},O\vec{X},\vec{X}P$. The sign of a semicycle is positive if the product of the signs of the lines forming the semicycle is positive.) This definition of balance is applicable to structures containing any finite number of relations. There is no limitation on the type and number of relations defined on a particular set of elements. In addition, the Cartwright and Harary formulation provides a means of handling non-reciprocal relations between structural elements (e.g., a situation where P likes O, but O does not like P). Heider states that non-reciprocal liking is imbalanced, but fails to include such situations in his structural definition of balance. The definition of balance in terms of semicycles has the added advantage of permitting degrees of balance to be specified. This is accomplished by computing the proportion of positive semicycles to total number of semicycles in the system.

Empirical Studies of Cognitive Balance

A number of techniques have been devised to test Heider's (1946, 1958) Balance theory, and its extensions. One method follows from the assumption that states of imbalance generate tension and are unpleasant (cf., Heider, 1958, p. 207), and requires that subjects rate hypothetical social situations for subjective feelings of "unpleasantness." Jordan (1953), for example, had subjects rate sixty-four triadic structures for unpleasantness. The structures represented all possible combinations of L, DL, U, and not-U relations and were of the following form: "I dislike O; I like X; O has

no sort of bond or relationship with X." The subject was instructed to imagine himself in the situation, playing the role of "I" and then to rate the situation for pleasantness or unpleasantness on a ninety-point scale. The results of Jordan's study supported Heider's hypothesis--there was a statistically significant tendency for balanced structures to be rated more pleasant than imbalanced structures. Contrary to prediction however, subjects tended to distinguish between balanced structures containing positive relationships between P and O, and those in which the P/O relationship was negative, the latter being rated considerably more unpleasant than the former. In fact, the mean rating for balanced structures with negative P/O bonds was hardly distinguishable from that given to imbalanced structures. Subsequent studies which have used pleasantness-unpleasantness ratings to test derivatives of the balance hypothesis show a similar discrepancy between prediction and results (e.g., Hershkowitz, 1954; Price, Harburg, and Newcomb, 1966; Rodrigues, 1966; Steiner and Spaulding, 1966).

Jordan (1953) attempted to account for this, and other discrepancies between prediction and results, by suggesting that "the original coordinating definition of balance and pleasure is faulty." He recommends instead that balance "be coordinated with the concept of a strong or good 'gestalt.' A strong gestalt is characterized in practically all 'gestalt' theoretical literature as a most proper, inner-necessary state. Balanced situations can therefore be considered to be experienced as more proper than imbalanced situations independent of their degree of experienced pleasantness. Propriety is not synonymous with pleasantness. For many, retribution for sins is proper, but few if any consider it to be pleasant" (p. 282).

Following this lead, Knox (1963) had subjects (n=10) rate a number

of hypothetical social situations of the P-O-X type for pleasantness and for "consistency." Consistency was defined as "a state of logical congruity among the persons and thing in the [P-O-X] situation." The subject was instructed to rate situations that seemed "to hang together in a logical, sensible, and rational manner" toward the consistent end of the scale. He was instructed to rate situations that seemed "'out of kilter,' illogical, and irrational," toward the inconsistent end of the scale. The results showed a weak, but significant positive relationship between pleasantness ratings and consistency ratings ($r = +.20$). Knox concludes that pleasantness and consistency are not equivalent terms (p. 81). A subsequent study by Gutman (1969) was designed to replicate Knox's (1963) findings and to determine the relationship or possible equivalence of the concepts of pleasantness, consistency, and tension. The subjects in this study (n=84) rated the eight structures shown in Figure 1 on 9-point scales anchored by the terms unpleasant-pleasant, inconsistent-consistent, and no tension-very strong tension. The results yielded a significant Pearson correlation of +.47 between the pleasantness and consistency ratings.[1] The correlations between pleasantness and tension ratings and between consistency and tension ratings were -.81 and -.42 respectively. These findings indicate that subjects define as unpleasant the same situations that they define as tension-provoking. The results suggest also that

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[1] Differences in the time interval between pleasantness and consistency ratings may perhaps account for the difference in magnitude of the correlation between pleasantness and consistency in the Knox (1963) and the Gutman (1969) studies. In Knox's study, pleasantness and consistency ratings were collected in four sessions held on alternate days in an ABBA design. In Gutman's study, pleasantness, consistency, and tension ratings were collected in a single one hour session.

subjects differentiate between situations that are unpleasant and tension-provoking and those that are psychologically inconsistent.

Rather than attributing the distinction in the rated pleasantness of balanced structures with positive P/O bonds and those with negative P/O bonds to a fault in the coordinating definition of balance and pleasantness, Rodrigues (1965) has suggested that "agreement" may act as an independent source of "cognitive bias," conflicting with tendencies toward balance in the P/O negative case. As shown in Figure 1, where P likes O, balance is achieved when P and O have the same attitude toward X. Where P dislikes O, balance results from disagreement regarding X. Thus, in the P/O positive case preferences for balance and agreement work in the same direction. In the P/O negative case, agreement and balance work in opposite directions. Jordan's results suggest that subjects' ratings are affected by this conflict of forces. Mean unpleasantness ratings were lowest in balanced structures with agreement and highest (most unpleasant) in balanced structures with disagreement. Imbalanced structures containing agreement were rated somewhat more pleasant than imbalanced structures containing disagreement. Rodrigues (1965) obtained similar results when he had subjects rate triadic structures for tension. His data show an increase in mean tension ratings as one goes from balanced structures with agreement, through imbalanced structures with agreement and imbalanced structures with disagreement, to balanced structures with disagreement.

Newcomb (1968), on the other hand, feels that agreement or disagreement between P and O may have little effect on the perceived pleasantness of a situation in which P and O dislike one another. He states that the negative P/O bond "engenders its own tension, which is independent of the

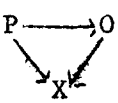
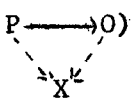
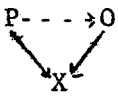
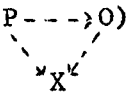
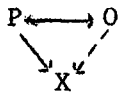
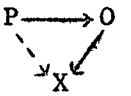
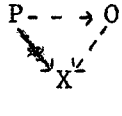
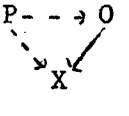
kind of tension that is intrinsic to the notion of balance, as defined by Heider and by others who have followed him" (p. 33). Consistent with this line of reasoning, Jordan (1966) reports that a considerable portion of the variance in the 1953 study is accounted for by the sign of the P/O bond. The results of studies by Steiner and Spaulding (1966) and Hershkowitz (1954) also suggest that the sign of the P/O bond could be an important determinent of pleasantness ratings. The question that remains is which factor contributes most to social perception in the triadic situation: balance, agreement, or attraction (i.e., sign of the P/O bond)?

Zajonc (1968) analyzed data from a number of empirical studies of social perception and reports that approximately half favor agreement over balance as the more critical determinant of responses. None favor attraction. Included in his analysis were several studies involving pleasantness-unpleasantness ratings (Hershkowitz, 1954; Jordan, 1953; Price, Harburg, and Newcomb, 1966; Rodrigues, 1966; Steiner and Spaulding, 1966), a study which required prediction of missing relations (Morrissette, 1958), and two so-called "ease-of-learning" studies (Zajonc and Burnstein, 1965a, 1965b). In the prediction study, subjects were required to role-play a move into an apartment. Sentiments among some of the roommates were given. The subject's task was to predict the remaining sentiments and to rate how much tension he would feel in such a situation. The two ease-of-learning studies utilized a paired-associates technique. The dependent measure was the number of errors made in learning the signs of relations in P-O-X and P-O-X-Y structures. (Structures of type P-O-X-Y involve two persons and their attitudes toward two issues.)

The method of analysis utilized by Zajonc involved calculation of

separate indices for balance, agreement, and attraction. These indices are derived by ordering the eight triads shown in Figure 1 into four quadrants. As shown in Figure 2, the quadrants are derived by considering the sign of the P/O bond (+ or -) and the presence or absence of agreement between P and O with regard to X. Quadrant A contains structures in which there

Figure 2

is a positive bond between P and O and agreement with regard to X (i.e., structures  and ); quadrant B contains structures in which there is a negative bond between P and O, and agreement concerning X (structures  and ). Structures  and  are represented in quadrant C; structures  and  are represented in quadrant D. Only quadrants A and D contain balanced structures. The effects of balance are estimated by the ratio of average scores (on whatever dependent measure was used in a particular study) for structures in balanced quadrants to the average scores for structures in imbalanced quadrants (i.e., quadrants $\frac{A + D}{B + C}$). The effects of agreement are estimated by the ratio of quadrants containing agreement to those containing disagreement ($\frac{A + B}{C + D}$). The effects of attraction are estimated by the ratio of P/O positive to P/O negative quadrants ($\frac{A + C}{B + D}$). The relative strength of each structural factor is determined by comparing the magnitude of indices computed from these ratios. If the effects of agreement are stronger than

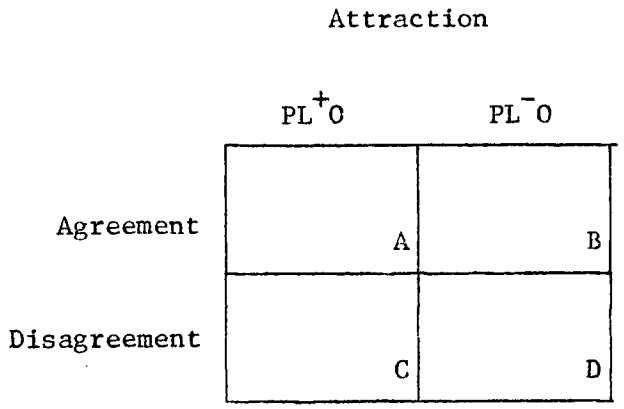


Figure 2: Quadrants utilized in computing Zajonc indices.

those of balance, the agreement index is greater than that for balance. The situation is reversed if the effects of balance are stronger than those of agreement. The index for attraction would be greatest if this were the most important determinant of the subjects' responses.

A concrete example may perhaps clarify the procedure following in computing Zajonc indices. Data in the example come from Jordan's (1953) study.

Quadrant	Structures in Quadrant	Mean rating for each structure	Mean rating for each quadrant
A	+++	22.1	27.9
	+--	33.8	
B	-++	59.1	64.5
	---	69.9	
C	++-	64.5	65.8
	+-+	67.1	
D	-+-	64.2	67.8
	--+	71.5	

	Attraction	
	$PL^{+}O$	$PL^{-}O$
Agreement	27.9	64.5
Disagreement	65.8	67.8

Index of Agreement: $\frac{27.9 + 64.5}{65.8 + 67.8} = 1.44$

Index of Attraction: $\frac{27.9 + 65.8}{64.5 + 67.8} = 1.41$

Index of Balance: $\frac{27.9 + 67.8}{64.5 + 65.8} = 1.36$

The results of Zajonc's (1968) analysis are shown in Table 1. As he reports, approximately half of the studies in the table favor agreement over balance as the more critical determinant of social perception. As Knox (1969) has pointed out, however, the bulk of evidence in favor of agreement in the table comes from studies which utilize pleasantness ratings. Reorganization and extension of Zajonc's table (see Table 2)

Table 1

shows that indices of balance are greater than those of agreement and attraction in tasks involving prediction of missing relations, ease-of-learning, consistency ratings, or stability assessment. (Studies of the latter type require the subject to indicate whether he would expect a particular structure to remain the same or to change over time.) Thus, balance seems to be the more important factor when the dependent measure relates to psychological consistency. Agreement would seem to be more

Table 2

important when the measure is based on affect.

Table 1: A comparison of balance, agreement, and attraction (Zajonc, 1968, p. 348)

Study, measure, and condition	p and o agree		p and o disagree		Effect ratio		
	$pL^{+}o$	$pL^{-}o$	$pL^{+}o$	$pL^{-}o$	Agreement	Attraction	Balance
Hershkowitz (1954)							
Unpleasantness scores on a 100-point rating scale							
a) Values	20.1	54.2	66.6	62.9	1.74	1.35	1.46
b) Objects	24.3	54.7	60.6	62.9	1.56	1.38	1.32
Jordan (1953)							
Unpleasantness scores on a 90-point rating scale	27.9	64.5	65.8	67.8	1.44	1.41	1.36
Morrissette (1958)							
Percent of Ss predicting a positive or negative relation between o and x.	73%	37%	27%	63%	1.22	--	2.12
Price, Harburg, and Newcomb (1966)							
Percent of Ss reporting unpleasant affect	6%	41%	87%	36%	2.61	--	3.04
Rodrigues (1966)							
Unpleasantness scores on a 90-point rating scale							
a) Control (replication of Jordan)	27.5	65.6	63.0	57.0	1.29	1.35	1.52
b) Strong relation among peers	22.5	55.0	73.1	64.5	1.77	1.25	1.47
c) Weak relation among peers	34.3	45.0	61.7	58.9	1.52	1.08	1.14
d) Strong relation between p and an expert	21.9	58.8	64.9	73.3	1.71	1.52	1.40
e) Weak relation between p and an expert	33.2	50.9	60.1	67.7	1.52	1.27	1.10
Zajonc and Burnstein (1965a) Errors in learning of structures							
a) Important issue	1.87	2.58	3.07	1.85	1.10	0.90	1.53
b) Trivial issue	3.87	2.47	2.80	3.00	0.91	0.82	0.77
Zajonc and Burnstein (1965b) Errors in learning of structures	2.45	3.35	3.06	1.91	0.85	0.95	1.47

Table 1 Continued

Study, measure, and condition	p and o agree		p and o disagree		Effect ratio		
	$pL^{+}o$	$pL^{-}o$	$pL^{+}o$	$pL^{-}o$	Agreement	Attraction	Balance
Steiner and Spaulding (1966) Pleasantness ratings from 1 to 18 (sum of four items)							
a) Wisconsin sample males	31.20	17.68	17.88	22.37	1.21	1.22	1.51
b) Wisconsin sample females	30.47	14.79	19.47	22.47	1.08	1.34	1.54
c) Illinois sample (8 items) males	55.93	33.75	33.23	43.25	1.17	1.16	1.48
d) Illinois sample (8 items) females	58.32	34.32	34.00	42.68	1.21	1.20	1.47

Table 2: Reorganization and extension of Zajonc's table comparing balance, agreement, and attraction

Study, measure, and condition	p and o agree		p and o disagree		Effect Ratio		
	$pL^{+}o$	$pL^{-}o$	$pL^{+}o$	$pL^{-}o$	Agreement	Attraction	Balance
I. Pleasantness, tension, or consistency ratings							
Gutman (1969)							
a) Pleasantness scores on a 9-point scale	6.91	3.40	4.17	1.74	1.74	2.15	1.14
b) Consistency scores on a 9-point scale	6.77	3.55	4.16	4.46	1.20	1.36	1.46
c) Tension scores on a 9-point scale	.76	3.98	3.66	6.14	2.07	2.29	1.11
Hershkowitz (1954)							
Unpleasantness scores on a 100-point scale							
a) values	20.1	54.2	66.6	62.9	1.74	1.35	1.46
b) objects	24.3	54.7	60.6	62.9	1.56	1.38	1.32
Jordan (1953)							
Unpleasantness scores on a 90-point scale	27.9	64.5	65.8	67.8	1.44	1.41	1.36
Knox (1963)							
a) Pleasantness scores on a 9-point scale (reciprocated sentiments only)							
1) positive unit relations	8.69	2.90	6.45	1.33	1.49	3.58	1.07
2) negative unit relations	5.97	4.45	5.10	3.94	1.15	1.32	1.04
b) Consistency scores on a 9-point scale (reciprocated sentiments only)							
1) positive unit relations	8.52	3.60	4.41	7.35	1.03	1.18	1.98
2) negative unit relations	6.74	4.39	4.28	6.92	.99	.97	1.58
Price, Harburg, and Newcomb (1966)							
Percent of Ss reporting unpleasant affect	6%	41%	87%	36%	2.61	--	3.04

Table 2 Continued

Study, measure, and condition	p and o agree		p and o disagree		Effect Ratio		
	$pL^{+}o$	$pL^{-}o$	$pL^{+}o$	$pL^{-}o$	Agreement	Attraction	Balance
Rodrigues (1965)							
Tension ratings on a 7-point scale	1.5	2.3	3.1	4.2	1.92	1.41	.95
Rodrigues (1966)							
Unpleasantness scores on a 90-point scale							
a) Replication of Jordan	27.5	65.6	63.0	57.0	1.29	1.35	1.52
b) Strong relations among peers	22.5	55.0	73.1	64.5	1.77	1.25	1.47
c) Weak relations among peers	34.3	45.0	61.7	58.9	1.52	1.08	1.14
d) Strong relations between p and an expert	21.9	58.8	64.9	73.3	1.71	1.52	1.40
e) Weak relations between p and an expert	33.2	50.9	60.1	67.7	1.52	1.27	1.10
Steiner and Spaulding (1966)							
Pleasantness ratings from 1 to 18 (sum of 4 items)							
a) Wisconsin males	31.20	17.68	17.88	22.37	1.21	1.22	1.51
b) Wisconsin females	30.47	14.79	19.47	22.47	1.08	1.34	1.54
c) Illinois males	55.93	33.75	33.23	43.25	1.17	1.16	1.48
d) Illinois females	58.32	34.32	34.00	42.68	1.21	1.20	1.47
II. Prediction of missing relations							
Morrissette (1958)							
Percent of Ss predicting a positive or negative relation between o and x.	73%	37%	27%	63%	1.22	--	2.12
III. Ease-of-learning studies							
Zajonc and Burnstein (1965a)							
Errors in learning of structures							
a) important issue	1.87	2.58	3.07	1.85	1.10	0.90	1.53
b) trivial issue	3.87	2.47	2.80	3.00	0.91	0.82	0.77

Table 2 Continued

Study, measure, and condition	p and o agree		p and o disagree		Effect Ratio		
	$pL^{+}o$	$pL^{-}o$	$pL^{+}o$	$pL^{-}o$	Agreement	Attraction	Balance
Zajonc and Burnstein (1965b)							
Errors in learning of structures	2.45	3.35	3.06	1.91	0.85	0.95	1.47
IV. Stability of structures							
Burnstein (1967)							
Percent of subjects who predict no change	91%	34%	43%	85%	.98	1.21	2.29

Balance in Children

The majority of empirical studies of cognitive balance have been conducted with adolescent or adult subjects. Few investigators have studied balance in children, although such studies could have important implications for the origin of tendencies toward cognitive consistency. Atwood (1969) attributes this neglect to the conceptual relation between Balance Theory and Gestalt psychology. He states: "It is typically assumed (albeit implicitly) that the regulative patterns of equilibrium in attitudinal thought are rooted in cognitive pregnanz and do not depend upon special lines of development" (p. 74). Recently, however, this assumption has come into question. Atwood (1969), for example, feels that an understanding of transitivity is a necessary precondition for balance.[2] According to the theory and research of Piaget (1950), the ability to make transitive inferences presupposes a reversible grouping of mental operations and does not, in general, appear in children before 7-8 years of age. Atwood concludes that thinking according to the balance model must therefore arise during the period of concrete operations (7-11 years) or thereafter. Storm and Knox (1967) reached a similar conclusion. They, too, base their argument on the operational similarity between balance and transitivity, noted earlier by Heider (1958, p. 206).

Studies by Atwood (1969) and by Storm and Knox (1969) were designed to test these contentions. Both examined cognitive balance by means of tasks which involved prediction of missing relations in three person

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[2] A relation is designated transitive if (aRb) and (bRc) imply (aRc). An example frequently cited is the relation "greater than:" if a is greater than b, and b is greater than c, then a is greater than c.

(i.e., P-O-Q) systems. Atwood (1969) preselected subjects on the basis of their Piagetian "stage" as determined by (a) their chronological age, and (b) their performance on tests of conservation of quantity and volume and on tests of concrete and verbal seriation. Those nursery school children (5-6 years of age) unable to conserve quantity or to seriate on a concrete plane were designated "intuitive." Children aged 8-9 who were able to conserve quantity and seriate on a concrete plane but who failed in volume conservation and verbal seriation were designated "concrete operational." Children aged 11-12 who were able to conserve volume and seriate verbally were designated "formal operational." Atwood found that intuitive subjects failed to balance any of the three-person systems that were presented to them. Concrete operational subjects "conformed to the balance model with surprising rigor, often reacting as if the implication of each relation within a triadic system for the other two were purely a matter of logic. Formal operational subjects consistently balanced the triads, but recognized that a situation of cognitive balance represents only one of many possible relational arrangements in a given three-person system" (Atwood, 1969, p. 73).

Storm and Knox (1969) presented balance and transitivity items to five groups of children (n=20 in each group) selected solely on the basis of age (5-12 years). In each item, relations between two persons were given and the subject's task was to predict the third relation and to justify his answer. As shown in Table 3 there was a marked and statistically significant ($p<.01$) increase in the percent of balanced responses and balanced and transitive explanations between the ages of 6-7 and 8-9 years, the approximate age of transition from pre-operational to concrete

Table 3

operational functioning (Piaget, 1950, chapter 5).

Knox (1969) has attempted to explain the developmental course of balance by postulating a shift in the influence of affect between the pre-operational and concrete operational stages. He suggests that the social perception of younger, pre-operational children may be influenced more by affect than by a desire for or tendency toward consistency. This hypothesis derives from the observation that young children seem to predict missing social relations in a manner designed to produce a happy or pleasant, though not necessarily balanced ending, whereas older children seem to rely more on principles of balance in predicting missing social relations. This fits well with Piaget's (1930) characterization of the pre-operational stage. The pre-operational stage, he states

> . . . is characterized from the logical point of view, by egocentricity; on the one hand, there is an absence of the desire to find logical justification for one's statements, and on the other hand, syncretism combines with juxtaposition to produce an excess of subjective and affective relations at the expense of genuine logical implication.
>
> (Piaget, 1930, p. 303)

If, indeed, affect dominates social perception at the pre-operational level, it would follow that younger children would utilize agreement to a greater extent than balance when called upon to perform tasks involving psychological consistency (e.g., tasks requiring prediction of missing relations, consistency ratings, etc.). The rationale for this prediction is based upon Zajonc's (1968) review and its extension which suggest that

Table 3: Percent of balanced and transitive responses and explanations in children ranging in age from 5-12 years (Storm and Knox, 1969).

Age	Transitive Responses	Transitive Explanations	Balanced Responses	Balanced Explanations
5:3- 5:11 years	81.6%	26.2%	59.6%	29.0%
6:2- 7:0 years	93.3%	39.1%	61.2%	30.9%
8:1- 9:0 years	85.0%	70.8%	86.2%	72.8%
9:4-10:11 years	97.9%	85.8%	90.3%	80.9%
11:8-12:10 years	98.3%	77.5%	89.6%	84.0%

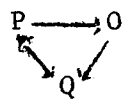
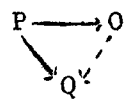
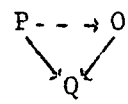
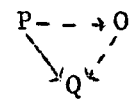
pleasantness ratings are determined more by agreement than by balance. However, if the influence of affect decreases with increasing age, older children would be expected to utilize balance to a greater extent than agreement in these tasks. Of course, in the pleasantness rating situation, agreement should exert greater influence than balance at all age levels.

Data in accord with this expectation were obtained by Knox and Gutman (1968), in a study conducted in Bellingham, Washington, immediately prior to the 1968 U.S. federal election. In this study, children in the operational age range (9-14 years of age) were asked to predict the Presidential preference of a liked and disliked other. The prediction based upon balance was that the subjects would perceive the liked other as preferring the same candidate that they themselves favored, while the disliked other would be perceived to prefer a candidate different from the subject's own choice. A tendency to base predictions on agreement would be indicated if subjects assigned their own choice to both the liked and to the disliked other. As shown in Table 4, a greater percentage of subjects in all age groups responded in a balanced manner than in one indicating a desire for or tendency toward agreement. Data in columns 3 and 4 of Table 4 suggest also that the tendency to base predictions on agreement

Table 4

decreases as age increases, while utilization of balance increases with increasing age, when the task involves prediction of missing relations. (Structures represented in columns 3 and 4 place balance and agreement in opposition.)

Table 4: Balance and agreement in prediction of political preferences of a liked and a disliked other (Knox and Gutman, 1968).

Grade	Predicted Choice of Most Liked Other		Predicted Choice of Most Disliked Other	
	 Same First Choice as P (Agreement + Balance)	 Same Last Choice as P (Dis-agreement + Imbalance)	 Same First Choice as P (Agreement + Imbalance)	 Same Last Choice as P (Dis-agreement + Balance)
4 (n=37)	67.6%	5.4%	24.3%	54.0%
5 (n=31)	64.5%	12.9%	19.4%	32.3%
6 (n=28)	75.0%	0	14.3%	60.7%
7 (n=27)	55.6%	3.7%	14.8%	59.3%
8 (n=24)	62.5%	8.3%	4.2%	70.8%
9 (n=27)	55.6%	7.4%	7.4%	81.5%

Total = 174

Results obtained by Ohashi (1964), however, indicate little difference between agreement and balance when children in the operational age range rate triadic structures for pleasantness. Subjects in Ohashi's study were 6th graders. They rated a series of P-O-Q structures, derived from actual sociometric relations among the children, for pleasantness on a 7-point scale ranging from -3 to +3. Ohashi reports a strong tendency toward positivity--i.e., the more positive relations contained in a structure, the higher the pleasantness rating. However, further inspection of the data indicates that this tendency was primarily due to the P/O relationship. That is, structures containing positive relations between P and O were rated considerably more pleasant than those containing negative relations. There was a tendency, of lesser magnitude, to rate structures containing agreement more pleasant than those containing disagreement. To a similar degree, structures that were balanced were rated more pleasant than those that were unbalanced. Attraction, in other words, contributed more to the ratings than either agreement or balance; the contributions of agreement and balance were approximately equal to one another.

Ohashi's (1964) findings contrast with the results of most studies with adults which indicate that although attraction is an important determinant of pleasantness ratings it is less important than agreement or balance. It is only in the studies of Knox (1963) and Gutman (1969) that attraction is found to play the dominant role. Among children, however, very strong attraction effects may be the rule rather than the exception. Further studies investigating the relative contribution of attraction to the pleasantness ratings of children are required in order to assess this possibility.

Purposes of the Study

The results of the studies of Atwood (1969) and of Storm and Knox (1969) which use a prediction procedure to investigate the developmental course of cognitive balance suggest that balance, rather than being a primitive, non-acquired mechanism, emerges with the development of other cognitive skills such as conservation and seriation between 5-8 years of age. One implication of this ontogenetic concurrence is that the ability to reason about social relations according to the balance principle may be dependent upon the individual's general level of cognitive development. Another implication is that balance, like conservation and seriation, may develop in stages, as a function of increasing chronological age. However, as Braine (1959) has emphasized, the apparent "age of emergence" of various types of reasoning appears to depend, at least in part, on the specific experimental procedures utilized. The generality of these findings must therefore remain uncertain until they have been confirmed in different experimental settings. One purpose of the present study then was to extend the investigation of the developmental course of cognitive balance beyond the confines of the prediction situation in order to determine the generality of the Atwood (1969) and the Storm and Knox (1969) findings.

A second, and more specific, purpose of the present study was to test Knox's (1969) contention that the observed age increase in balance effects between the ages of 5-8 years in the prediction situation is related to an age- or perhaps stage-related shift in the influence of affect (i.e., that the social perceptions of younger children are determined more by affect than by considerations of consistency but that with increasing age consistency takes precedence).

The latter purpose in particular was served by requiring children in the age range 5-12 to rate hypothetical social situations of the P-O-X type both for pleasantness and for consistency. It was assumed that if, as Knox suggests, affect influences the social perceptions of younger children more than considerations of consistency there should be little differentiation between the two types of ratings (i.e., situations defined as pleasant would also be defined as consistent). On the other hand, if there is a decrease in the influence of affect as a function of increasing age, there should be greater differentiation between pleasantness and consistency among older children. The influence of affect would also be reflected in the extent to which younger and older children utilize balance and agreement as a basis for pleasantness and consistency ratings. This follows from the Zajonc (1968) review and its extension which indicate that agreement is most important when the dependent measure relates to affect whereas balance exerts greatest influence when the task relates to psychological consistency.

A third purpose of the study was to determine the extent to which attraction influences the social perceptions of children. For, although the majority of previous studies indicate that pleasantness ratings of adult subjects are determined more by agreement or balance than by attraction, there is reason to believe on the basis of Ohashi's (1964) findings that attraction may be a more important determinant of the child's assessments of social situations that either agreement or balance.

Hypotheses

Three specific hypotheses were tested in the present study. They derive from the theory and research reviewed in the preceding sections.

1. Within the age range 5-12 years, young children in their ratings of hypothetical social situations will differentiate little between pleasantness and consistency. Relative to the youngest children, older children will differentiate more between pleasantness and consistency. Thus, it is predicted that as a function of increasing age, correlations between pleasantness and consistency will monotonically decrease across the successive age groups in the study.

2. Children at all age levels will attach greater weight to agreement (or disagreement) between P and O than to the balance (or imbalance) of the total social situation when making pleasantness ratings.

3. The relative importance of agreement and balance on consistency ratings of social situations will vary with chronological age. Younger children will base consistency ratings more on agreement than on balance; balance will exert greater influence than agreement on consistency ratings of older children.

CHAPTER II

METHOD

Subjects

Subjects were 80 children, 20 (10 males, 10 females) from each of the following age groups: 5-6 (mean age 6.0 years), 7-8 (mean age 7.8 years), 9-10 (mean age 9.9 years) and 11-12 (mean age 12.0 years). All attended Holy Trinity School in North Vancouver, B. C. Subjects in the 5-6 group were enrolled in kindergarten, those in the 7-8 group were in grade 2. Subjects in the 9-10 and 11-12 groups were in grades 4 and 6 respectively.

Overall Design

Each child rated two sets of hypothetical P-O-X structures for pleasantness and for consistency. The sets differed only in the form of the unit relations. Format 1 described P and O as partners in school; in format 2 they were described as neighbor-playmates. Testing was conducted on an individual basis, in two sessions of 15-35 minutes duration, separated by an interval of 6-11 days. In each session, the subject rated a set of structures (test series), performed a conservation task, then rated a second set of structures (retest series).[3]

In order to avoid systematic order effects, half of the subjects in

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[3]Two pilot studies were conducted prior to the main study. These are described in Appendix 1. Pilot Study II in particular, suggested the need for an activity between the test and retest series in each session. Conservation tasks were selected for this purpose in order to facilitate possible interpretation of results along Piagetian lines and to enable closer comparison of results with those of Atwood (1969). A description of performance, at each age level, on these tasks is given in Chapter III.

each age group performed pleasantness ratings in the first session and consistency ratings in the second session. The order was reversed for the remaining subjects. The order of format presentation and the order in which conservation tasks (quantity and volume) were administered also varied. As shown in Figure 3, format 1 was used for the test series in

Figure 3

both session 1 and session 2 for half of the subjects in each age group; it served as the retest series for the other half of the subjects. Half of the children were tested for conservation of quantity in the first session and conservation of volume in the second; half were tested for conservation of volume in the first session and conservation of quantity in the second session.

A class party was promised (and given) to the two youngest groups as a means of arousing and sustaining motivation. The children were told that their class would get its party when 20 children had earned red and green tickets. They were told that the tickets were earned by helping E with some "games." Subjects in the two older groups were asked to assist E with "some very important experiments."

The study was cross-validated on a different sample, by a second female E in order to ensure generalizability of the findings beyond the specific population sampled and to reduce the possibility that the results were due to experimenter bias. The cross-validation study was conducted at the same time as the principal study (June, 1969), using 32 children, 8 (4 males and 4 females) from each of the following age groups: 5-6

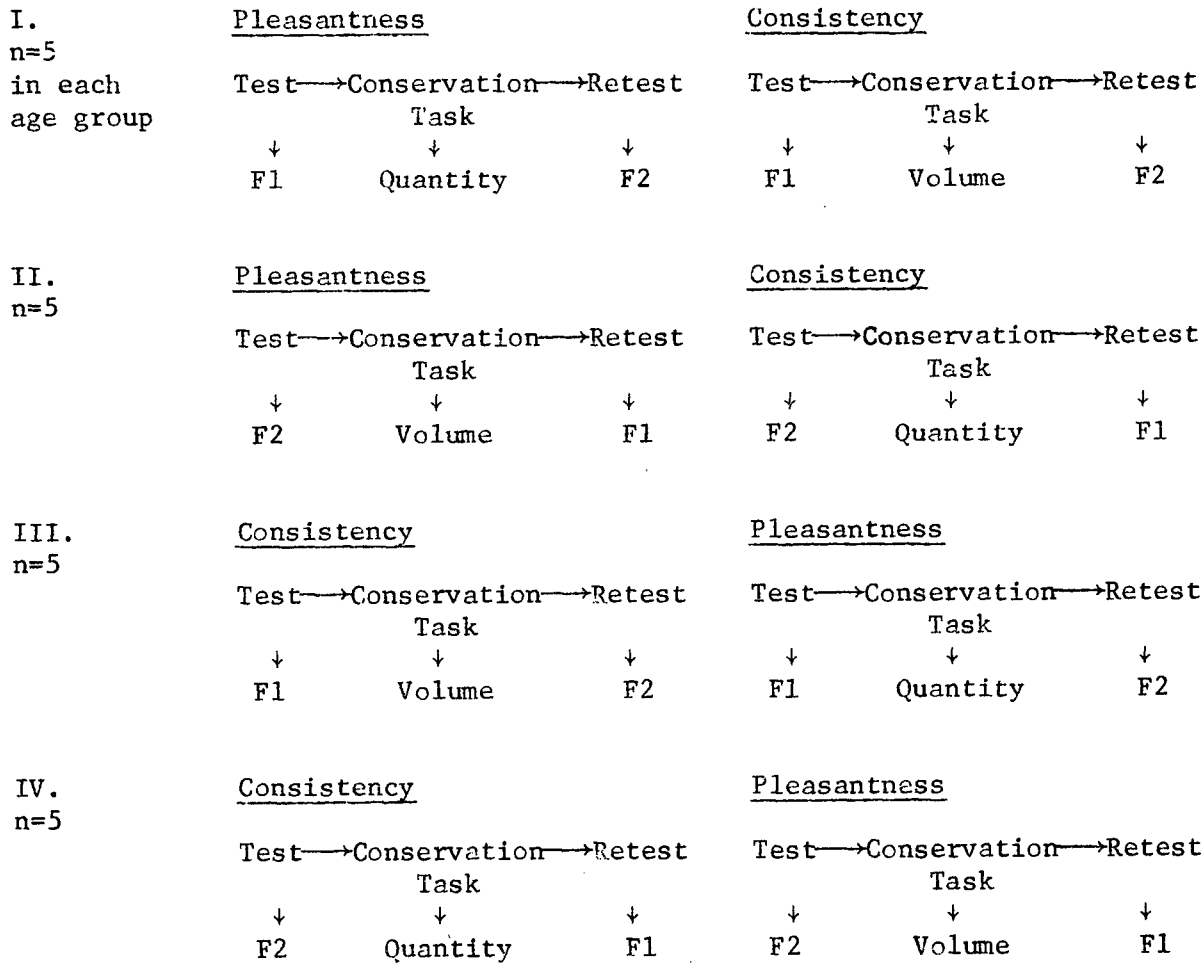

Figure 3: Diagrammatic representation of the experimental design.

(mean age 6.0 years), 7-8 (mean age 7.7 years), 9-10 (mean age 10.0 years), and 11-12 (mean age 12.0 years). All attended Dr. R. E. McKechnie School, a public school of moderate size, in Vancouver, B. C. Subjects in the 5-6 group were enrolled in kindergarten. Subjects in the 7-8, 9-10, and 11-12 groups were in grades 2, 4, and 6 respectively. E_2 was blind as to E_1's specific purposes and hypotheses.

Procedure

Two sets of instructions were developed--one suitable in language and content for use with younger children (i.e., those in the 5-6 and 7-8 age groups) and another set, identical in purpose, but more suited to the interests and abilities of older children (i.e., those in the 9-10 and 11-12 age groups).

Procedure for testing younger children (groups 5-6 and 7-8).

(a) Training

Session I began with a training period designed to ensure understanding of the rating procedure. Six size-graded blocks were placed in disarray on the table in front of the subject. E said: "See these blocks--they are all different sizes. I'm going to make a stairway out of them. Watch carefully how I do it." E then constructed a stairway (starting with the smallest block), making sure that the child watched the procedure. E then mixed the blocks and said--"Now, I want you to make a stairway just like the one I made." If the child initially failed the task, E repeated the demonstration. E was prepared to discontinue testing if the child failed to seriate correctly following the second demonstration. There were, however, no cases of failure following the second demonstration. E was therefore able to proceed with all subjects to rating scale I which

consisted of a 26" x 11½" sheet of white shelf paper on which were drawn six points, three inches apart. Intervals delineated by scale points were numbered from 1 through 6. As shown in Figure 4, squares of increasing size paralleled the increase in scale numbers.[4] E introduced the scale as follows: "I'm going to build another stairway but this time I'm going to put my blocks on this line. See the little wee box at this end of the

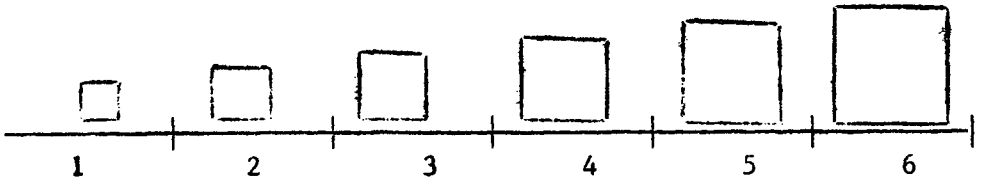

Figure 4: Rating Scale I

line (low end of the scale)--well, I'm going to put the littlest block right here on top of the littlest box. I'm going to put this block, which is a little bit bigger, in the next box in the line . . . I'm going to put this block, the biggest block, here at this end of the line in the biggest box. See, we have a stairway again." E then scrambled the blocks and asked the subject to make a stairway on the line. Errors were

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[4]The rating scales and training procedures employed in this study were specially designed to meet the needs of young, pre-literate children. They were inspired to some extent by the work of Walster, Berscheid, and Barclay (1967) and Elkind (1964).

Walster, Berscheid, and Barclay (1967) investigated post-~~choice~~ dissonance reduction in nursery-school children. They had subjects rate toys, before and after choosing one, on a scale which consisted of five squares which increased in size from one square centimeter to five square centimeters. Elkind (1964) used a "stairway" procedure to investigate seriation in children aged 4-6 years.

drawn to the subject's attention and he was asked to correct them. Rating scale I was then removed and the child was presented with the following items: a pencil, a small plastic bracelet, a harmonica, a viewmaster, and a scotty dog. E drew attention to each item and allowed the child to handle it. Rating scale II was then presented. Rating scale II consisted of nine points, five inches apart. Scale intervals delineated by these points were numbered from 1 through 9. Squares of increasing size paralleled the increase in scale numbers. As shown in Figure 5, rating scale II was anchored at the high end by a large red heart and at the low end by a large blue cross. E said: "See this line, it's just like the one we made the

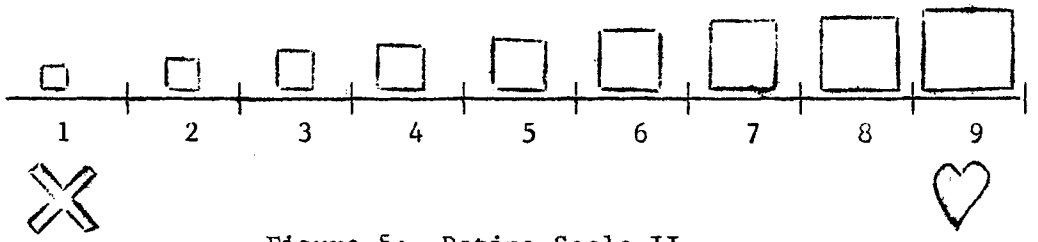


Figure 5: Rating Scale II

stairway on before, only it's a little bit bigger. What I want you to do this time is to put the toys on the line so the toys make a stairway. The toy you like the very, very best--the one you would like to play with most of all--should go at this end of the line, in the big box above the red valentine. The red valentine means that you like the toy very, very much. Now, where would you put the toy you like the very, very best? . . . very good. Now, see this blue cross at this end of the line? The blue cross means that you don't like the toy. The toy that you really don't like very much and wouldn't want to play with at all should go at

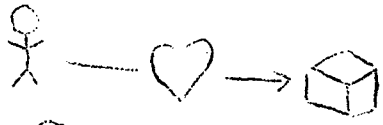
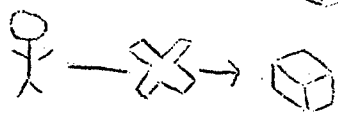
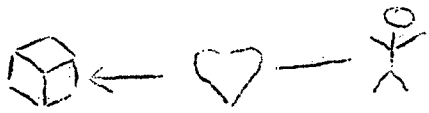
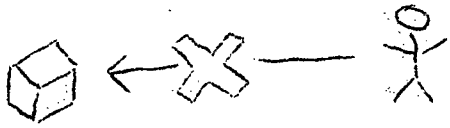
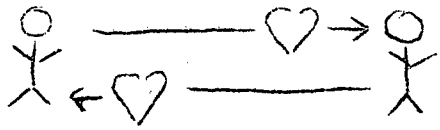
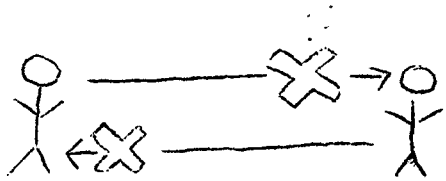
this end of the line in the little box by the blue cross. Now, where would you put the toy you dislike the most? . . . very good. What I want you to do is to start with the toy you like the very, very best and put it at this end of the line--by the red valentine. Then take the toy you like next best and put it here. The last toy, the one you put in the little box by the blue cross, should be the one you like the least. O.K.? If you like two toys the same you can put them in the same box. Now let's play the toy game. Show me the toy you like the best--now, where will you put it? etc." When the subject finished, E removed the toys and rating scale and stated: "Before we play any more stairway games I'm going to show you some cards. Each card tells a story, but the story is told in a secret code. Would you like to learn the secret code?" E then presented training cards 1-9. These cards, described in Table 5, were designed to teach the child

Table 5

to associate a red heart with "likes," a blue cross with "dislikes," and a box with "something very, very important." The subject was then told that he would be shown some cards containing stories written in the "secret code." He was instructed to examine each card and to tell E the "story" on it. Cards 10-17 (series A) were then presented in succession. Any errors or omissions in "telling the story" were drawn to the subject's attention as they occurred.

The structures represented in series A (and in all subsequent series) are shown in Figure 6. Structures 1, 2, 7, and 8 are balanced; structures 3, 4, 5, and 6 are imbalanced; all relations between persons are reciprocal.

Table 5: Training cards 1-9

Card No.	Content of Card	E's explanation
1		A red valentine means that somebody <u>likes</u> something.
2		A blue cross means that somebody <u>doesn't like</u> something.
3		A box means something very, very important.
4		This child likes the important thing. See, there is a red valentine.
5		This child doesn't like the very important thing. See, there is a blue cross.
6		This child likes the important thing. See, there is a red valentine.
7		This child doesn't like the important thing. See, there is a blue cross.
8		These two children like each other. This child likes this one and this child likes this one. See, there are red valentines here and here.
9		These two children don't like each other. This arrow means that he doesn't like him because there is a blue cross here. This arrow means that this child doesn't like this one because there is a blue cross here.

Each structure was presented in pictorial form on a separate 3" x 5" card. As shown in the example in Figure 6 stick figures were used to indicate persons "P" and "O" and a box was used to symbolize "X," "something very, very important to both children." The affective relations between elements were indicated by red hearts (likes) and blue crosses (dislikes). The direction of relations between elements were indicated by black arrows. Separate sets of cards illustrating the structures were prepared for males and females.

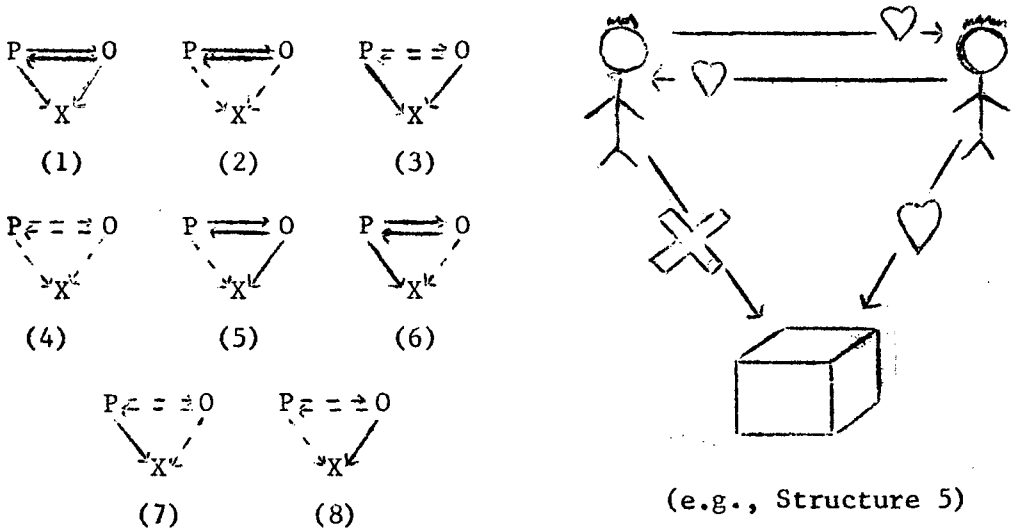


Figure 6: Structural content of training cards 10-17

Upon completion of series A, card 18 was presented. On this card, the stick figure in the "P" position was circled. E stated, "Let's pretend that you are one of the boys (girls) in the story. You are this boy (girl) with the circle around him (her). Now, I want you to look at some stories and whenever you see a boy (girl) with a circle around him (her) pretend that boy (girl) is you." Cards 19-26 (series B) were then presented in succession. The structures represented in series B were the same as those

in series A but the presentation sequence was varied and figures in the "P" position were circled. The subject's task was to describe the structure on each card, placing himself in the "P" position.

(b) Pleasantness ratings: test and retest

Pleasantness ratings were made on scale III. Scale III contained fifteen points, five inches apart, anchored at the high end by a smiling face and at the low end by a frowning face (see Figure 7). Squares of increasing size again paralleled the increase in number value of scale intervals. E introduced the scale as follows: "Remember when we played

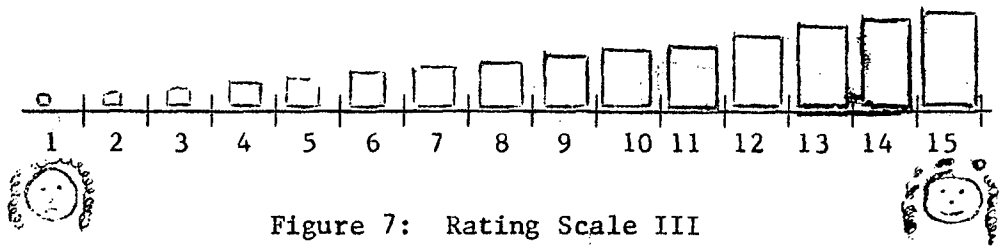


Figure 7: Rating Scale III

the stairway game before, I showed you some toys and you told me which one you liked the very, very best and we put it in the biggest box on the line? Then you showed me the toy you liked next best, and we put it in the next biggest box. What I want you to do now, is to look at the stories on these cards and put them in the boxes on this line. Put the nicest story, the one that makes you feel very, very happy, in the biggest box at this end of the line by the picture of the happy, smiling face. The one that you like next best, that doesn't make you feel quite as happy, should go in one of these boxes . . . the story that makes you feel very, very unhappy should go at this end of the line by the picture of the sad,

unhappy face. O.K.? When you are all finished today you'll get your red (or green) ticket for the class party."

E placed cards 27-34 (test series) in a semi-circle in front of the child and said: "What I want you to do is pretend that this child--the one with the circle around him (her) is you and this other child is your partner (Format 1). Do you know what a partner is? Pretend that at the beginning of the year the teacher picked two children--you and this other boy (girl) in the card and said that you two were to be partners for the whole year. You are to help each other with your school work, sit together, and work on special projects together. Look at all the stories and ask youself how happy you would feel if (pointing to structure 5) you liked your partner and he (she) liked you, and you didn't like the box but he (she) liked it.[5] Or how happy would you feel (pointing to structure 4) if you didn't like your partner and he (she) didn't like you and you both didn't like what was in the box. Put the nicest, happiest story at this end of the line by the happy, smiling face, then the next nicest story, and the next, until you get down to the most unpleasant, unhappy story." In order to minimize possible experimenter bias effects, E went to another part of the room, with her back to the subject while ratings were being made. The subject was instructed to tell E when he had finished his ratings.

When the card numbers and scale positions had been recorded, rating scale III was removed. A test of conservation (quantity or volume) was then conducted. The procedure followed in administering these tests was

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[5]The structures are presented in diagrammatic form in the foldout in Appendix 2. The reader may find it helpful to refer to these diagrams throughout the remainder of the paper.

as follows:

Conservation of quantity. The subject was shown two glasses (4" in height, 2¼" in diameter) filled to the same level with colored water. He was asked whether or not the two glasses contained the same amount of water. The water from one glass was then poured into a taller and wider glass (6" in height, 2 3/4" in diameter). The subject was asked whether the two glasses contained more, less, or the same amount of water. He was asked to explain his answer.

Conservation of volume. In the conservation of volume task, the subject was shown a glass (6" in height, 2 3/4" in diameter) two-thirds filled with water. A round piece of Plasticine was placed in the glass. The new water level was marked with a rubber band. The Plasticine was then removed from the water, dried, and rolled into a "sausage." The subject was asked to predict whether the water level would rise more, less, or the same amount if the "sausage" were placed in the water. He was asked to explain his answer.

Rating scale III was then placed once more before the child and the retest series (cards 35-46) was presented. E stated: "We are going to play one more line game before you get your red (or green) ticket. Pretend that this is you (E indicated the figure in the "P" position) and this other child is someone who lives near you that you play with (Format 2). Think how pleasant or happy you would feel if you liked this child and he (she) liked you and you both didn't like what was in the box (structure 2). Think how happy you would feel if you didn't like this child and he (she) didn't like you and you didn't like what was in the box, but your playmate did (structure 8). How would you feel then? Put the nicest, happiest

story here in the biggest box by the happy, smiling face. Put the saddest, most unhappy story in the littlest box by the sad, unhappy face. When you are all finished you will get your ticket." When the retest series was completed, E probed briefly for a classification rule. The child was asked: "How did you decide where to put the cards? Why did you put these stories here (E pointed to the low end of the scale) and these stories over here (high end of the scale)?" Subjects were then given their tickets, thanked, and dismissed with the plea not to tell their classmates about the task "because it wouldn't be fair." Subjects were given a red ticket at the close of session I and a green ticket at the end of session II.

Session II was conducted 6-11 days after session I. If pleasantness ratings were obtained in session I, consistency ratings were obtained in session II and vice versa. E introduced session II as follows: "Remember last week, when we played some stairway games and we put toys and stories on a line--well, we are going to play some more stairway games today. We are also going to play some more games with glasses of water today. When we are all finished you will get your green ticket and on _____ (day of week) we are going to have the class party. It should be lots of fun . . . Before we start the stairway games though, I want to see if you remember the secret code. Can you tell me what it says on this card?" Cards 19-26 were then presented in succession. E corrected any mistakes the child made in "telling the stories."

(c) Consistency ratings: test and retest

Consistency ratings were made on scale IV. Like scale III, it contained fifteen points, five inches apart; squares of increasing size again paralleled the increase in scale numbers. As shown in Figure 8, it was anchored at the high end by a large red "S" and at the low end by a

red "S" with a black cross over it. Subjects were introduced to the task of rating structures for consistency in the following manner: E stated:

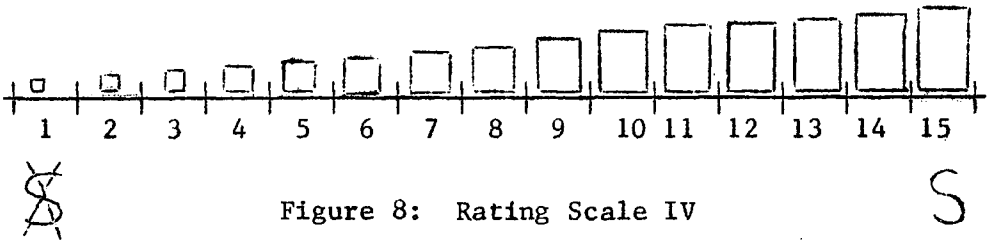

Figure 8: Rating Scale IV

"I want you to read the stories on the cards and decide how much sense they make. Stories that seem to make sense should go in the big boxes at the end of the line by the big red "S." Stories that seem to be "mixed-up" or silly, stories that don't make sense should go in the little boxes at the end of the line by the S with the black cross over it. Now, suppose I told you that when I was out yesterday I saw a little tiny cat eat a great big dog. Where would you put a story like that? Right, you would put it in one of the wee boxes by the S with the cross over it, because it doesn't make sense--little wee cats can't eat big dogs! Suppose I told you that 3 plus 3 is 8. Where would you put a story like that? Right--in a little wee box because that doesn't make sense either. 3 plus 3 is 6. We make 8 by adding 4 plus 4 or 5 plus 3 or 6 plus 2 or 7 plus 1. (Kindergarten: Suppose I told you there were 3 blocks here. Does that make sense? No--because there are 6 blocks here--see 1, 2, 3 . . . 6. What I said didn't make sense.) Now, what if I told you that Peter likes Joe the very best in the whole world--but, I know that Joe is always mean to Peter. Joe hits Peter and pushes him down and kicks him every time they play together. Does it make sense for Peter to like Joe best in the

whole world when Joe is always mean? Where would you put this story? What if I told you my best friend was always nice to me--where would you put a story like that? Well, what I want you to do is to read the stories on these cards and decide whether or not they make sense and then put them on the line. If the story makes lots of sense, where would you put it? If the story seems very silly or mixed up or wrong, where would you put it? . . . The stories in the cards are like the ones you saw before--they are about the two children who are partners in school (Format 1). See in this story (structure 5) you like your partner and he (she) likes you. You don't like what's in the box but he (she) does. Does that make sense? Or what about this one (structure 4) . . . you don't like your partner and he (she) doesn't like you. He (she) doesn't like what's in the box. You don't like what's in the box." When the test items had been rated, scale IV was removed and a conservation task was administered. A second (retest) series in the alternate format was then presented. When the retest series was completed, E probed briefly for a classification rule. The child was asked "How did you decide where to put the cards? . . . Why did you put these stories here (low end of the scale) and these stories over here (high end)?" The subject was then thanked, given his ticket, and dismissed.

Procedure for testing older children (groups 9-10 and 11-12)

With the older children, the "secret code" guize was dropped and training cards 10-17 were omitted. Instead of beginning session I with practice in building stairways, E began the session as follows: "I'm going to show you some cards today. Each card tells a story--the story is about two children and something that is very, very important to both of them. In some of the stories, the two children like each other, in other stories

they dislike each other. Sometimes both children like or both dislike the important thing; in other stories one child likes the important thing but the other child doesn't like it. I'm showing these cards to children from kindergarten right up to grade 6. Now little kids can't read, so I had to make the stories in pictures. Whenever you see a red heart, it means . . . ." The introduction to session II also differed for older children. E stated: "Remember last week when we did some experiments with cards--well, we are going to do some more today. We are also going to do another experiment with the glasses of water. But, before we start, I want to make sure that you remember how to read the cards. Can you tell me what it says on these cards? . . ." The remainder of the procedure was identical to that used with younger children except that no mention was made of a class party.

CHAPTER III

ASSESSMENT OF THE PROCEDURES

Qualitative Observations

All children in the 5-6 and 7-8 groups correctly seriated six blocks, both off and on the "line" (i.e., scale I). There were few occasions when E needed to correct errors or repeat the initial demonstration of "stairway" building. Subjects indicated, verbally and by placement of toys on scale II, that they understood that their task was to arrange things on "lines" in order of increasing magnitude.

Both verbal comments during training and scale placement of examples made it apparent that children at all age levels understood that pleasantness ratings were to be based on "how happy I would feel if I were really in the situation." There were similar indications that they understood that consistency ratings were to be made on the basis of how much "sense" the situations made.

It was E's impression that motivation was high in all age groups, both on the basis of observation of the children's behaviour during the experiment and from conversations with the children and their teachers at the conclusion of the study. An additional indication of high motivation was the willingness of the children to participate in the second session.

Reliability of the Ratings

Two reliability coefficients were computed for each subject: one for pleasantness and one for consistency. Coefficients of each type were computed by correlating the subject's ratings under formats 1 and 2. Z transformed intra-individual coefficients were then combined to yield average reliability coefficients for each age group.[6] These are shown in

[6] Fisher transformations were used in all cases where correlations were averaged or tested for significance.

Table 6. At all age levels reliability coefficients for pleasantness and

Table 6

and consistency are of sufficient magnitude to warrant the conclusion that the processes underlying the ratings were stable across formats.

Performance on the Interpolated Conservation Tests

Tests of conservation were selected for use as the interpolated activity between ratings made under formats 1 and 2 in the hope that the results of these tests might be of aid in interpreting the ratings and to facilitate comparison of results with those of Atwood (1969). However, as shown in Table 7, although the majority of subjects in the 5-6 group performed in a manner consistent with Piagetian theory and research[7]

Table 7

(i.e., 85% failed to conserve quantity or volume), the performance of

[7] In Piagetian theory, a number of cognitive changes are hypothesized to take place at the end of the pre-operational stage, the most important of which is manifested in the acquisition of the "schema of conservation." When a child is able to conserve, he realizes that certain properties of an object (e.g., quantity, weight) remain constant in the face of certain transformations (e.g., changes in the object's shape). His thinking is no longer dominated by physical appearance. However, although an understanding of conservation marks the transition from pre-operational to operational functioning, the various types of conservation described by Piaget and his co-workers (Piaget, 1946; Piaget, 1952; Piaget and Inhelder, 1941; Piaget, Inhelder, and Szeminska, 1960) do not develop all in a piece. For example, although conservation of quantity is generally acquired by age 7-8, conservation of weight does not appear until 9-10, and conservation of volume is seldom apparent before 11-12 years. Atwood (1969) and others have used the differential growth rate of quantity and volume conservation to further subdivide subjects into the Piagetian stages of concrete operational and formal operational functioning.

Table 6: Mean reliability coeffi. ients (Pearson r) for pleasantness and consistency ratings

	Pleasantness	Consistency
5-6	.84	.87
7-8	.93	.92
9-10	.97	.89
11-12	.91	.89

Table 7: % of subjects in each age group showing quantity or volume conservation (principal study n=20 in each age group; cross-validation study n=8)

	Quantity conservation		Volume conservation	
Age Gp.	Principal Study	Cross-validation Study	Principal Study	Cross-validation Study
5-6				
Failure	85.0%	75.0%	85.0%	87.5%
Success	15.0%	25.0%	15.0%	12.5%
7-8				
Failure	15.0%	25.0%	40.0%	62.5%
Success	85.0%	75.0%	60.0%	37.5%
9-10				
Failure	0	0	25.0%	12.5%
Success	100 %	100 %	75.0%	87.5%
11-12				
Failure	0	0	35.0%	12.5%
Success	100 %	100 %	65.0%	87.5%

children in the three older groups was somewhat anomalous. For example, in the principal study the proportion of volume conservers in the 7-8 and 9-10 groups was inordinately high (60% in the 7-8 group and 75% in the 9-10 group) for a cognitive ability not supposed to be reliably found before 11-12 years of age (cf., Piaget and Inhelder, 1941). Furthermore, children in the 11-12 group performed no better on the volume conservation task than 9-10 year old children and little better than those of 7-8 years. Thus, in view of the atypicallity of the conservation results and the virtually indistinguishable performance of the three older groups, it did not seem feasible to classify subjects by conservation level nor to make any further attempt to relate these data to the results of the rating task.

CHAPTER IV

RESULTS AND DISCUSSION OF HYPOTHESES

Hypothesis 1

Hypothesis 1 was concerned with the relationship between perceptions of pleasantness and perceptions of consistency in subjects of varying chronological age. Younger children, hypothesized to differentiate little between the pleasantness and the consistency of social situations, were expected to yield high correlations between pleasantness and consistency ratings. Older children, hypothesized to differentiate somewhat more between pleasantness and consistency in social situations were expected to yield lower correlations between the two types of ratings.

Separate correlation coefficients were computed for each subject by correlating his responses to the same situations when rating for pleasantness and for consistency. Intra-individual correlation coefficients were then averaged for each age group. These average correlations are shown in Table 8. Inspection of the table indicates a rather high correlation

Table 8

between pleasantness and consistency in all age groups. A one-way analysis of variance by age groups of the transformed values of the intra-individual correlations indicated no significant between-group effects ($F<1$). The results, indicating a lack of clear differentiation between pleasantness and consistency at all age levels, thus fail to confirm the hypothesis that differentiation would increase between the ages of 5-12 years.[8]

[8]These high correlations, while necessary to an inference that children

Table 8: Mean pleasantness-consistency correlations for each age group (Pearson r)

Age Group	r_{PC}
5-6	.72
7-8	.84
9-10	.79
11-12	.77

The absence of evidence of differentiation between pleasantness and consistency, although predicted in the case of younger children, was unexpected in the case of older children. In the training session, these children indicated that they understood the meaning of consistency. In predictions tasks (e.g., Atwood, 1969; Knox and Gutman, 1968; Storm and Knox, 1969) children above the age of 7 show a strong tendency to perform in accordance with consistency principles although younger children appear to respond on a more affective basis. Further, there is evidence that adults distinguish between pleasantness and consistency when rating hypothetical P-O-X situations (e.g., Knox, 1963; Gutman, 1969). Yet, the present results indicate that children between the ages of 7-12 years do not. The question that remains is why? A possible explanation, relating to the overall complexity of the rating task and to the strength of the balance "schema" in comparison to alternative cognitive biases is offered in Chapter VII.

Hypotheses 2 and 3

Hypotheses 2 and 3 concerned the relative importance of agreement and balance for pleasantness and consistency ratings. It was predicted that children at all age levels would attach greater weight to agreement than to balance when making pleasantness ratings (hypothesis 2) and that younger

do not differentiate clearly between the pleasantness and consistency of triadic structures are not alone sufficient for this inference. It is possible, in other words, that the children were differentiating on some basis masked by the correlations. For example, it is conceivable that the children could have utilized different portions of the rating scale when assessing pleasantness as compared to consistency. Consequently, each child's distribution of ratings on these two criteria was examined. The distributional characteristics of the pleasantness and consistency ratings were found to be virtually identical for 90% of the children.

children would also base consistency ratings more on agreement than on balance (hypothesis 3). Balance was expected to exert greater influence than agreement on consistency ratings of older children (hypothesis 3).

The unanticipated high correlation between pleasantness and consistency ratings at all age levels precluded joint confirmation of these two hypotheses. Conceivably, however, the data might still have supported one or the other hypothesis--a possibility that warranted further statistical tests. The statistical procedures employed for these tests would also provide information concerning the relative contribution of agreement, balance, and other structural determinants (e.g., attraction) to the two sets of ratings. Thus, analyses of variance were performed on the ratings. A between-within design (Winer, 1962, p.320) was used. Assessed within subjects were the agreement factor (A) with two levels, the attraction factor (B) with two levels, the format factor (C) with two levels, and a structure factor (O) with two levels that reflected high or low positivity. The age factor (D) with four levels, was a between-group factor. (The overall design is summarized in Table 9.) Zajonc indices were also computed in

Table 9

order to facilitate comparison of results with those obtained in previous studies. Multiple regression equations were fitted to the data of each subject in order to examine the relative effects of agreement, balance, and attraction at the individual level.

(a) Results relevant to hypothesis 2

The results of the analysis of variance of pleasantness ratings are

Table 9: Design of the analyses of variance

Factor Designation	Factor Label	Levels	Structure No.
A	Agreement	1) Agreement	1, 2, 3, 4
		2) Disagreement	5, 6, 7, 8
B	Attraction	1) Positive	1, 2, 5, 6
		2) Negative	3, 4, 7, 8
C	Formats	1) Partners	all structures
		2) Neighbor-playmates	" "
D	Age	1) 5-6 years	all structures
		2) 7-8 years	" "
		3) 9-10 years	" "
		4) 11-12 years	" "
O	Structures	1) high positivity	1, 3, 5, 8
		2) low positivity	2, 4, 6, 7

summarized in Table 10. As shown in this table, the main effect due to agreement was significant ($F=7.42$, $df=1,76$; $P<.01$). The presence of a significant interaction between agreement and attraction ($F=33.46$; $df=1,76$; $P<.01$) indicates that the effects of balance were significant also.[9]

Table 10

Examination of the percent of total variability (i.e., percent of total sum of squares) accounted for by these two variables indicates, however, that balance effects were slightly greater than those of agreement (the reverse of that predicted in hypothesis 2). The percent of variability accounted for by these variables was, nevertheless, extremely small. (Balance accounted for only 1.36% of the total variability; the amount attributable to agreement was .29%.) Subjects in all age groups appear to have based their ratings primarily on attraction. The F ratio for attraction was 410.09 ($df=1,76$; $P<.01$). This factor accounted for 45.51% of the total variability.[10]

The relative magnitude of Zajonc indices for balance, agreement, and attraction were consistent with the findings of the analysis of variance.[11]

[9] Balance involves the interaction of the liking relation between P and O and the agreement between them concerning X. Balanced states are those in which P and O like one another and agree, or alternatively, where they dislike one another and disagree. Imbalanced states combine liking with disagreement, or disliking with agreement.

[10] Inspection of Table 10 indicates that effects relating to factor O also account for a greater proportion of the variability than agreement or balance. (Results and discussion of factor O are presented in Chapter V together with effects relating to format differences.)

[11] Mean pleasantness and consistency ratings used in the computation of Zajonc indices are presented in Appendix 3.

Table 10: Summary of analysis of variance of pleasantness ratings

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
Between Subjects	79			
D (Age gps)	3	128.69	3.28*	1.27
Subj. in gps	76	39.19		
Within Subjects	1200			
A (Agreement)	1	88.73	7.42**	.29
DA	3	40.15	3.36*	.40
A x Subj. in gps	76	11.95		
B (Attraction)	1	13867.00	410.09**	45.51
DB	3	21.09	.62	
B x Subj. in gps	76	33.81		
C (Format)	1	3.94	1.02	
DC	3	7.36	1.91	
C x Subj. in gps	76	3.84		
O (Structure)	1	1123.10	156.23**	3.69
DO	3	14.52	2.02	
O x Subj. in gps	76	7.19		
AB (Balance)	1	415.19	33.46**	1.36
DAB	3	9.04	.73	
AB x Subj. in gps	76	12.41		
AC	1	21.27	3.89*	.07
DAC	3	18.78	3.44*	.18
AC x Subj. in gps	76	5.46		
AO	1	1590.90	206.60**	5.22
DAO	3	20.15	2.62	
AO x Subj. in gps	76	7.70		
BC	1	17.81	2.85	
DBC	3	18.00	2.89*	.18
BC x Subj. in gps	76	6.24		
BO	1	.49	.08	
DBO	3	2.96	.49	
BO x Subj. in gps	76	6.09		
CO	1	7.97	1.66	
DCO	3	2.67	.56	
CO x Subj. in gps	76	4.80		

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
ABC	1	31.56	7.24**	.11
DABC	3	3.06	.70	
ABC x Subj. in gps	76	4.36		
ABO	1	1.19	.23	
DABC	3	16.50	3.14*	.16
ABO x Subj. in gps	76	5.26		
Residual	240	4.68		
Total	1279			

*p<.05
**p<.01

As shown in Table 11, indices for balance were of slightly greater magnitude than those for agreement, in all groups. Indices for agreement and balance were small in comparison to those for attraction. The index

Table 11

value of largest magnitude at all age levels was that for attraction.

The same pattern of results emerged when pleasantness ratings were subjected to multiple regression analysis (see Appendix 4). Average beta coefficients for balance were greater than those for agreement in all groups, and average beta coefficients for attraction were greater than those for balance. All three methods of analysis indicate, in other words, that pleasantness ratings were based primarily on the P/O relationship.

The prediction that agreement would exert stronger influence on pleasantness ratings than balance was based on theoretical considerations outlined in the Introduction. As previously mentioned, however, strong attraction effects in pleasantness ratings were obtained by Ohashi (1964) in children, and by Knox (1963) and Gutman (1969) in adults. The present results are thus not without precedent. The results of the present study (and those of Ohashi, 1964) differ, however, from those obtained by Knox (1963) and by Gutman (1969) in the absolute magnitude of attraction and agreement effects. In Gutman's study, for example, attraction accounted for 33.28% of the variability; agreement accounted for 18.41%.[12] In the

[12] Summaries of the analyses of variance performed on Gutman's (1969) data are presented in Appendix 5.

Table 11: Zajonc indices for pleasantness

Age Group	p and o agree		p and o disagree		Effect ratio		
	$pL^{+}o$	$pL^{-}o$	$pL^{+}o$	$pL^{-}o$	Agreement	Attraction	Balance
5-6 years	12.72	4.88	11.38	5.92	1.02	2.23	1.15
7-8	12.17	4.02	11.40	5.12	.98	2.58	1.12
9-10	13.46	6.17	11.99	6.37	1.07	2.03	1.09
11-12	12.66	5.09	9.61	5.20	1.20	2.16	1.22

present study, the proportion attributable to attraction was 45.51%; .29% was attributable to agreement. The difference in these percentages suggests that attraction may decrease in importance between childhood and adulthood, but that there is an increase over the same age span in the importance of agreement, when pleasantness is the criterion.

Within the age range examined in the present study (i.e., 5-12 years of age) there was no evidence of interaction between age and attraction ($F<1$). However, the interaction between age and agreement was significant ($F=3.36$; $df=3,76$; $P<.05$). Inspection of the means relevant to this interaction indicate that differences between agreement and disagreement were greater among older than among younger children (see column 3 of Table 12).

Table 12

The age by agreement interaction might perhaps be attributed to the abstract nature of the third entity in each triadic situation; that is, to the possibility that younger children may have had greater difficulty than older children in conceptualizing "X." Such an argument would not, however, explain the small agreement effects apparent in Ohashi's (1964) data for Ohashi used three-person structures. It seems more likely that the age increase in agreement effects is related to an increase in the ability to coordinate information. (This interpretation will be discussed in greater detail in Chapter VII).

In sum, it is clear that hypothesis 2 was not supported by the data.

(b) Results relevant to hypothesis 3

The results of the analysis of variance of consistency ratings are summarized in Table 13. This analysis yielded significant effects for

Table 12: Mean pleasantness ratings for structures containing agreement and disagreement

Age Gp.	A1 Agreement	A2 Disagreement	A1-A2
1 (5-6 years)	8.82	8.64	.18
2 (7-8 years)	8.09	8.26	-.17
3 (9-10 years)	9.81	9.18	.63
4 (11-12 years)	8.87	7.40	1.47

agreement (F=30.38; df=1,76; P<.01) and balance (F=31.11; df=1,76; P<.01) but interaction effects between age and agreement (D x A) and age and

Table 13

balance (D x A x B) were not significant. The results, therefore, do not support hypothesis 3. That is, if hypothesis 3 were tenable, differences between agreement and disagreement would have been greater in younger than in older children; differences between balance and imbalance would have been greater in older children. Younger children would have assigned high consistency ratings to structures 1, 2, 3, and 4 since all contain agreement. In older children, the perceived consistency of these structures would have been reduced by the imbalance in structures 3 and 4. Younger children would have rated structures 5, 6, 7, and 8 as inconsistent because all contain disagreement. Older children, responding to the balance in structures 7 and 8 would have rated them more consistent.

Inspection of mean consistency ratings indicates that subjects in all groups assigned highest ratings to balanced structures containing agreement (structures 1 and 2). The next highest ratings were assigned to imbalanced structures containing disagreement (structures 5 and 6). Structures combining balance with disagreement (7 and 8) and imbalance with agreement (3 and 4) were rated lowest in all groups. The structural feature which distinguishes structures 3, 4, 7 and 8 from those rated more consistent in the presence of a negative P/O bond. The sign of attraction between P and O, in other words, exerted greater influence on consistency ratings than either agreement or balance.

Table 13: Summary of analysis of variance of consistency ratings

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
Between Subjects	79			
D (age gps)	3	261.88	6.82**	2.56
Subj. in gps	79	38.41		
Within Subjects	1200			
A (Agreement)	1	941.88	30.38**	3.07
DA	3	37.39	1.21	
A x Subj. in gps	76	31.00		
B(Attraction)	1	9537.50	360.33**	31.13
DB	3	6.87	.26	
B x Subj. in gps	76	26.47		
C (Format)	1	1.13	.22	
DC	3	3.27	.65	
C x Sub	76	5.02		
O (Structure)	1	822.40	66.19**	2.68
DO	3	68.08	5.48**	.67
O x Subj. in gps	76	12.43		
AB (Balance)	1	380.63	31.11**	1.24
DAB	3	16.41	1.34	
AB x Subj. in gps	76	12.24		
AC	1	8.78	.74	
DAC	3	3.41	.29	
AC x Subj. in gps	76	11.78		
AO	1	990.53	96.71**	3.23
DAO	3	72.70	7.10**	.71
AO x Subj. in gps	76	10.24		
BC	1	35.78	3.04	
DBC	3	34.02	2.89*	.33
BC x Subj. in gps	76	11.78		
BO	1	102.38	12.25**	.33
DBO	3	12.46	1.49	
BO x Subj. in gps	76	8.36		
CO	1	2.81	.00	
DCO	3	8.14	1.06	
CO x Subj. in gps	76	7.68		

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
ABC	1	4.75	.75	
DABC	3	.74	.12	
ABC x Subj. in gps	76	6.30		
ABO	1	118.83	10.60**	.39
DABO	3	9.78	.87	
ABO x Subj. in gps	76	11.21		
Residual	240	5.95		
Total	1279			

*p<.05
**p<.01

The F ratio for attraction was 360.33 (df=1,76; P<.01). This factor accounted for 31.13% of the variability. Agreement accounted for 3.07% of the variability. The proportion due to balance was 1.24%.[13]

The same pattern of results with respect to the effects of balance, agreement, and attraction obtained when the data were analyzed according to Zajonc's (1968) method. As shown in Table 14, index values for agreement are slightly greater than those for balance in all but the 7-8 group

Table 14

but the most noticeable differences are between balance and agreement on the one hand and attraction on the other.

The pattern was repeated when consistency ratings were subjected to multiple regression analysis. As shown in Appendix 4, average beta coefficients for agreement were larger than those for balance in all but the 7-8 group. Average beta coefficients for attraction exceed those for agreement and balance in all groups. All three methods of analysis thus indicate: (a) that agreement exerted slightly greater effect on the ratings than balance but that attraction was the primary component of consistency ratings; and (b) that there was no significant interaction between age and balance, age and agreement, or age and attraction.

The prediction that balance and agreement would interact with age,

[13] Factor 0 effects were also significant (F=66.19; df=1,76; P<.01). The proportion of variability accounted for by factor 0 was 2.68%. An additional 3.23% of the variability is attributable to the interaction between factor 0 and agreement. The contribution of factor 0 to the ratings was thus greater than that of balance.

Table 14: Zajonc indices for consistency

Age group	p and o agree		p and o disagree		Effect Ratio		
	$pL^{+}o$	$pL^{-}o$	$pL^{+}o$	$pL^{-}o$	Agreement	Attraction	Balance
5-6 years	11.10	4.72	9.14	4.32	1.18	2.24	1.11
7-8	11.80	4.84	9.55	4.96	1.15	2.18	1.16
9-10	13.48	7.65	10.46	6.04	1.28	1.75	1.08
11-12	13.11	6.08	9.12	5.48	1.31	1.92	1.22

in the case of consistency ratings, was based on two related assumptions:

(a) that affect influences social perceptions of younger children more than considerations of consistency, and

(b) that the influence of affect decreases as age increases.

The first assumption was supported. Children in the 5-6 group based consistency ratings on the same structural factor utilized in pleasantness ratings--namely, attraction. But attraction was also the primary determinant of pleasantness and consistency ratings among older children. There was no evidence of an age increase in utilization of balance. The results would thus seem to suggest that affect continues to exert stronger influence than balance throughout the 5-12 year period. Results obtained in the prediction situation (e.g., Atwood, 1969; Knox and Gutman, 1968; Storm and Knox, 1969) are not, however, consistent with this line of reasoning. These latter studies indicate that older children base predictions more on balance than on agreement or attraction.

The discrepancy between results obtained in the rating situation and in the prediction situation may, perhaps, be explained on the basis of differences in task complexity. Such an explanation is proffered in Chapter VII.

Summary

The results, indicating a lack of clear differentiation between pleasantness and consistency at all age levels, failed to confirm hypothesis 1. The uniformly high correlation between pleasantness and consistency in all age groups precluded joint confirmation of hypotheses 2 and 3. Conceivable, however, the data might still have supported either hypothesis 2 or hypothesis 3. The ratings were therefore subjected

to further statistical tests. These tests indicated that balance exerted slightly greater influence than agreement in all age groups when pleasantness was the criterion (the reverse of that predicted in hypothesis 2) while in the case of consistency, agreement exerted slightly greater influence than balance. The effects of balance and agreement were very small, however, in comparison to those of attraction. Subjects in all groups appear to have based both pleasantess and consistency ratings primarily on the sign of the P/O bond.

CHAPTER V

ANCILLARY FINDINGS AND THEIR IMPLICATIONS

1. Effects involving factor O (Structure effects)

In the discussion of Zajonc indices (pp. 8 - 12) it was pointed out that the eight triads employed in this study can be ordered into four quadrants by considering the sign of the P/O bond (positive or negative) and the presence or absence of agreement between P and O with regard to X. Theoretically, the two structures assigned to each quadrant should exert the same effect on subjects' ratings since both are balanced (or imbalanced), both contain agreement (or disagreement), and both have the same P/O bond. The presence of significant main effects for factor O in the analysis of variance of pleasantness ratings ($F=156.23$; $df=1,76$; $P<.01$) and consistency ratings ($F=66.19$; $df=1,76$; $P<.01$) demonstrates, however, that this is not the case. Level 1 structures were rated more pleasant and more consistent than level 2 structures by all age groups.[14]

The most parsimonious explanation of factor O effects is in terms of the number of positive bonds contained in the triads included in each level of factor O. As shown in the foldout in Appendix 2, all structures in level 1 of factor O contain a positive O/X bond, and all structures in level 2 of factor O contain a negative O/X bond. Since each combination of the other two bonds is represented in both levels, the structures in level 1 are more "positive" than those in level 2. Subjects appear to have preferred the more positive structures.

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[14] Subsequent analysis of Gutman's (1969) data yielded significant factor O effects in the ratings of adult subjects as well. (See Appendix 5.)

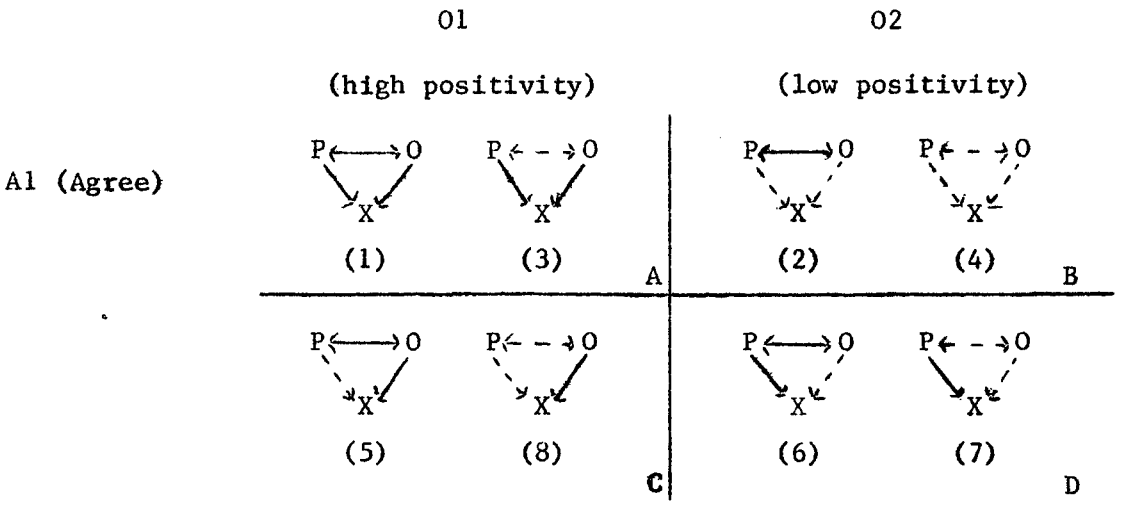
Structure differences in positivity could also account for the significant agreement by structures (A x O) interaction in the pleasantness ratings ($F=206.60$; $df=1,76$; $P<.01$) and in the consistency ratings ($F=96.71$; $df=1,76$; $P<.01$). The grouping of structures appropriate to this interaction is shown in Table 15a. Cell A of the table contains one structure

Table 15

in which all bonds are positive and one in which two bonds are positive and one negative; cells C and D each contain one structure with two positive bonds and one with a single positive bond; cell B contains one structure with a single positive bond and one in which all bonds are negative. As shown in Table 15b, the cell means for pleasantness are ordered exactly as they should be if positivity were the operative factor. For consistency (see Table 15c), the most positive cell stands out; the other cells are closely grouped. The cell containing the greatest number of positive relations is rated highest in each level of factor O. In level 1, the cell containing the greatest number of positive relations contains structures in which there is agreement between P and O. In level 2, there are more positive relations in the cell containing structures with disagreement between P and O. The result is that agreement is more pleasant and more consistent than disagreement at level 1 of factor O, but the reverse tends to be true at level 2; hence, the interaction of factors O and A.

Since all that is required in order to rate structures in terms of positivity is that one compare the number of positive relations in the structures, it seems reasonable that positivity effects should be strong

Table 15: Mean pleasantness and consistency ratings relevant to the agreement (A) x structures (O) interaction.



(a)

	O1	O2
A1	10.95	6.84
A2	8.19	8.55

$\bar{X}$ Pleasantness ratings

(b)

	O1	O2
A1	10.78	7.41
A2	7.30	7.46

$\bar{X}$ Consistency ratings

(c)

in younger children. However, since older children are capable of utilizing more complex strategies, one would expect older children to take greater cognizance of the position in which positive relations occur in the triads. The ratings of older children, in other words, should be based more on the arrangement of positive and negative relations in different triads than on the total number of positive relations contained. The significant interaction of factor O with age in the consistency ratings ($F=5.48$; $df=3,76$; $P<.01$) is consistent with this expectation. The interaction with age was not significant for the pleasantness ratings ($F=2.02$; $df=3,76$; $P=.12$).

The effect of attraction--the predominant influence on pleasantness and consistency ratings at all age levels is, of course, a positive biasing effect as well, but one specific to the P/O relationship, which tends to override the preference for positive bonds elsewhere in the triad.

2. Effects involving factor C (Format effects)

Main effects due to format differences were not significant in either the analysis of pleasantness ratings ($F=1.02$; $df=1,76$; $P=.32$) or the analysis of consistency ratings ($F<1$). Only one interaction involving factor C was significant in the case of consistency--that between age, attraction, and formats. In the case of pleasantness, formats were significant as a factor in interaction with agreement; age and agreement; age and attraction; and agreement and attraction. In general, these interactions suggest that triads involving neighbor-playmates have a more pleasant connotation for younger children than triads involving the more task-oriented relationship of partners. Differences in the means involved in these interactions are small, however. Effects involving factor C

account for less than 1% of the variability in the data.

3. Main effects of age

Significant main effects of age were obtained both for pleasantness ($F=3.28$; $df=3,76$; $P<.05$) and consistency ($F=6.82$; $df=3,76$; $P<.01$). Means of 8.73, 8.17, 9.49 and 8.13 were obtained for each successive age group when pleasantness ratings were collapsed across structures. Corresponding average consistency ratings for the four age groups were 7.32, 7.78, 9.40 and 8.44. This would seem to indicate slightly different use of the rating scale by subjects of different chronological age.[15]

Summary

An unanticipated finding in the results was the difference associated with factor O. In the case of both pleasantness and consistency ratings subjects assigned higher ratings to structures in level 1 (i.e., structures 1, 3, 5, and 8) than to those in level 2 (structures 2, 4, 6, and 7). This effect was tentatively attributed to positivity. That is, it was attributed to a preference for structures containing the greatest number of positive relations.

There were no significant main effects for formats in either the pleasantness ratings or the consistency ratings. The format factor, although involved in several higher order interactions, apparently contributed little to the ratings.

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[15] Pair-wise comparison of age groups according to the Neuman-Keuls procedure (Winer, 1962, pp. 80-85) indicated no significant between-group differences either in the pleasantness ratings or in the consistency ratings.

CHAPTER VI

RESULTS OF THE CROSS-VALIDATION STUDY

Reliability

Average reliability coefficients for pleasantness and consistency are shown in Table 16. As in the principal study, reliability is lower in the 5-6 group than in the older groups. This is particularly noticeable

Table 16

in the case of consistency ratings where the average value for the 5-6 group is .59 while those for the other age groups range from .75 to .96. Mann-Whitney U tests indicated, however, that none of the differences between age groups were significant.

Comparison across studies (see Tables 6 and 16) indicates that reliability was generally lower in the cross-validation study but the only significant difference between samples was in the 5-6 group, and then only in the case of consistency ratings ($U=120$; $z=2.02$; $P<.04$, two-tailed).

Hypothesis 1

Hypothesis 1 predicted an increase in differentiation between pleasantness and consistency with increasing age. The results of the principal study failed to support the hypothesis: r_{PC} was high in all groups. The results of the cross-validation study also fail to support hypothesis 1. As shown in Table 17, instead of decreasing with increasing

Table 17

Table 16: Mean reliability coefficients (Pearson r) for Pleasantness and Consistency

	Pleasantness	Consistency
5-6	.76	.59
7-8	.82	.96
9-10	.89	.75
11-12	.87	.90

Table 17: Mean pleasantness-consistency correlations for each age group (Pearson r)

Age Gp	r_{PC}
5-6	.46
7-8	.72
9-10	.78
11-12	.81

age, average PC correlations increase with increasing age.

Hypotheses 2 and 3

Hypotheses 2 and 3 were concerned with the relative effects of agreement and balance on pleasantness and consistency ratings. It was predicted that subjects in all age groups would utilize agreement to a greater extent than balance when rating for pleasantness (hypothesis 2). Younger subjects were expected to base consistency ratings more on agreement than on balance; balance was expected to exert greater influence than agreement on the consistency ratings of older subjects (hypothesis 3).

The results of the principal study failed to confirm either hypothesis. Results in the direction predicted for hypothesis 2 were obtained in the cross-validation study. As shown in Table 18, the F ratio for agreement ($F=22.19$; $df=1,28$; $P<.01$) is slightly larger than the F ratio for balance

Table 18

($F=19.92$; $df=1,28$; $P<.01$) when pleasantness is the criterion. Since there is no direct method of testing for the significance of differences between two values of F, one must turn to the multiple regression analysis for a statistical test of hypothesis 2. From a within subject comparison of regression coefficients in the equations for pleasantness, it was found that the beta coefficients for agreement were of greater magnitude than those for balance for only 50% of the subjects. This is clearly not significant, and thus, as in the principal study, leads to rejection of hypothesis 2. Also, as in the principal study, the percent of variability accounted for by agreement (2.47%) and balance (1.54%) is small in

Table 18: Summary of analysis of variance of pleasantness ratings

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
Between Subjects	31			
D (Age gps)	3	111.46	2.00	
Subj. in gps	28	55.77		
Within Subjects	480			
A (Agreement)	1	328.32	22.19**	2.47
DA	3	25.26	1.71	
A x Subj. in gps	28	14.80		
B (Attraction)	1	4680.30	65.17**	35.26
DB	3	52.79	.73	
B x Subj. in gps	28	71.82		
C (Format)	1	.50	.08	
DC	3	3.27	.55	
C x Subj. in gps.	28	5.98		
O (Structures)	1	276.12	42.01**	2.08
DO	3	4.07	.62	
O x Subj. in gps.	28	6.57		
AB (Balance)	1	205.03	19.92**	1.54
DAB	3	12.69	1.23	
AB x Subj. in gps.	28	10.30		
AC	1	.03	.01	
DAC	3	3.68	.63	
AC x Subj. in gps.	28	5.81		
AO	1	399.03	29.35**	3.01
DAO	3	45.15	3.32**	1.02
AO x Subj. in gps.	28	13.59		
BC	1	9.57	.83	
DBC	3	8.45	.73	
BC x Subj. in gps.	28	11.50		
BO	1	4.88	.96	
DBO	3	2.44	.48	
BO x Subj. in gps.	28	5.10		
CO	1	18.76	3.02	
DCO	3	4.62	.74	
CO x Subj. in gps.	28	6.21		

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
ABC	1	.38	.09	
DABC	3	1.25	.29	
ABC x Subj. in gps	28	4.27		
ABO	1	2.82	1.04	
DABO	3	6.53	2.40	
ABO x Subj. in gps	28	2.72		
Residual	96	5.21		
Total	511			

*p<.05
**p<.01

comparison to that attributable to attraction (the F ratio for attraction was 65.17; this factor accounts for 35.26% of the variability). Attraction, in other words, was the primary component of pleasantness ratings in both studies.

The analysis of consistency ratings leads to the same conclusion concerning hypothesis 3 as the principal study. As shown in Table 19,

Table 19

significant effects ($P<.01$) were obtained for agreement ($F=13.48$; $df=1,28$) and balance ($F=11.93$; $df=1,28$). Neither factor interacted with age. Attraction accounted for a greater proportion of the variability (24.33%) than either agreement (3.83%) or balance (.65%).

Effects involving factor O (Structure effects)

The results of the cross-validation study also confirmed the findings of the principal study with respect to factor O. As shown in Tables 18 and 19, significant main effects for factor O were obtained in the case of both pleasantness ratings ($F=42.01$; $df=1,28$; $P<.01$) and consistency ratings ($F=18.18$; $df=1,28$; $P<.01$). There was no interaction between factor O and age. All groups rated level 1 structures (i.e., structures 1, 3, 5, and 8) significantly more pleasant and more consistent than level 2 structures (i.e., structures 2, 4, 6, and 7).

As in the principal study, there was a significant interaction between factor O and agreement in the pleasantness ratings ($F=29.35$; $df=1,28$; $P<.01$) and in the consistency ratings ($F=17.56$; $df=1,28$; $P<.01$). Inspection of the relevant cell means indicates that level 1 structures

Table 19: Summary of analysis of variance of consistency ratings

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
Between Subjects	31			
D (Age gps)	3	78.18	1.26	
Subj. in gps	28	62.20		
Within Subjects	480			
A (Agreement)	1	544.50	13.48**	3.83
DA	3	18.26	.45	
A x Subj. in gps	28	40.38		
B (Attraction)	1	3454.90	51.78**	24.33
DB	3	20.47	.31	
B x Subj. in gps	28	66.72		
C (Format)	1	46.32	6.28*	.33
DC	3	8.26	1.12	
C x Subj. in gps	28	7.37		
O (Structure)	1	321.95	18.18**	2.27
DO	3	8.65	.49	
O x Subj. in gps	28	17.71		
AB (Balance)	1	92.82	11.93**	.65
DAB	3	5.36	.69	
AB x Subj. in gps	28	7.78		
AC	1	18.76	1.96	
DAC	3	15.67	1.63	
AC x Subj. in gps	28	9.59		
AO	1	255.95	17.56**	1.80
DAO	3	6.97	.48	
AO x Subj. in gps	28	14.58		
BC	1	.13	.01	
DBC	3	17.05	.88	
BC x Subj. in gps	28	19.43		
BO	1	94.53	8.94**	..67
DBO	3	24.27	2.29	
BO x Subj. in gps	28	10.58		
CO	1	1.53	.29	
DCO	3	2.69	.52	
CO x Subj. in gps	28	5.19		

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
ABC	1	1.53	.24	
DABC	3	10.02	1.59	
ABC x Subj. in gps	28	6.30		
ABO	1	50.00	5.14*	.35
DABO	3	28.18	2.90*	.59
ABO x Subj. in gps	28	9.72		
Residual	96	8.47		
Total	511			

*p<.05
**p<.01

containing agreement were rated more pleasant and more consistent than those containing disagreement. Level 2 structures containing disagreement were rated more pleasant but not more consistent than those containing agreement.

Effects involving factor C (Format effects)

In contrast to the principal study, significant main effects for factor C were obtained in the analysis of consistency ratings ($F=6.28$; $df=1,28$; $P<.05$). Inspection of the means indicated that subjects assigned higher consistency ratings to neighbor-playmate triads than to partner triads. There were no format effects in the case of pleasantness ($F<1$). None of the interactions involving factor C were significant for either type of rating.

Summary

In general, the results of the cross-validation study confirmed the findings of the principal study:

(a) they failed to provide evidence of an increase in differentiation between pleasantness and consistency as a function of age,

(b) they indicated that attraction was the primary structural component of pleasantness and consistency ratings at all age levels,

(c) they yielded results similar to those of the principal study with regard to factor O (i.e., subjects in all age groups assigned significantly higher pleasantness and consistency ratings to structures in level 1 of factor O than to those in level 2).

The results, in other words, are not restricted to the particular sample studied nor are they dependent, in any large measure, on a particular E.

CHAPTER VII

FURTHER DISCUSSION

The results of the present studies indicate that children between the ages of 5-12 years tend to base pleasantness and consistency ratings more on attraction than on agreement or balance. The children also appeared to rely on positivity to a slightly greater extent than on agreement or balance when rating for pleasantness and consistency. These results, which differ from results obtained with children in the prediction situation (e.g., Atwood, 1969; Storm and Knox, 1969), may perhaps be explained by considering the information processing requirements of the rating task. In the rating situation, the child must not only decide whether a particular structure is pleasant or unpleasant (consistent or inconsistent) but must evaluate that structure in comparison to others presented simultaneously (as in the present study), or in series (e.g., Ohashi, 1964). He must hold in mind fairly complex instructions concerning the bases and mechanics of rating and also information concerning the specific relationship between the individuals in the situation (i.e., format information). The rating situation thus places considerable demands on the information processing abilities of the child. The children may have based their ratings first and foremost on attraction because it was the simplest way of coping with the complexity of the task. (The child need focus attention on only one relation--that between P and O--in order to evaluate the structures in terms of attraction.) Evaluation in terms of agreement required that the child simultaneously attend to two relations--those between P and X and between O and X. In order to evaluate the structures in terms of balance, the child must simultaneously attend to three relations.

Processing solely in terms of attraction would, however, only enable the child to dichotomize the structures since four structures contain positive P/O relations and four contain negative P/O relations. To fulfill the requirements of the task the children had to devise some means of further differentiating between the structures. It is conceivable that they made an implicit count of the number of positive relations contained in the structures. In other words, one plausible way to account for the results and, incidentally, a way that is consistent with the overt behaviour of a number of children in the pilot studies is to suggest that the subjects may first have separated the structures into those in which P and O liked each other and those in which they disliked each other. The structures within each P/O category may then have been arranged in terms of the number of positive relations they contained.

A two-stage process of this nature would serve to make the task more manageable and it would account for the ranking of structures in order of mean pleasantness and consistency ratings (see Table 20), at least in the case of the younger children. Inspection of Table 20 suggests, however,

Table 20

that the older children may have differentiated between structures more on the basis of attraction and agreement than on attraction and positivity, especially when rating for consistency. A preference for agreement over positivity would be consistent with Bruner's (1964) observation that the complexity of information processing strategies increases with increasing age, since processing in terms of agreement requires that the subject

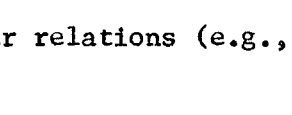
TABLE 20: Rank order of structures in terms of mean pleasantness and mean consistency ratings.

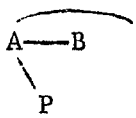
	Age Group					
A. Pleasantness	5-6	7-8	9-10	11-12	Adults	(Gutman, 1969)
Highest rating	+++	+++	+++	+++	+++	
↓	+-+	++-	++-	+--	+--	
	++-	+-+	+--	++-	+-+	
	+--	+--	+-+	+-+	++-	
	-++	-++	-++	-++	-++	
	-+-	--+	-+-	--+	---	
	--+	-+-	--+	-+-	--+	
	---	---	---	---	-+-	
Lowest rating						

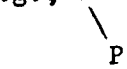
	Age Group					
B. Consistency	5-6	7-8	9-10	11-12	Adults	(Gutman, 1969)
Highest rating	+++	+++	+++	+++	+++	
↓	++-	+-+	+--	+--	+--	
	+-+	++-	++-	+-+	--+	
	+--	+--	+-+	++-	-+-	
	-++	-++	-++	---	+-+	
	-+-	-+-	---	-++	++-	
	--+	--+	--+	--+	---	
	---	---	-+-	-+-	-++	
Lowest rating						

take cognizance of the position of positive and negative relations within the structures whereas processing in terms of positivity requires only that the subject count the number of positive relations in the structure. Further studies focusing specifically on agreement and positivity are, however, required in order to determine whether there is a significant change in the relative effects of these two variables over age. Studies focusing on the rating process itself are, of course, also necessary in order to determine the tenability of a two-stage hypothesis.

Although the results of the present studies suggest that utilization of agreement may increase with increasing age, there was no evidence of an age increase in utilization of balance. Balance effects were small in all groups, both for pleasantness and for consistency. As previously mentioned (p. 66) the absence of strong balance effects among older children contrasts with results obtained in studies in which children are required to predict missing relations (e.g., Atwood, 1969; Knox and Gutman, 1968; Storm and Knox, 1969). The discrepancy between results obtained in the rating situation and in the prediction situation may, perhaps, be due to differences in task complexity. For example, in the prediction situation the subject is not required to make comparative judgements between structures; he does not have to consider degrees of pleasantness or degrees of consistency. Two relations are presented, he need only supply a positive or negative sign for the missing third relation. The rating situation, in other words, places greater demands on the information processing abilities of the children. It is possible that children restrict their attention to specific components of the structures as the overall complexity of the task increases.

Two studies reported by Singer (1966) support the notion that there is a relationship between the information processing requirements of a task and tendencies toward balance. Both studies were conducted with adult subjects and both used a prediction task modelled after that of Morrissette (1958).[16] In these studies, subjects were given partial information concerning the sentiment relations among four persons involved in an apartment situation. Their task was to predict the remaining relations and to indicate the degree of tension they would feel in the completed situations. When subjects were given four relations (e.g., 

) they predicted the remaining two relations in a maximally balanced manner and reported tension inversely related to the degree of balance. When given three relations (e.g., 

) both predictions and tension were more variable. With two of six relations given (e.g., 

) there was significantly less tendency to perceive a balanced system and the degree of balance bore little relation to the reported tension. Singer (1966) concludes that "these studies show that the motivating effects of inconsistency can be vitiated by 'cognitive flooding'"(p. 70).

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[16] In an attempt to test Cartwright and Harary's (1956) formulation of Balance Theory, Morrissette had undergraduate students role-play a move into an apartment. The sentiments among some of the roommates were given. The subject's task was to predict the remaining sentiments and to indicate the degree of tension he would feel in such a situation. Morrissette found that in general subjects tended to complete the situations in a balanced manner. He also found a positive correlation between reported tension and the degree of imbalance in the situations.

Although differential task complexity may perhaps account for the discrepancy between results obtained with children in the rating vs the prediction situation, a task-complexity argument cannot be used to explain the difference between results obtained when adults and children rate structures for consistency. For example, Knox (1963) and Gutman (1969) had college students rate hypothetical P-O-X structures for consistency. In both studies ratings were based more on balance than on agreement or attraction. Yet in the present studies, consistency ratings were based mainly on attraction. The difference in consistency ratings of adults and children could, however, be due to differences in information processing abilities (i.e., differences in the amount of information that the subject can process simultaneously; in the facility with which the subject can encode, store, and decode information, and so on). Adults, in other words, may have less difficulty than children in coping with the demands of the rating situation. They may be more facile at combining and considering the three relations in each situation while holding other relevant information in mind. The difference in consistency ratings of adults and children could also be due to differences in the strength of the balance "schema." The "schema" or implicit code for balance may be more firmly established in adults than in children. This could perhaps account for the fact that although adults utilize balance to a greater extent than agreement or attraction in the prediction and the rating situation, strong balance effects among children are obtained only in the easier prediction situation. The balance "schema" in children may not be of sufficient strength to withstand the competition of alternative biases such as attraction, agreement, and positivity when the task is complex.

Recommendations for future research

There do not appear to be any studies investigating the relationship between task complexity and balance in children. Such studies should be conducted, using both rating and prediction tasks. If the absence of strong balance effects in the rating situation is, in fact, due to the child's inability to cope with the information processing requirements of the rating task, balance effects should increase in strength as task complexity decreases. By the same token, there should be a decrease in balance effects in the prediction situation as task complexity increases. There should also be an interaction between age, task complexity, and level of information processing such that complex tasks are differentially more difficult for younger children. Processing in terms of balance, in other words, should break down at a lower level of task complexity among younger than among older children.

Studies in which teenage subjects are required to rate structures for pleasantness and consistency should also be conducted for, although the results of the present study do not indicate an increase in differentiation between the ages of 5-12, they contrast with results obtained by Knox (1963) and Gutman (1969) with ratings in adults. The question that remains is: at what point in ontogenetic time does differentiation develop? When are children able to clearly distinguish between what is pleasant and what is psychologically consistent when presented with hypothetical social situations, or, alternatively, when are they able to cope with the requirements of the rating situation?

Another method of investigating the developmental course of differentiation between pleasantness and consistency would be with an adaptation

of the prediction task. Children of varying chronological age could be specifically instructed to predict missing relations in social structures so as to maximize pleasantness in one instance and to maximize consistency in another. Such a procedure might provide a more sensitive test of the hypotheses of the present study and further strengthen the interpretation of results for the rating situation provided above.

Comparison of the present results with those of Knox (1963) and Gutman (1969) also raises questions concerning the nature of the rating process in adults and children, especially as it concerns consistency. The results of the Knox and the Gutman studies suggest that adults combine agreement and attraction so as to evaluate the consistency of triadic structures in terms of balance. The present results suggest that children may focus on the components of balance in sequence. That is, children appear to evaluate triadic structures first and foremost in terms of attraction. Attention is then directed to the presence or absence of agreement and/or to the total positivity of the structures. In future studies greater attention should be focused on the rating process itself.

CHAPTER VIII

SUMMARY

The primary purpose of the present study was to investigate the structural bases of pleasantness and consistency ratings and to determine the relationship between the two types of judgement in children ranging in age from 5-12 years. An additional purpose of the study was to determine whether the results of studies by Atwood (1969) and by Storm and Knox (1969) using a prediction procedure to investigate the developmental course of cognitive balance would generalize to a different dependent measure. Three specific hypotheses were tested. It was predicted that:

1. in their ratings of hypothetical social situations, young children would differentiate little between pleasantness and consistency. Relative to the youngest children, older children were expected to differentiate more between pleasantness and consistency. Thus, it was predicted that as a function of increasing age, correlations between pleasantness and consistency would monotonically decrease across the successive age groups in the study.

2. children at all age levels would attach greater weight to agreement (or disagreement) between P and O than to the balance (or imbalance) of the total social situation, when making pleasantness ratings.

3. the relative importance of agreement and balance on consistency ratings of social situations would vary with chronological age. Younger children were expected to base consistency ratings more on agreement than on balance; it was expected that balance would exert greater influence than agreement on consistency ratings of older children.

The tenability of hypothesis 1 was determined by correlating each subject's pleasantness ratings with his consistency ratings. These intra-individual correlations were then subjected to analysis of variance. This

analysis indicated no significant between-group effects--correlations between pleasantness and consistency were uniformly high in all age groups. The results, indicating a lack of clear differentiation between pleasantness and consistency at all age levels, thus failed to confirm hypothesis 1.

Although disconfirmation of hypothesis 1 precluded joint confirmation of hypotheses 2 and 3, it was still possible that the data might have supported either hypothesis 2 or hypothesis 3. The ratings were therefore subjected to further statistical tests (i.e., analyses of variance). These tests indicated that balance exerted slightly greater influence than agreement in all age groups when pleasantness was the criterion (the reverse of that predicted in hypothesis 2), while in the case of consistency, agreement exerted slightly greater influence than balance. The effects of balance and agreement were very small, however, in comparison to those of attraction. Subjects in all age groups appear to have based both pleasantness and consistency ratings primarily on the sign of the P/O bond.

Zajonc indices and multiple regression analysis indicated that the results relevant to hypotheses 2 and 3 were not dependent on the method of data analysis. A cross-validation study conducted concurrently with the principal study by an independent and "naive" E yielded the same pattern of results with regard to all three hypotheses.

Although the results of the principal study and the cross-validation study failed to yield support for the experimental hypotheses they did confirm one of the major assumptions underlying the hypotheses. That is, they indicated that affect influences the perceptions of younger children more than considerations of consistency. The influence of affect was reflected in the subjects' utilization of attraction as a basis for both

pleasantness and consistency ratings.

The presence of strong attraction effects in the pleasantness ratings of children is consistent with results obtained by Ohashi (1964). Ohashi had sixth grade children rate triadic structures for pleasantness. His data also indicate that children base pleasantness ratings more on attraction than on agreement or balance. Zajonc indices computed from data obtained by Knox (1963) and Gutman (1969) indicate a similar tendency among adult subjects. Analysis of other studies with adults by the Zajonc method show agreement or balance to have contributed slightly more to pleasantness ratings than attraction. Indices for balance are of greater magnitude than those for agreement or attraction, on the other hand, in all studies of psychological consistency conducted among adults. Studies with children favor attraction or balance, depending on the task. Attraction seems to influence perceptions of children to a greater extent than agreement or balance when a rating task is used (e.g., the present study); balance seems to be the more important determinant when the child is required to predict missing relations (e.g., Atwood, 1969; Knox and Gutman, 1968; Storm and Knox, 1969).

It was suggested that differences between adults and children in the rating situation may be due to differences in information processing abilities and/or to differences in the strength of the balance "schema." Differences in results obtained with children in the rating vs the prediction situation were tentatively attributed to differential task complexity.

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APPENDIX 1

PILOT STUDIES

Two pilot studies were conducted as feasibility tests for the main study and provided vehicles for developing a suitable procedure for young children.

The first study required pleasantness ratings from subjects aged 4-6 years (n=11). Subjects were children of E's friends and relatives. The children were tested in their homes in two sessions. In the first session, they were shown how to use the rating scales and then rated two sets of P-O-X structures for pleasantness. There were 8 structures in each set, representing the 8 triads shown in Figure 6. Each structure was presented in pictorial form on a separate 3" x 5" card. Stick figures were used to indicate the two persons P and O, in each situation. A box was used to symbolize X, "something very, very important to both children." Affective relations between elements were indicated by red hearts (like) and blue crosses (dislike). The direction of relations between elements was indicated by black arrows. The subject was instructed to assume the role of P in each structure in the first set. He was asked to rate structures involving two other children in the second set. Ratings were made on a 15-point scale, 6½ feet in length, anchored at the high end by a smiling face and at the low end by a frowning face. One week later, E returned to the child's home and asked him to recall the contents of the cards and to describe the rating procedure.

Pilot Study II was conducted at the Vancouver Talmud Torah, a Hebrew Day School. In this study, children in grades 2, 4, and 6 (n=16 in each grade) rated the two sets of P-O-X structures used in Pilot Study I. They rated the structures first for pleasantness and then consistency. Consistency ratings were made on a 15-point scale identical to that used

for pleasantness ratings in Pilot Study I except that this scale was anchored at the high end by a large red S indicating that situations placed at this end made "lots of sense." At the low end of the scale there was a large red S covered by a black cross indicating that situations made "very little sense." Testing was conducted in one session of approximately 30 minutes duration, prefaced by a training period. The subject made four ratings during the session, two for pleasantness (test and retest) and two for consistency. A five minute rest was given between the pleasantness and consistency rating tasks.

In the second pilot study, an attempt was made to establish unit relations between the two persons in each P-O-X situation. This was accomplished by presenting the various structures in the following contexts:

Format 1:

> The stories that I'm going to show you are about two school children. At the beginning of the year, the teacher told these two children that they were to be partners. They were to help each other with their school work, go to swimming together, work together on special projects, etc. You are one of these children--the one with the black circle around him (her).

Format 2:

> This time I want you to pretend that you and the other child are in Israel. You are staying at a Kibbutz for the summer. You and the other child are the only Canadians on the Kibbutz. You and the other child sleep in the same room. You are the child with the black circle around him (her); the other child is your roommate.

Format 1 was used to present structures in the test series. Format 2 was used to present the retest series. The subject was instructed to view himself as a participant in all situations.

The results of the recall session in Pilot Study I indicated that

subjects understood the basic elements of the situations and the procedure involved in making ratings. Observation of the subjects' behaviour in both sessions, however, suggested certain changes in the training procedure and in the wording of instructions. For example, at one point in the training procedure the child was required to seriate 6-size graded blocks on a 6-point scale, 1¼ feet in length. A small square was drawn below scale position 1 and a large one was drawn below scale position 6. These squares proved confusing to the children. They placed the smallest block on the small square and the largest block on the large square but were not sure how to proceed thereafter. A scale containing 6 squares of increasing size, placed above the scale numbers, was substituted. It proved more successful. Squares of increasing size were also added to the pleasantness and consistency rating scales in the principal study, in order to facilitate scoring. In both pilot studies subjects sometimes placed structure cards half-way between two scale points. E had to question the subject in order to determine which scale point was intended.

Further procedural changes derive specifically from Pilot Study II. Verbal comments by subjects in Pilot Study II indicated, for example, that retest ratings may have been influenced to some extent by memory of ratings made in the test series. Some form of activity should have been interpolated between the test and retest series. Observation of subjects' behaviour during Pilot Study II indicated that motivation tended to wane toward the end of the session. This was partially alleviated by shortening the training procedure and by changing the wording of instructions. Discussion with subjects at the conclusion of the study suggested, however, that a further reduction in the total duration of the training and testing

session was necessary. It also became apparent during the course of Pilot Study II that the order in which formats were presented should have been varied, as should the order in which subjects rated for pleasantness and consistency.

Ratings obtained in Pilot Study I were analyzed according to Zajonc's (1968) method. Index values for attraction, agreement, and balance were 1.53, .99, and 1.11 respectively, indicating that attraction was the more important determinant of subjects' pleasantness ratings. The same result was obtained in Pilot Study II. As shown in Table 21, Zajonc indices for

Table 21

attraction exceed those for agreement and balance in all age groups, when computed from pleasantness ratings. In the case of consistency ratings, the index value for attraction was larger than that for agreement or balance in the 2nd grade group; values for agreement were of greatest magnitude among 4th and 6th grade children.

Table 1: Zajonc indices for Pilot Study II

a) Pleasantness ratings

Grade	p and o agree $PL^{+}O$	p and o agree $PL^{-}O$	p and o disagree $PL^{+}O$	p and o disagree $PL^{-}O$	Effect Ratio: Agreement	Attraction	Balance
2	12.08	4.34	11.75	3.54	1.07	3.03	.97
4	12.88	4.79	10.82	5.43	1.09	2.32	1.17
6	13.36	6.01	11.60	5.91	1.11	2.09	1.09

b) Consistency ratings

Grade							
2	12.88	5.48	9.22	4.25	1.36	2.27	1.17
4	12.66	7.77	6.86	7.46	1.43	1.28	1.38
6	12.66	9.11	8.54	8.02	1.31	1.24	1.17

Grade 2 (n=16), Age range 91-107 months; $\bar{X}$ age=95 months (7.9 years)

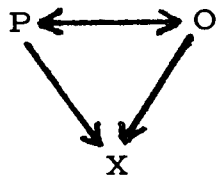
Grade 4 (n=16), Age range 114-122 months; $\bar{X}$ age=118 months (9.8 years)

Grade 6 (n=16), Age range 136-146 months; $\bar{X}$ age=142 months (11.8 years)

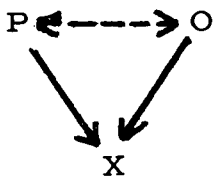
APPENDIX 2

DIAGRAMMATIC REPRESENTATION OF THE STRUCTURES INCLUDED IN LEVEL 1 AND LEVEL 2 OF FACTOR O

Level 1 of Factor O



(1)



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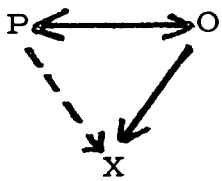
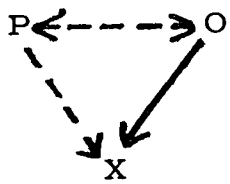
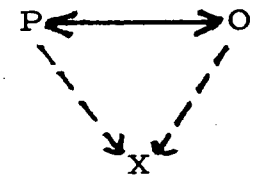


(5)

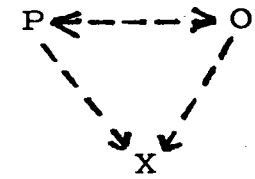


(8)

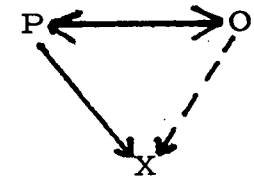
Level 2 of Factor O



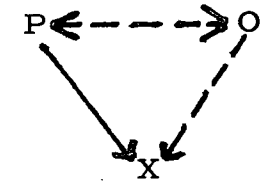
(2)



(4)



(6)



(7)

NOTE: Structures 1, 2, 8, and 7 are balanced; the remainder are imbalanced.

APPENDIX 3

MEAN PLEASANTNESS AND CONSISTENCY RATINGS FOR EACH STRUCTURE (BY AGE)

Table 22: Mean pleasantness and consistency ratings for each structure.

Structure No.	Age Gp.	Pleasantness	Consistency
1	5-6	14.68	14.20
	7-8	15.00	14.45
	9-10	14.83	14.93
	11-12	14.78	14.98
2	5-6	10.85	8.00
	7-8	9.33	9.15
	9-10	12.08	12.03
	11-12	10.53	11.23
3	5-6	6.75	7.05
	7-8	6.50	6.60
	9-10	8.08	8.10
	11-12	6.98	5.90
4	5-6	3.00	2.38
	7-8	1.53	3.08
	9-10	4.25	7.20
	11-12	3.20	6.25
5	5-6	11.50	9.10
	7-8	10.65	9.60
	9-10	11.83	9.88
	11-12	9.48	9.28
6	5-6	11.25	9.18
	7-8	12.15	9.50
	9-10	12.15	11.03
	11-12	9.73	8.95
7	5-6	6.15	4.38
	7-8	5.00	5.28
	9-10	6.85	5.93
	11-12	5.10	5.43
8	5-6	5.68	4.25
	7-8	5.23	4.63
	9-10	5.88	6.15
	11-12	5.30	5.53

The values in each cell of the above table represent an average of ratings made under formats 1 and 2. A high value indicates that the structure was perceived to be pleasant (or consistent); low values indicate that on the average, Ss perceived the structure to be unpleasant (or inconsistent).

APPENDIX 4

MULTIPLE REGRESSION ANALYSIS OF THE RATINGS

(a) The principal study

In order to rule out the possibility that the findings relative to hypotheses 2 and 3 were an artifact of the method of data analysis, pleasantness and consistency ratings were also subjected to multiple regression analysis. In this analysis, multiple regression equations in standard score form were computed for each subject. Predictors were balance, agreement, and attraction. The subject's own ratings served as criteria. Beta coefficients were then averaged for each age group. These average coefficients are shown in Table 23. Inspection of this table indicates that average beta weights for attraction exceed those for balance

Table 23

and agreement in all groups, both for pleasantness and for consistency. Average beta weights for balance are greater than those for agreement in the pleasantness equations but in the consistency equations in all groups but 7-8, average beta weights for agreement exceed those for balance.

Coefficients of concordance were calculated in order to estimate the amount of agreement among subjects in each age group in their weighting of the three predictors. The procedure, described by Siegel (1956), involves ranking the beta coefficients according to magnitude. As shown in Table 24, W values are significant ($P<.01$) at all age levels for both pleasantness and consistency. Significant values of W may be interpreted as meaning

Table 24

that subjects within a particular age group tend to use the three

Table 23: Average regression equations for pleasantness and consistency.

	Pleasantness			Consistency		
Age	Agreement	Attraction	Balance	Agreement	Attraction	Balance
5-6	.0051	.6457	.1434	.1048	.5413	.0977
7-8	-.0163	.7116	.1010	.1196	.6297	.1257
9-10	.0122	.8167	.1661	.1829	.6543	.1333
11-12	.1665	.6585	.1784	.2414	.5953	.1955

Table 24: Kendall Coefficients of Concordance

	Pleasantness		Consistency	
Age Group	W	S	W	S
5-6	.593	474.00**	.552	451.50**
7-8	.693	554.17**	.483	386.00**
9-10	.773	618.00**	.610	488.00**
11-12	.438	350.00**	.333	266.00**

*p<.05
**p<.01

predictors in similar fashion.

The frequency of significance of each predictor is summarized in Table 25. Attraction was a significant component of pleasantness and consistency ratings for the majority of subjects in all groups. From 70-100% of subjects in each group assigned positive weighting to attraction.

Table 25

Positive weighting means that if P and O like each other, there is a tendency of varying intensity, but independent of other predictors, to rate the situation highly pleasant (or highly consistent). Negative weighting implies the reverse meaning. A smaller proportion of subjects (5-40%) in each age group also assigned significant weighting to balance and/or agreement. There is some indication that use of agreement and balance as a basis for rating increases with increasing age.

Overall, the results of the regression analyses lead to the same conclusions with regard to hypotheses 2 and 3 as the analysis of variance and the Zajonc indices. That is, the results fail to support either hypothesis.

(b) The cross-validation study

Average regression equations computed from ratings obtained in the cross-validation study are presented in Table 26. The relative weighting

Table 26

of predictors in these equations is the same as in the principal study

Table 26 No. of Ss for whom predictors are significant components of pleasantness and/or consistency ratings. (n=20 in each age group.)

	Pleasantness						Consistency					
	Balance		Agreement		Attraction		Balance		Agreement		Attraction	
Age Gp	+	-	+	-	+	-	+	-	+	-	+	-
5-6	5	0	0	0	14	0	2	0	2	0	14	0
7-8	4	0	0	1	20	0	2	0	2	0	17	0
9-10	6	0	2	1	20	0	2	0	6	0	18	0
11-12	3	0	5	0	17	0	5	0	8	0	16	0

Cross Validation Study

Table 26: Average regression equations for pleasantness and consistency.

	Pleasantness			Consistency		
Age	Agreement	Attraction	Balance	Agreement	Attraction	Balance
5-6	.0913	.4394	.0604	.1446	.4085	.0897
7-8	.2160	.5447	.1593	.1872	.4064	.0618
9-10	.1741	.7640	.1132	.2088	.5741	.1165
11-12	.3146	.5412	.2194	.3273	.5855	.1421

in the case of consistency. In the regression equations for pleasantness, the relative weighting of balance and agreement is the reverse of that in the principal study (i.e., beta weights for agreement exceed those for balance). As mentioned in Chapter VI however, a subject by subject comparison indicated that beta weights for agreement were of greater magnitude than those for balance in only 50% of the subjects. Thus, the results of the cross-validation study also fail to support hypotheses 2 and 3.

APPENDIX 5

SUMMARY OF ANALYSIS OF VARIANCE OF PLEASANTNESS, CONSISTENCY, AND TENSION RATINGS OBTAINED WITH ADULT SUBJECTS (GUTMAN, 1969)

Table 27a: Summary of analysis of variance of pleasantness ratings.

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
A (Agreement)	1	1629.80	1317.19**	18.41
B (Attraction)	1	2946.50	2381.39**	33.28
AB (Balance)	1	98.58	79.68**	1.11
C (Format)	1	.50	.41	
AC	1	.11	.09	
BC	1	.36	.29	
ABC	1	3.05	2.46	
O (Structures)	1	97.50	78.80**	1.10
AO	1	56.68	45.81**	.64
BO	1	13.36	10.80**	
ABO	1	6.30	5.09*	.07
CO	1	1.86	1.50	
ACO	1	.76	.62	
BCO	1	9.00	7.28**	.10
ABCO	1	.43	.35	
S	83	6.60	5.33**	6.02
AS	83	8.46	6.84**	7.93
BS	83	11.07	8.94**	10.37
ABS	83	2.72	2.20**	2.55
CS	83	1.28	1.04	
ACS	83	1.32	1.07	
BCS	83	1.31	1.08	
ABCS	83	1.52	1.23	
OS	83	1.59	1.29	
AOS	83	4.92	3.98**	4.61
BOS	83	1.53	1.24	
ABOS	83	1.40	1.13	
COS	83	.92	.75	
ACOS	83	.97	.79	
BCOS	83	1.19	.97	
Error	83	1.24		
Total	1343			

*p<.05
**p<.01

Table 27b: Summary of analysis of variance of consistency ratings.

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
A (Agreement)	1	240.89	91.03**	3.11
B (Attraction)	1	718.97	271.68**	9.28
AB (Balance)	1	1041.30	393.47**	13.44
C (Format)	1	.81	.31	
AC	1	.63	.24	
BC	1	.17	.06	
ABC	1	1.94	.73	
O (Structures)	1	32.50	12.28**	.42
AO	1	28.88	10.91**	.37
BO	1	57.92	21.89**	.75
ABO	1	56.27	21.26**	.73
CO	1	.09	.03	
ACO	1	11.63	4.39*	.15
BCO	1	2.77	1.05	
ABCO	1	4.41	1.67	
S	83	10.09	3.81**	10.81
AS	83	7.09	2.68**	7.59
BS	83	8.82	3.33**	9.45
ABS	83	11.61	4.39**	12.43
CS	83	2.76	1.04	
ACS	83	1.77	.67	
BCS	83	1.64	.62	
ABCS	83	1.92	.73	
OS	83	2.29	.87	
AOS	83	3.23	1.22	
BOS	83	3.32	1.25	
ABOS	83	2.56	.97	
COS	83	2.37	.90	
ACOS	83	2.83	1.07	
BCOS	83	1.90	.72	
Error	83	2.65		
Total	1343			

*p<.05
**p<.01

Table 27c: Summary of analysis of variance of tension ratings.

Source of Variation	df	MS	F	% of variability due to significant main effects and interactions
A	1	2160.40	1638.56**	23.67
B	1	2731.40	2071.65**	29.93
AB	1	46.50	35.27**	.51
C	1	.19	.14	
AC	1	2.50	1.90	
BC	1	.36	.27	
ABC	1	3.86	2.93	
O	1	35.36	26.82**	.39
AO	1	11.44	8.68**	.13
BO	1	15.43	11.70**	.17
ABO	1	4.53	3.43	
CO	1	.96	.73	
ACO	1	.00	.00	
BCO	1	.03	.02	
ABCO	1	7.44	5.64*	.08
S	83	9.93	7.53**	9.03
AS	83	8.97	6.80**	8.15
BS	83	8.62	6.54**	7.83
ABS	83	2.18	1.65*	1.98
CS	83	1.83	1.39*	
ACS	83	1.12	.90	
BCS	83	1.96	1.49*	1.78
ABCS	83	.83	.63	
OS	83	2.30	1.74**	2.09
AOS	83	3.83	2.91**	3.48
BOS	83	1.36	1.03	
ABOS	83	1.74	1.32	
COS	83	1.41	1.07	
ACOS	83	1.22	.93	
BCOS	83	.81	.61	
Error	83	1.32		
Total	1343			