

A LEVEL
Research Guide

PSYCHOLOGY

H167/H567

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Key Research Guide: Component 3 – Child Psychology

Version 1



A LEVEL
PSYCHOLOGY

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A twin-family study of general IQ

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A twin-family study of general IQ

Learning and Individual Differences, 18, 76–88.

1. Theory/ies on which the study is based

- Many definitions have been provided over the years for the term 'intelligence' e.g. 'the power of good responses from the point of view of truth or fact' (Edward Lee Thorndike); 'the ability to carry on abstract thinking' (Lewis Madison Terman). However one of the most influential definitions was put forward in 1944 by David Wechsler: 'the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment'. However, because this definition ignores other important properties, good lexicographic practice suggests that it may be best to define intelligence simply as cognitive ability. (Oxford Dictionary of Psychology).
- Individual differences in intelligence tend to cluster in families (Bouchard, & McGue, 2003, 1981; Boomsma, 1993; Deary, Spinath, & Bates, 2006).
- The resemblance (in intelligence) between relatives can be due to genetic relatedness, environmental similarities, cultural transmission from one generation to the next, social interactions between family members, or a combination of these mechanisms. The hypothesis of marital interaction or convergence states that spousal correlations arise because spouses spend time together. Spouses would tend to become more similar the longer they are together, because they either influence each other or because they share similar experiences. However, the few studies that tested this hypothesis found no indications of convergence for intelligence (Gilger, 1991; Mascie-Taylor, 1989; Watson et al., 2004).
- Phenotypic assortment assumes that spouses choose each other based on observable characteristics (Reynolds, Baker, & Pederson, 1996), in this case on intelligence or a trait related to it i.e. individuals will tend to mate with partners of a similar intelligence level.
- Social homogamy refers to assortment based on solely environmental similarities. Spousal phenotypes therefore become correlated because spouses meet each other within a particular environment. In the case of intelligence, the social homogamy hypothesis states that people with the same intelligence level live in the same social environment. Within a particular social environment, partners do not choose each other on the basis of intelligence, but since they live in the same environment, they tend to mate with people with a similar IQ.
- The causes in this resemblance (in intelligence) is best studied using a twin-family study. This is because monozygotic (MZ; identical) twins share all, or nearly all of their DNA and dizygotic (DZ; fraternal) twins share on average 50% of their segregating genes (Boomsma, Busjahn, & Peltonen, 2002; Plomin, DeFries, Craig, & McGuffin, 2002). This larger resemblance in MZ than DZ twins is therefore suggestive of genetic influences on twin resemblance, rather than environmental influences.
- Parents may create a particular kind of environment that is correlated with their genotype or their phenotype, for example, bright parents might stimulate their children with schoolwork or provide them with more intelligence-boosting toys. Whenever there is cultural transmission in the presence of genetic transmission, environmental influences become correlated with genetic influences.
- Including parents in a twin design adds extra information about the origins of individual differences. The resemblance between parents and offspring may reflect genetic transmission, cultural transmission, or both. In the case of genetic transmission, resemblance between parents and offspring is caused by the genes which are transmitted from the parents to their children. In an ordinary family design genetic transmission is confounded with cultural influences of parents on their offspring. Cultural transmission will increase parent–offspring correlations, as well as correlations between siblings and twins who grow up in the same home environment. In the classical twin design, cultural transmission will show up as shared (or common) environmental variance.

A twin-family study of general IQ

Van Leeuwen, M., Van den Berg, S. M. & Boomsma, D. (2008)

2. Background to the study

- Previous twin studies have estimated the contribution of genetic effects to the variability in intelligence at 25% to 50%. Part of the remaining variance is due to environmental factors shared by children who grow up in the same family (Bartels, Rietveld, Van Baal, & Boomsma, 2002; Plomin et al., 2002; Turkheimer, Haley, Waldron, D'Onofrio, & Gottesman, 2003). Heritability appears to increase with age and the influence of shared environment disappears in early adolescence (see e.g. Bouchard & McGue, 2003; Cherny & Cardon, 1994; Plomin et al., 2002; Plomin and Spinath, 2004; Plomin, Pedersen, Lichtenstein, & McClearn, 1994; Posthuma, De Geus, & Boomsma, 2001; Scarr & Weinberg, 1983).
- Previous spouse and family studies have shown that spouses resemble each other in IQ scores and traits correlated to IQ, such as educational attainment. Spousal correlations for performance on the Raven Progressive Matrices are around 0.30 (Guttman, 1974; Watkins & Meredith, 1981). For the Wechsler Adult Intelligence Scale (WAIS), spousal correlations are between 0.37 and 0.61 (Mascie-Taylor, 1989; Watson et al., 2004; Williams, 1975).
- Previous research has shown that the environment might have a greater influence in less intelligent people than more intelligent people e.g. Finkel & Pederson, 2001.
- This article builds on previous research. It uses an extended twin design which includes MZ and DZ twins, their siblings and their parents, to study to what extent assortative mating, cultural inheritance and GE (genotype-environment) interaction and correlation are present for general intelligence (IQ). Data on general IQ were collected in both generations with the Raven Progressive Matrices test.
- Until this study only the CAP study (Colorado Adoption Project) had examined the genetic and environmental transmission of intelligence from parents to their children in the presence of spousal resemblance.
- The study investigates whether biological factors and/or environmental factors might affect intelligence.
- Van Leeuwen et al. expected additive genetic effects would explain a large part of any individual differences in intelligence.

3. Research method

- This is a research article/paper which assesses the presence of assortative mating, gene-environment interaction and the heritability of intelligence in childhood using a twin family design with twins, their siblings and parents from 112 families. Two competing hypotheses about the cause of assortative mating in intelligence: social homogamy and phenotypic assortment, are evaluated and their implications for the heritability estimate of intelligence considered. The researchers also assessed GE interaction by testing to see if there was an association between absolute difference scores in MZ twins (reflecting non-shared environmental effects) and average scores (reflecting familial effects).
- This study could also be viewed as a collection of (mini) case studies, the findings of which were collated and analysed in order to compare the two hypotheses about the cause of assortative mating in intelligence.
- In addition, the study may be viewed as a correlational study as the researchers were looking for relationships between such factors as intelligence and biological factors, intelligence and environmental factors.
- The study was approved by the Central Committee on Research involving Human Subjects (CCMO).

A twin-family study of general IQ

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4. Sample

- Twins were recruited from the Netherlands Twin Registry (NTR), established by the Department of Biological Psychology at the Vrije Universiteit (VU) in Amsterdam.
- Twin families with an extra sibling between 9 and 14 years were selected from two birth cohorts (1995–1996). Because the twins and siblings also took part in an MRI study, there were several exclusion criteria such as a pacemaker and metal materials in the head. Families with children with a major medical history, psychiatric problems (as reported by the parents), participation in special education, or physical or sensory disabilities were also excluded.
- A total of 214 families were invited by letter, which was sent out one to two months before the ninth birthday of the twins. Two weeks after receiving the letter, the families were contacted by phone. Of these families 52% (112) agreed to participate.
- There was no significant difference between the educational level of mothers who did participate and who did not participate in the study.
- Of the 112 families, 103 had full siblings who wanted to participate.
- The 112 families came from all over the Netherlands.
- Mean age of the twins at time of cognitive assessment was 9.1 years, ranging from 8.9 to 9.5 years.
- There were 23 MZ male, 23 DZ male, 25 MZ female, 21 DZ female and 20 DZ pairs of opposite sex. Zygosity was based on DNA polymorphisms and questionnaire items.
- Mean age of the siblings (N=103; 59 female) was 11.9 years ranging from 9.9 to 14.9.
- The mean age of the biological fathers was 43.7 (N=94, SD=3.7 years), and of the biological mothers 41.9 (N=95, SD=3.4 years).

5. Outline of the procedure/study

- Parents signed informed consent forms for their children and themselves. Children also signed their own consent forms.
- Parents were compensated for their travel expenses and children received a present.

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5. Outline of the procedure/study

Testing procedures

- The study collected cognitive, behavioural and hormonal data, pubertal status and structural Magnetic Resonance Imaging (MRI) brain data.
- Data collection took place on two different days.
- Cheek swabs, for DNA isolation, were collected at home by parents and children.
- For cognitive testing, families arrived between nine and eleven o'clock in the morning. Children were tested in separate rooms with a cognitive test battery including the Raven's Standard Progressive Matrices (SPM; Raven, 1960). Parents completed the Raven Advanced Progressive Matrices (APM; Raven et al., 1998). The whole protocol took approximately 5 h, including two short breaks and one longer lunch break.

Materials

- Children were individually tested with the SPM, which they completed at their own pace after verbal instruction. The test consists of 60 problems divided into five sets of twelve. In each set the first problem is as nearly as possible self-evident. The problems within a set become progressively more difficult. The test is intended to cover the whole range of intellectual development from the time a child is able to grasp the idea of finding a missing piece to complete a pattern, and to be sufficiently long to assess a child's maximum capacity to form comparisons and reason by analogy. The test provides an index of general intelligence. For children retest reliability is .88 (Raven, 1960).
- Parents were given the APM (Raven et al., 1998), since the SPM is too easy for most adults. They received written instructions and made the test at their own pace. The APM is comparable to the SPM with the main difference being the level of difficulty. The APM consists of two sets. The first set contains twelve practice items, to familiarize participants with the test. The second set consists of 36 items, which are identical in presentation and argument with those in Set I. They only increase in difficulty more steadily and become considerably more complex. Reported retest reliability for adults is .91 (Raven et al., 1998).

Zygosity determination

- In 110 twin pairs, zygosity was determined at the VU Medical Centre with eight highly polymorphic di-, tri- and tetra nucleotide genetic markers. Results of the zygosity test were sent to the parents. In the remaining two twin pairs zygosity was based on questionnaire items.

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6. Key findings

- Descriptive statistics of the Raven IQ scores are shown below:

Descriptives for all subjects of the sum IQ score on the RAP

	N	Minimum	Maximum	Mean	SD
Fathers	94	4	36	27.0	6.5
Mothers	95	9	36	25.9	6.0
Male siblings	44	24	56	43.8	7.8
Female siblings	57	30	49	46.4	6.5
Male twins	114	13	50	36.7	8.6
Female twins	110	19	50	36.6	7.1

Parents received the APM (maximum achievable score = 36), offspring received the SPM (maximum achievable score = 60)

For the estimated IQ measures (based on the Rasch scaling), no significant sex differences were observed: neither in the total group, not within groups (parents, siblings, twins).

- There was no age by sex interaction in the offspring.
- The variance in the siblings was significantly larger than in the twins, which could partly be explained by age difference.
- Correlations were higher in MZ twins than in first-degree relatives (siblings, DZ twins and parent-offspring pairs).
- The mean IQ score was higher in the older siblings than the younger and there was more variance in siblings than in twins, even though the same test was used. This could not be fully explained by age differences among the siblings.
- The spousal correlation for the Rasch IQ estimates was significant and moderately high (0.33). A model assuming that this correlation is due to phenotypic assortment proved superior to a model assuming that the correlation was due to purely environmental factors that are transmitted from generation to generation.
- The distribution of Rasch IQ scores looked more or less normal though the distribution of the estimated measures in twins showed a slight negative skew and the sibling and parental data a slight positive skew.
- Corrected for scale unreliability effects, additive genetic effects account for 67% of the variation in intelligence and the remainder is explained by random environmental factors, including measurement error indicating that inherited genetic factors influence children's intelligence
- Non-additive genetic effects and cultural transmission effects were not significant.
- Findings in relation to GE interaction suggested that the environment is relatively more important in explaining individual differences for low IQ groups than for high IQ groups.

A twin-family study of general IQ

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9. Possible conclusions

- Variability in fluid intelligence as measured by the Raven is largely explained by additive genetic effects that are transmitted from parents to offspring.
- Individual differences in intelligence are largely accounted for by genetic differences.
- Parental influence on their children's IQ can be explained by the transmission of genes.
- Cultural transmission from parents does not influence their children's IQ.
- Environmental factors are significantly more important in children with a genetic predisposition for low IQ than in children with a genetic predisposition for high IQ.
- Environmental factors influencing IQ are generally not shared among siblings.

Neural representation of expected value in the adolescent brain

Barkley-Levenson, E. & Galván, A (2014)

Barkley-Levenson, E. & Galván, A. (2014)

Neural representation of expected value in the adolescent brain

Proceedings of the National Academy of Sciences of the United States of America, 111, 1646–1651.

1. Theory/ies on which the study is based

- Adolescence is characterised by heightened sensitivity to rewards (Galvan, 2013). This is shown by exaggerated neural response in ventral striatum to the anticipation and receipt of either an expected or an unexpected reward in adolescents compared to other age groups.
- Subjective value (SV) is defined as the value that an individual places on a stimulus, (Knutson et al., 2008). To make a choice, an organism determines the SV of each alternative and then selects the one with the greatest SV, e.g. Bartra et al., 2013).
- Research has found that the ventromedial prefrontal cortex (VMPFC) and ventral striatum (VS) regions represent SV during choice for monetary stimuli, charitable donations, consumer goods, and food.
- One approach to understanding the neural computation of SV is through measurement of expected value (EV), the sum of all of the possible outcomes of a particular choice multiplied by their probabilities, (Trepel et al., 2005). It had been found that in adults, increasing EV yields parametric activation increases in bilateral VS, midbrain, medial prefrontal cortex (MPFC), and dorsolateral prefrontal cortex (DLPFC).
- It is currently unknown if there are ontogenetic differences in how EV is represented in the brain and whether these differences confer a greater influence in value-based choices in adolescents versus adults (Barkley-Levenson & Galvan, 2014).

2. Background to the study

- Previous work shows that the adolescent reward system is hyperactive, but this finding may be confounded by differences in how teens value money. To address this, Barkley-Levenson and Galvan examined the neural ontogeny of objective value representation.
- A recent meta-analysis of 206 studies of SV in adults identified the ventromedial prefrontal cortex (VMPFC) and VS as a “valuation system” (Bartra et al., 2013).
- Despite the wealth of knowledge on the neural correlates of SV in adults, no previous studies had examined the neurobiological development of SV, which precludes ruling out the possibility that previous findings in support of a hyperactive adolescent reward system were confounded by differences in participant valuation.
- Until this study, it was not clear whether the adolescent brain attributes greater value to available rewards, or whether the effect is driven by adolescents valuing money to a greater extent than adults because they typically have less access to and experience with it. The goal of this study was to disentangle these possibilities by examining subjective valuation (indexed by behaviour) of objectively valued choices.
- This study sheds light on brain development and the impact of this on risk taking behaviour.
- Barkley-Levenson and Galvan had three hypotheses:
 - (a) Adolescents will exhibit greater behavioural sensitivity (accept more gambles) to increasing EV than adults.
 - (b) Neurobiologically VS activation will modulate in proportion to increasing EV more for adolescents than adults.
 - (c) Adults who behave like adolescents in terms of gambling behaviour will not exhibit hyperactive striatal activation.

Neural representation of expected value in the adolescent brain

Barkley-Levenson, E. & Galván, A (2014)

3. Research method

- This was a quasi-experiment using an independent measures design, conducted in a laboratory.
- The independent variable (IV) was whether the participant was an adult or an adolescent. This was naturally occurring and could not be manipulated.
- The dependent variable (DV) was the performance on a simple mixed gambles game during functional resonance imaging (fMRI).
- A secondary analysis was conducted to test the hypothesis that an exaggerated VS activation in adolescents would be observed even after matching adolescents and adults on subjective valuation (acceptance of gambles).

4. Sample

- 19 healthy, right-handed adults (ages 25-30, mean age 27.9 years, SD = 1.9 years; 11 female and therefore 8 male).
- 22 healthy, right-handed adolescents (ages 13-17, mean age 15.6 years, DV = 1.4 years; 11 female and therefore 11 male).
- All participants were recruited through poster and internet advertisements approved through the University of California, Los Angeles (UCLA), Institutional Review Board and through a database of prior research participants.
- All participants reported no prior diagnosis of psychiatric or neurologic illness or development delays, had no metal in their bodies, and were not taking psychoactive medication.

Neural representation of expected value in the adolescent brain

Barkley-Levenson, E. & Galván, A (2014)

5. Outline of the procedure/study

- Participants visited the laboratory for an intake session and for the neuro-imaging session.
- At the intake session, all participants provided informed consent, and participants under the age of 18 provided assent while their parents/guardians completed the informed consent form.
- At the intake session each participant was also asked to provide the primary source and amount of spending money per month. This was because the valuation of monetary rewards might be influenced by available spending money/income. There was a significant effect of age on spending money each month: mean for adolescents = \$52.50, mean for adults = \$467.11.
- Finally at the intake session, participants were familiarised to an MRI environment with a mock scanner.
- Participants were given \$20 for completing the intake session and were informed that they would use the \$20 as “playing” money during the fMRI task on the subsequent laboratory session. They were also informed that there was an opportunity to win up to \$20 more in addition to their playing money (for a total of \$40) but that there was a possibility that they would lose the \$20 during the gambling fMRI task. Allowing them to feel ownership of the \$20 earned during the intake session helped preclude the “house money effect” (increased risk-taking behaviour that is observed when the money at stake is not the participant’s own) In actuality, all participants were assigned a payment of between \$5 and \$10 corresponding to a trial that they accepted, to ensure that no participants were required to return money to the experimenters.
- Approximately one week after the intake session, participants returned to the laboratory for the fMRI session.
- During the fMRI scan, participants completed a gambling task. In this task, participants were presented with a series of gambles with a 50% probability of gaining the amount shown on one side of a “spinner” and a 50% probability of losing the amount shown on the other side. The gain and loss amounts were independently manipulated, with gain amounts selected from the range of whole-dollar values between +\$5 and +\$20 and loss amounts selected from the range of whole-dollar values between -\$5 and -\$20, for a total of 144 trials. Randomly interspersed within these trials were 24 gain-only trials and 24 loss-only trials, with values drawn from the same range, for a total of 192 trials across four runs. These gain-only and loss-only trials allowed for a broader range of EVs within the task than mixed gambles alone would provide. The EVs of the mixed gambles ranged from -\$7.50 to +\$7.50, whereas the EVs of the gain-only gambles ranged from +\$6 to +\$19 and the EVs of the loss-only gambles ranged from -\$6 to -\$19. The side of the spinner in which the gain and loss appeared and the order of the stimuli was counterbalanced across participants. For each trial, participants decided whether or not they would be willing to play that gamble for real money. Participants were informed that one of the trials that they chose to accept would be selected at the end of the scan and played for real money, with that amount of money added to or subtracted from their overall payment for the study. This procedure was designed to encourage a choice on each trial that was consistent with the participant’s actual feelings about that gamble.
- Participants were extensively trained before the scan to make sure they understood all aspects of the gambling task.
- Scanning was performed on a 3-Tesla Siemens Trio MRI machine in the Ahmanson-Lovelace Brain Mapping Center at UCLA. Data pre-processing and analysis were conducted using Functional MRI of the Brain Software Library (FSL) version 4.1.

Neural representation of expected value in the adolescent brain

Barkley-Levenson, E. & Galván, A (2014)

5. Outline of the procedure/study

... continued

- Participants were told to be enthusiastic when writing their statements and had to use two adjectives among “exciting”, “incredible”, “great” and “superb”. Negative effects of sensory deprivation were not to be mentioned.
- The experimenter told participants to begin and left the room for 7 minutes.
- If a participant believed the proposed research on sensory deprivation violated ethical norms he/she could anonymously challenge it by putting a form in the mailbox.
- After the 7-minute interval the experimenter returned and invited the participant to follow him back to the first room where he/she was administered two personality inventories, probed for suspicion, fully debriefed and asked to sign a second consent form, this time fully informed.
- The entire session lasted approximately 40 minutes.

Neural representation of expected value in the adolescent brain

Barkley-Levenson, E. & Galván, A (2014)

6. Key findings

- HLM was used to determine whether there was a significant effect of change of EV on acceptance rates and whether this relationship was different by age group. For the initial HLM analysis, three participants were excluded as outliers based on the deviation of their data from the fitted model; 20 adolescent and 17 adult participants were included in the HLM results. Results showed that acceptance rates did not change in either adolescents or adults when there was no risk involved in both gain-only and loss-only trials, suggesting that adolescents behave similarly to adults when there is no risk involved.
- Across all participants trials with positive EV were accepted significantly more than trials with EV of zero, which were accepted significantly more than trials with negative EV.
- No significant differences were observed between adolescent and adult participants in the percentage of EV+ trials accepted, the percentage of EVo trials accepted, or the percentage of EV- trials accepted.
- Increasing EV increased the likelihood of an accept response.
- There was a significant age group effect with parametric changes in positive EV having a greater effect on response for adolescents than adults.
- The amount of disposable income did not have an effect on the relationship between EV and acceptance rates.
- No significant differences were observed between adolescent and adult participants in reaction time.
- Acceptance rates did not change in either adolescents or adults when there was no risk involved in both gain-only and loss-only trials.
- Increasing expected value(EV) had a stronger influence over gambling choices in adolescents relative to adults
- This effect was paralleled by greater activation in the ventral striatum in adolescents than adults.
- Activation in some brain areas increased with increasing EV activation whilst activation in other brain areas decreased with increasing EV.
- This unique adolescent ventral striatum response remained even after matching groups on acceptance behaviour.

Neural representation of expected value in the adolescent brain

Barkley-Levenson, E. & Galván, A (2014)

7. Possible conclusions

- The value of available options has a greater influence in adolescent versus adult choices, even when objective value and subjective choice are held constant.
- Maturation changes in neural representation of valuation during adolescence are most robust in the VS.
- Neural differences in sensitivity to EV change across development.
- Hyper activation of reward circuitry in adolescence may be a normative ontogenetic shift that is due to greater valuation in the adolescent brain / the unique adolescent response to rewards is mediated by ontogenetic differences in valuation and is not simply a methodological consequence of using money as the rewarding stimulus.
- Adolescents behave similarly to adults when there is no risk involved (in gambling).

The Visual Cliff

Gibson, E.J & Walk P. D (1960)

Gibson, E. J. & Walk, P. D. (1960)

The Visual Cliff

Scientific American, 202, (4), 64–71

1. Theory/ies on which the study is based

- Height perception is a form of distance perception: information in the light reaching the eye provides stimuli that can be utilized for the discrimination both of depth and of receding distance on the level.
- With both eyes open, the brain receives and integrates information from both eyes to allow objects to be perceived in three dimensions.
- Depth cues (which are two-dimensional) allow for three-dimensional perception. These cues include: overlap, height in visual field, relative size, linear perspective and texture gradient.
- Depth perception is the **visual** ability to perceive the world in three **dimensions (3D)** and the distance of an object.
- When an observer moves, the apparent relative motion of several stationary objects against a background gives hints about their relative distance. If information about the direction and velocity of movement is known, motion parallax can provide absolute depth information. (Ferris, S.H. (1972). Motion parallax and absolute distance. *Journal of experimental psychology*, 95 (2), pp. 258–263). This effect can be seen clearly when driving in a car. Nearby things pass quickly, while far off objects appear stationary.
- Human infants at the creeping and toddling stage are prone to falls from more or less high places. They must be kept from going over the brink by side panels on their cots, gates on stairways and the vigilance of adults. As their muscular coordination matures they begin to avoid such accidents on their own.
- The effects of early experience and of such deprivations as dark-rearing represent important cues to the relative roles of maturation and learning in animal behaviour.

2. Background to the study

- Robert M. Yerkes found in 1904 that aquatic turtles have poorer depth-discrimination than land turtles.
- Previous research has shown that depth perception in rats is innate e.g. K. S. Lashley and James T. Russell, 1934.
- This study investigated the age at which infants start to show the ability to utilise visual stimuli for the discrimination of both depth and the recording of receding distance on the level.
- The study also aimed to show support for the suggestion that both humans' and other species' depth perception and thus avoidance of falling from such things as steep cliffs is innate. This was affected by observing the behaviour of chicks, turtles, rats, lambs, kids, pigs, kittens and dogs, as well as human infants on the visual cliff apparatus.
- In addition, the study aimed to determine which of two visual cues plays the decisive role in depth perception – (a) the fact that distance decreases the size and spacing of pattern elements projected on the retina or (b) motion parallax which causes the pattern elements on the shallow side to move more rapidly across the field of vision when the animal moves its position (on the board) or moves its head.

The Visual Cliff

Scientific American – Gibson, E.J & Walk P. D

3. Research method

- The main study was a laboratory experiment that used a repeated measures design.
- The independent variable (IV) was whether the infant was called by its mother from the cliff side or the shallow side (of the visual cliff apparatus).
- The dependent variable (DV) was whether or not the child would crawl to its mother.
- This was a repeated measures design because the infant was called from both the cliff side and the shallow side of the apparatus.
- The studies using other species are quasi (laboratory) experiments. The naturally occurring independent variable (IV) was the animal species e.g. rat / chick / lamb / kitten. The dependent variable (DV) was whether the animal preferred the shallow side or the deep side of the visual cliff apparatus.

4. Sample

- 36 infants ranging in age from six months to 14 months. Their mother also participated in the experiment.
- Parental consent must have been given as the child's mother was included in the experiment.
- The behaviour of chicks, turtles, rates, lambs, kids, pigs, kittens and dogs on the visual cliff apparatus was also observed.

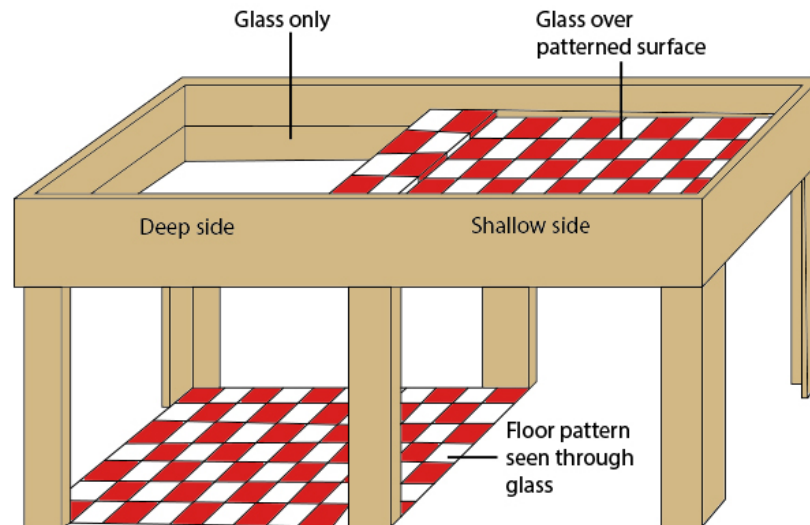
The Visual Cliff

Scientific American – Gibson, E.J & Walk P. D

5. Outline of the procedure/study

The visual cliff apparatus

- The apparatus consisted of a board laid across a large sheet of heavy glass which is supported a foot or more above the floor. On one side of the board a sheet of patterned material is placed flush against the under-surface of the glass, giving the glass the appearance as well as the substance of solidity. On the other side a sheet of the same material is laid upon the floor; this side of the board thus becomes the visual cliff :



- Each child was placed on the centre board, and his mother called him from the cliff side and the shallow side successively.
- Similarly chicks, turtles, rats, lambs, kids, pigs, kittens and dogs were placed on the visual cliff apparatus and the subsequent behaviour was observed.
- The visual cliff experiment was then further developed at the Cornell Behavior Farm: the patterned material was fixed to a sheet of plywood so that the 'depth' of the deep side could be adjusted. Access a clip here: <https://www.youtube.com/watch?v=1VPaBcT1KdY>

The Visual Cliff

Scientific American – Gibson, E.J & Walk P. D

5. Outline of the procedure/study

- A number of control experiments were conducted (using animals) to ensure the design of the visual cliff apparatus had no hidden bias:
 - In one of these experiments reflections from the glass were eliminated by lighting the patterned surfaces from below the glass.
 - In some experiments the patterned surface was replaced with a homogeneous grey surface.
 - To eliminate the optical difference between the two sides of the board, in some experiments the patterned surface was placed directly against the under-surface of the glass on each side.
- When trying to determine which of two visual cues plays the decisive role in depth perception – (a) the fact that distance decreases the size and spacing of pattern elements projected on the retina or (b) motion parallax which causes the pattern elements on the shallow side to move more rapidly across the field of vision when the animal moves its position (on the board) or moves its head:
 - (a) The potential distance cue provided by pattern density was removed by increasing the size and spacing of the pattern elements on the deep side in proportion to its distance from the eye.
 - (b) The cue of motion parallax was removed by placing the patterned material directly against the glass on either side of the board but smaller and more densely spaced pattern elements on the cliff side were used.
- To determine whether depth perception in rats and kittens is innate, groups of light-reared and dark-reared rats were tested using the visual cliff experiment because it requires no re-training.

The Visual Cliff

Scientific American – Gibson, E.J & Walk P. D

6. Key findings

- All of the 27 infants who crawled off the board crawled out on the shallow side at least once.
- Only three of the 27 children (11%) who moved off the board crawled off the brink onto the glass suspended above the pattern on the floor.
- Many of the infants crawled away from the mother when she called to them from the cliff side.
- Some of the infants cried when their mother stood on the cliff side because they could not get to her without crossing the apparent chasm.
- Often the infants would peer down through the glass on the deep side and then back away.
- Some infants patted the glass with their hands, yet despite this tactual assurance of solidity would refuse to cross the apparent chasm.
- Many infants supported themselves on the glass over the deep side as they manoeuvred awkwardly on the board.
- At an age of less than 24 hours a chick was found to never make a 'mistake' and always hopped off the board on the shallow side.
- Kids and lambs were tested on the visual cliff as soon as they could stand. No goat or lamb ever stepped onto the glass of the deep side, even at one day of age. When one of these animals was placed on the glass of the deep side, it refused to put its feet down and backed up into a defensive posture. If it was then pushed across the glass until its head and field of vision crossed the edge of the surrounding solid surface, it would relax from its defensive posture and spring forward on the surface.
- When kids and goats were tested on the moderated version of the visual cliff:
 - When the pattern was immediately beneath the glass, the animal would move about freely.
 - When the optical floor was dropped more than a foot below the glass, the animal froze into its defensive posture.
 - Despite repeated experience of the tactual solidity of the glass, the animals never learned to function without optical support i.e. their sense of security or danger continued to depend upon the visual cues that gave them their perception of depth.
- Hooded rats when tested on the visual cliff showed:
 - Little preference for the shallow side as long as they could feel the glass with their vibrissae (whiskers).
 - When placed upon the glass over the deep side, they moved about normally.
 - When the centre board was raised several inches so that the glass was out of reach of their whiskers, they showed good visual depth-discrimination – 95 to 100% of them descended on the shallow side.
 - When tested using the patterned surface lit from below to eliminate reflections from the glass, they still consistently chose the shallow side.

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6. Key findings

- When the patterned surface was replaced with a grey surface, they showed no preference for either the shallow or the deep side.
- When the patterned surface was placed directly against the under-surface of the glass on each side, they descended without preference to either side but when the pattern was lowered 10 inches below the glass on each side, they stayed on the board.
- Kittens proved to have excellent depth-discrimination. At four weeks – about the earliest age a kitten can move about easily – they were found to invariably choose the shallow side of the cliff. On the glass over the deep side they either froze or circled aimlessly backward until they reached the centre board.
- The poorest performance on the visual cliff was shown by turtles. 76% of the aquatic turtles crawled off the board to the shallow side.
- With only the cue of motion parallax to guide them:
 - Adult rats still preferred the shallow side, though not as strongly as in the standard experiment.
 - Infant rats and chicks chose the shallow side nearly 100% of the time under both conditions.
 - Both light-reared and dark-reared rats preferred the shallow side.
- Without the potential distance cue provided by pattern density:
 - Both young and adult hooded rats preferred the side with the larger pattern.
 - Day-old chicks showed no preference for the larger pattern.
 - These results suggest that learning played some part in the preference exhibited by the rats as they were tested at a somewhat older age than the chicks.
 - Dark-reared rats, like the day-old chicks, showed no significant preference for either the shallow or steep side.
- When the visual cliff experiment was used to determine whether depth perception was innate in rats:
 - At the age of 90 days both light-reared and dark-reared rats showed the same preference for the shallow side of the apparatus. These results support Lashley and Russell's conclusion that depth perception in rats is innate.
- When the visual cliff experiment was used to determine whether depth perception was innate in kittens:
 - Dark-reared kittens at the age of 27 days at first crawled or fell off the centreboard equally often on both the deep and shallow sides.
 - When placed on glass over the deep side, they did not back in a circle like light-reared (normal) kitten, but showed the same behaviour that they had exhibited on the shallow side.
 - Once exposed to the light the dark-reared kittens were tested daily. After a week they were performing they were performing in every respect like normal, light-reared kittens i.e. they showed the same unanimous preference for the shallow side.

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7. Possible conclusions

- Most human infants can discriminate depth as soon as they can crawl.
- A seeing animal can discriminate depth when its locomotion is adequate, even when locomotion begins at birth.
- Depth perception in humans develops before many locomotor abilities.
- Infants should not be left close to a brink.
- Depth perception in chicks, kids and goats and kittens manifests itself rapidly.
- Hooded rats and kittens use tactile cues from its whiskers to help their depth perception.
- Contrary to Yerkes findings of 1904, aquatic turtles have good depth perception.
- The survival of any species requires that its members develop depth discrimination by the time they take up independent locomotion, whether this be at one day (the chick and the goat), three to four weeks (the rat and the cat) or six to 10 months (the human infant).
- Both infant rats and chicks can discriminate depth by differential motion alone, with no aid from texture density.
- Depth perception in rats is innate.
- Depth perception in kittens is maturational.
- In some animals, only motion parallax is an innate cue for depth discrimination.

The role of tutoring in problem-solving

Wood, D., Bruner, J.S. & Ross, G (1976)

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The role of tutoring in problem-solving

Journal of Child Psychology and Psychiatry, 17, (2), 89–100

1. Theory/ies on which the study is based

- From the earliest months of life, the developing child is a 'natural' problem solver (e.g. Bruner, 1973), though often his efforts are assisted and fostered by others who are more skilful than he is. (Kaye, 1970).
- The tutorial process is 'the means whereby an adult or 'expert' helps somebody who is less adult or expert'. (Woods et al. 1976).
- Although the aim of the tutorial process is general, it is expressed in terms of a particular task e.g. a tutor seeks to teach children aged 3,4, and 5 years of age to build a particular three-dimensional structure that requires a degree of skill that is initially beyond them. This is the usual type of tutoring situation where one individual (the tutor) 'knows the answer' whilst the other (the children) do not. (Woods et al. 1976).
- Tutorial interactions are therefore a crucial feature of infancy and childhood. (Woods et al. 1976).
- It appears that the human species is the only one in which any 'intentional' tutoring goes on. (Bruner, 1972; Hinde, 1971). Although Hamburg (1968) and van Lawick-Goodall (1968) both noted that many of the higher primate species learn through observation of their elders, they found no evidence that the elders actually did anything to instruct their charges in the performance of the skill in question. Therefore it seems that one feature that distinguishes man as a species is not only his capacity for learning but also his capacity for teaching.
- The acquisition of skill in the human child can be conceived as a hierarchical programme in which component skills are combined into 'higher skills' by appropriate orchestration to meet new, more complex task requirements. (Bruner, 1973).
- Problem solving is the mastery of 'lower order' or constituent problems in a sine qua non (absolutely necessary) for success with a larger problem, each level influencing the other e.g. reading, where the deciphering of words makes possible the deciphering of sentences, and sentences then aid in the deciphering of particular words. (Smith, F., 1971).
- The process of skill acquisition is therefore analogous to problem solving.
- The intervention of a tutor involves a kind of 'scaffolding' process that enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond his unassisted efforts. Scaffolding consists essentially of the adult 'controlling' the elements of the task that are initially beyond the learner's capacity, so he can concentrate on and complete only those elements that are within his range of competence.
- Well executed scaffolding begins by luring the child into actions that produce recognisable-for-him solutions. Once that is achieved, the tutor can interpret discrepancies to the child. Finally the tutor stands in a confirmatory role until the tutee is checked out to fly on his own. (Woods et al. 1976).
- Comprehension of a solution must precede production because without comprehension there can be no effective feedback. One must recognise the relation between means and ends in order to benefit from 'knowledge of results'. (Woods et al. 1976).

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2. Background to the story

- Woods et al. contended that a learner cannot benefit from any assistance in the processes of problem solving or skill acquisition unless the learner is able to recognise a solution to a particular class of problems before he is himself able to produce the steps leading to it without assistance i.e. comprehension of the solution must precede production. (Woods et al. 1976).
- Previous research supports this concept of 'comprehension of the solution must precede production'. Olson (1966, 1970) showed that a child is capable of recognising a diagonal design before he is able to construct one on a checker board since the constituent acts of placement require more degrees of freedom (i.e. taking into account both the horizontal and vertical axes) than he can handle simultaneously. Similarly, Clinchy (1974), used the classic game of Twenty Questions to show that young children were able to discriminate between good strategy and bad, good questions and less good ones, if they were asked to choose between them, even though unaided they could not produce good strategies or even good questions.
- Woods et al. wanted to examine a 'natural' tutorial in the hope of gaining knowledge about natural as well as automated teaching tasks. They did not want their observations to be regarded as a test of a hypothesis about the tutoring process. Rather they wanted them to be considered as attempts at systematic descriptions of how children respond to different forms of aid/assistance.
- The main aim of this study was therefore to examine some of the major implications of the interactive, instructional relationship between the developing child and his elders for the study of skill acquisition and problem solving.
- The changing interaction of tutor and children provided the data for this study.

3. Research method

- This was a controlled observation, in an artificial environment. Participants were observed as they tried to complete a predetermined building task with appropriate intervention and guidance from a tutor. Participants were observed in individual sessions lasting from 20 minutes to one hour. The observed and recorded interactions between the tutor and child as the task was attempted provided the data.

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4. Sample

- Thirty children (accompanied by their parents) who lived within a five mile radius of Cambridge, Massachusetts i.e. within easy reach of Harvard University where the research was conducted.
- Parents had replied to advertisements for 'subject volunteers'.
- The thirty children were equally divided in 3, 4, and 5 year olds with each age group being equally divided between girls and boys i.e. there were 10 x 3 year olds, 10 x 4 year olds and 10 x 5 year olds with five girls and five boys in each group.
- Participants were predominantly middle-class or lower middle-class.

5. Outline of the procedure/study

The task

- The task was designed so it was 'fun', multifaceted (and therefore 'interesting'), within easy reach of every child's skills and continuous in its yield of knowledge.
- The toy designed for the task consisted of 21 blocks that combined to form a pyramid standing about 9 inches high with a 9 inch square base. The pyramid had six levels with the top block being a solid square with a circular depression in its bottom. Each remaining layer was composed of 4 equal sized blocks made up of two locking pairs. Each pair fitted together with a hole and peg arrangement. When one pair was fitted in the correct orientation, two other half pegs were brought together; the other pair bringing together two half-holes. These formed the means for connecting the two pairs to form the four piece layer. The blocks were designed so that all pegs would fit into all holes. In addition to pegs and holes, each four-block layer had a shallow round depression in its base and a matched elevation on top. These could only be formed by putting the appropriate pairs together in the correct orientation, since each block possessed one quarter of each of the larger connectives.

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5. Outline of the procedure/study

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The tutoring procedure

A photo of the original blocks can be found on page 93 of the study here:

<http://onlinelibrary.wiley.com/doi/10.1111/j.1469-7610.1976.tb00381.x/pdf>

- The tutor's procedure was agreed upon in advance. The tutor (a woman) endeavoured to gear her behaviour to the needs of each individual child whilst following as closely as possible a standardised procedure to maintain reasonable comparability between each child and age group.
- The aim was to allow each child to do as much as possible for themselves.
- The tutor always tried to instruct verbally before intervening more directly, the latter only being done when the child failed to follow verbal instructions. The child's success or failure at any point in time thus determined the tutor's next level of instruction.
- When the child entered the experimental room they were seated at a small table with the 21 blocks of various shapes and sizes spread out in a jumble.
- The child was invited to play with the blocks. The child could have no idea what the blocks might look like when put together.
- The child was left to his own devices for about five minutes so he could become familiar with both the blocks and the situation.
- The tutor would then usually take up two of the smallest blocks and show the child how they could be joined together to make a connected pair. If the child had already discovered how to do this during the free-play time, the tutor would use it as an example and ask the child to 'make some more like that one'.

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5. Outline of the procedure/study

- The tutor then recognised and responded systematically to three types of response from the child:
 - (i) If the child ignored her and continued with his play: the tutor would again present suitable and constrained material already assembled, perhaps simply joining and positioning two blocks to form a correct pair.
 - (ii) If the child took up the blocks which the tutor had just assembled and manipulated them and then tried to assemble pieces for himself but overlooked a key feature: the tutor would verbally draw his/her attention to the fact that the construction was not completed e.g. if he had selected pieces himself and put them together wrongly, the tutor would ask him to compare his construction with hers and to make his similar.
 - (iii) If the child tried to make something with blocks presented for construction by the tutor in a way more or less similar to her own method e.g. by putting pegs into holes: the tutor would correct any errors that resulted.
- Where possible, the child was left to his own devices so the child could pace the task for himself as far as possible. The tutor only intervened if the child stopped constructing or got into difficulty.
- The tutor brought to the task a gentle, appreciative approach to the children.

System of scoring

- (a) The child was scored as either manipulating separate pieces which he was seeking to assemble or as assembling pieces previously made up.
 - (b) The assembly operations were further subdivided into two categories:
 - assisted, in which the tutor either presented or specifically indicated the materials for assembly
 - unassisted, where the child himself selected material.
- In both cases, the constructions created might or might not meet all task constraints.
- (c) When the constructions did not meet the task constraints i.e. were mismatched, the researchers (observers) noted whether the child rejected them or simply laid them down as assembled (wrongly).
 - (d) When the child picked up and disassembled previous constructions, it was noted whether or not he went on to reassemble them again.

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5. Outline of the procedure/study

- Every intervention by the tutor was noted. These were classified into one of three categories:
 - (i) Direct assistance (in which the tutor either presented or specifically indicated the materials for assembly)
 - (ii) A verbal error prompt (which characteristically took the form, 'Does this (a mismatched construction) look like this one (a matched one)?')
 - (iii) A straightforward verbal attempt to get the child to make more constructions e.g. 'Can you make more like this?'In each case, the child's subsequent behaviours were scored into the categories identified in (a) to (d) above.

Inter-scorer reliability

- Two scorers, working independently, achieved 94% agreement on a pool of 594 events scored directly from video-tape.

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6. Key findings

- The children enjoyed playing with the blocks during the initial 5 minute free play period but did not always enjoy giving up their imaginative play for the more constrained task of building a pyramid. Imaginative free play was often followed by a rather uninspired performance of the presented task.

Observations on tutorials

- The total number of acts (whenever a child picked up blocks and put them together or when he selected previous constructions and took them apart) was roughly similar for all ages: median for the 3 year olds = 39, for the 4 year olds = 41 and the 5 year olds = 32. The difference between the 4 and 5 year olds was not significant ($U = 26, p < 0.1$). Therefore in terms of overall task activity, there were no significant differences between the groups.
- The composition of the activities differed markedly from age group to age group. Older children did better in the tasks producing a larger number of correct constructions in which they actually put self-made pieces of the puzzle together correctly themselves, than younger children. The ratio of incorrect to correct solutions progressed from 9:0 (3 year olds), to 2:8 (4 year olds), to 1:2 (5 year olds). It took 15 acts of pair construction to make a correct pyramid. More than 75% of these acts were unassisted among the 5 year olds compared to 50% and 10% among the 4 year old and 3 year olds respectively.
- None of the 3 year olds could put four blocks together correctly, whilst all the 4- and 5 year olds did so at least once.
- Older children frequently picked up matching pieces for construction with no prior 'trial and error': a median of 7 such 'quick' constructions being made by each 5 year old compared to three per 4 year old and less than one per 3 year old child.
- The youngest children took apart almost as many constructions as they put together: median for 3 year olds = 13.0.
- Older children were less likely to 'deconstruct' their assemblies: median for 4 year olds = 5.0, for 5 year olds = 4.0.
- When a 3 year old took up and disassembled a correct construction he put it back together again on average two-thirds of the time (without the tutor's intervention). In contrast, having picked up an incorrect construction, he would restore it only 14% of the time. The 5 year olds reconstructed 9 out of 10 correct constructions they had disassembled and only 2 in 10 of the incorrect ones they had disassembled. The difference was however not very great between them and the younger groups.
- 3 year olds were just as sensitive as 4 year olds to the difference between acceptable and unacceptable constructions. The two were equally likely to reassemble appropriate constructions and to leave scattered those that had previously been inappropriately constructed.

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6. Key findings

The tutorial relationship

- The younger children needed the greatest amount of help. For 3 year olds the proportion of totally unassisted constructions was 64.5%, for the 4 year olds 79.3% and for the 5 year olds 87.5%.
- The median instances per child for constructions carried out with pieces offered by the tutor as compared to self-selected pieces was 9.0 for the 3 year olds, 6.5 for the 4 year olds and 3.0 for the 5 year olds.
- 3 year olds usually ignored the tutor's suggestions, paying little heed, particularly to her verbal comments. This is illustrated by the disparity between the median figures of 112 tutor rejections by the 3 year olds in contrast to virtually none by the older children.
- The tutor intervened directly twice as often with the 3 year olds than with the 4 year olds and four times more often than with the eldest group. These are shown in Tables 1 and 2 below.

TABLE 1. Median instances of direct interventions, verbal corrections and general verbal directions (reminding subjects of task requirements)

	Age		
	3	4	5
Direct intervention (Showing)	12.0	6.0	3.0
Verbal correction (Telling)	3.0	5.0	3.5
Verbal direction and reminder (Telling)	5.0	8.0	3.0
Total verbal intervention	8.0	13.0	7.5
Total help received	20.0	19.0	10.5
Ratio $\frac{\text{show}}{\text{tell}}$	$\frac{12.0}{8.0}$ = 1.5	$\frac{6.0}{13}$ = 0.46	$\frac{3.0}{7.5}$ = 0.40

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6. Key findings

Total help received

The 5 year olds received significantly less help than both the 4 year olds ($U = 22, p < 0.05$) and the 3 year olds ($U = 23, p < 0.05$). The 3 and 4 year olds did not differ significantly.

Ration of 'showing' to 'telling'

Both the 5 year olds ($U = 5, p < 0.002$) and the 4 year olds ($U = 6, p < 0.002$) received a significantly higher proportion of verbal assistance than the 3 year olds; 4 and 5 year olds did not differ in this respect.

TABLE 2. Relative successes of each age group with 'showing' and 'telling'

	Age		
	3	4	5
Showing succeeds	40%	63%	80%
Telling succeeds	18%	40%	57%

The predominant mode of interaction between tutor and the 4 year old tutee has become verbal, and the principal form of that verbal interaction is a combination of reminding the child of the task requirements and correcting his efforts as he seeks to carry on.

The number of direct interventions drops by half from the 3 year olds to the 4 year olds. and drops again by half with the 5 year olds.

The balance shifts from showing to telling as the age increases from 3 to 4 years of age.

- The number of acts the child could sustain between tutorial interventions rose steadily with age and experience as shown in Table 3 below.

TABLE 3. Relative frequency of interventions by the tutor expressed as interventions per number of construction operations (both assisted and unassisted) performance by each child.

	Age		
	3	4	5
Total construction operations	262	352	280
Total interventions	201	198	112
Operations per intervention	1.3	1.8	2.5

The 5 year olds performed significantly more operations per intervention than the 4 year olds ($U = 12, p < 0.02$) who performed more than the 3 year olds ($U = 10, p < 0.002$).

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6. Key findings

Analysis of tutoring

- In 478 opportunities the tutor conformed to the pre-set rules/procedure 86% of the time. She did so most frequently with the youngest children (92%) and less frequently with the 4 year olds (86%). With the 5 year olds her behaviour fell mid-way (86%) though the difference between this group and the others was not statistically different.
- The majority of her 'errors' with the 4 year olds was due to a tendency to offer more help than was allowed by the rules.
- The fact that she committed most violations with the middle age group suggests that a tutor is faced with a great deal of relatively unstructured behaviour from a child who initiates most of the task activity himself. These are the ones most difficult to accommodate within a fixed set of tutorial rules. Though she often had difficulty getting the 3 year olds to engage and stay focused on the task, she was seldom left in doubt as to what the child had done in response to her instructions, and when tutoring the 5 year olds she found the child soon learned the task constraints and conducted his efforts in an appropriate serial order making it easy for her to follow the set procedure.

The 'scaffolding' process

- The functions of the tutor were seen to include:
 - (i) Recruitment.
 - (ii) Reduction in degrees of freedom.
 - (iii) Direction maintenance.
 - (iv) Marking critical features.
 - (v) Frustration control.
 - (vi) Demonstration.

Further details of these functions can be found on pages 98-99 of the original study:

<http://onlinelibrary.wiley.com/doi/10.1111/j.1469-7610.1976.tb00381.x/pdf>

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7. Possible conclusions

- Increasing age is marked by success (in problem solving abilities).
- Increasing age is marked by the emergence of more complex, interlocking sequences of operations (demonstrating increased problem solving capability).
- Increasing age is marked by the development of more accurate, intuitive techniques of fitting blocks together (development of more advanced problem solving capability).
- Young children (aged 3 years old) are not as good as 4 year olds at constructing appropriate assemblies (i.e. not as good at problem solving).
- Young children (aged 3 years old) are just as adept as 4 year olds at recognising an appropriate constructions (i.e. can recognise when a problem has been solved correctly).
- Comprehension precedes production in problem solving e.g. a 3 year old can recognise what is appropriate before he can produce a sequence of operations to achieve it.
- Older children are more prepared to accept and act on advice from tutors than younger children.
- A tutor both intervenes more and is ignored more when working with 3 year olds than with either 4- or 5 year old children.
- A tutor acts as a prodder and corrector for four year olds but is principally a confirmer or checker of instructions when interacting with five year olds.
- Formal programmes of 'individualised' teaching may be most difficult to realise at the most crucial point – the mid-phase of learning.
- In tutoring, effectiveness depends upon the tutor and tutee modifying their behaviour over time to fit the perceived requirements and/or suggestions of the other.
- The effective tutor must have at least two theoretical models to which he must attend. One is the theory of the task problem and how it may be completed, the other a theory of the performance characteristics of the tutee. The actual pattern of effective instruction is that the task and tutee dependent, the requirements of the tutorial being generated by the interaction of the tutor's two theories.
- The tutor operates with an implicit theory of the learner's acts in order to recruit his attention, reduce degrees of freedom in the task to manageable limits, maintain 'direction' in the problem solving process, mark critical features, control frustration and demonstrate solutions when the learner can recognise them.

Exploration and Separation: Illustrated by the Behavior of One year-olds in a Strange Situation

Ainsworth, M. D. S. & Bell, S. (1970)

Ainsworth, M. D. S. & Bell, S. (1970) Attachment, Exploration and Separation: Illustrated by the Behavior of One year-olds in a Strange Situation
Child Development, 41, (1), 49–67

1. Theory/ies on which the study is based

- Infant-mother attachment has been conceived as related to separation anxiety (see Bowlby 1960), fear of the strange and strangers (see Morgan & Ricciuti 1969; Schaffer 1966), and exploration (see Ainsworth 1967; Ainsworth & Wittig 1969). It is believed that the interrelationships between these behaviours throw light upon the biological function of infant-mother attachment.
- **Key concepts** as proposed by Bowlby (1958, 1969) and Ainsworth (1964, 1967, 1969):
 - (i) *An attachment* may be defined as an affectional tie that one person or animal forms between himself and another specific one - a tie that binds them together in space and endures over time. The behavioural hallmark of attachment is seeking to gain and to maintain a certain degree of proximity to the object of attachment, which ranges from close physical contact under some circumstances to inter-action or communication across some distance under other circumstances.
 - (ii) *Attachment behaviours* are behaviours which promote proximity or contact. In the human infant these include active proximity- and contact-seeking behaviours such as approaching, following, and clinging, and signalling behaviours such as smiling, crying, and calling.
 - (iii) The very young infant displays attachment (proximity-promoting) behaviours such as crying, sucking, rooting, and smiling, despite the fact that he is insufficiently discriminating to direct them differentially to a specific person. These initial behaviours indicate a genetic bias toward becoming attached, since they can be demonstrated to be either activated or terminated most effectively by stimuli which, in the environment of evolutionary adaptation, are most likely to stem from human sources. When these behaviours, supplemented by other active proximity-seeking behaviours which emerge later - presumably through a process of learning in the course of mother-infant interaction - become organised hierarchically and directed actively and specifically toward the mother, the infant may be described as having become attached to her.
 - (iv) The intensity of attachment behaviour may be heightened or diminished by situational conditions, but, once an attachment has been formed, it cannot be viewed as vanishing during periods when attachment behaviour is not evident. Therefore, it seems necessary to view attachment as an organisation of behavioural systems which has an internal, structural portion that endures throughout periods when none of the component attachment behaviours have been activated.
 - (v) Viewed in the context of evolutionary theory, infant-mother attachment may be seen to fulfil significant biological functions, that is, functions that promote species survival. For the human species to have survived, the infant has required protection during their period of helplessness and defencelessness. It is inferred, therefore, that the genetic code makes provision for infant behaviours which have the usual (although not necessarily invariable) outcome of bringing infant and mother together.

Exploration and Separation: Illustrated by the Behavior of One year-olds in a Strange Situation

Ainsworth, M. D. S. & Bell, S. (1970)

1. Theory/ies on which the study is based

(vi) Exploratory behaviour is equally significant from an evolutionary point of view. The genetic biases in a species which can adapt to a wide range of environmental variations provide for a balance in infant behaviours (and in reciprocal maternal behaviours) between those which lead the infant away from the mother and promote exploration and acquisition of knowledge of the properties of the physical and social environment, and those which draw mother and infant together and promote the protection and nurturance that the mother can provide. Although at first infant and mother are in almost continuous close contact, soon they are in collusion to make more elastic the bonds that unite them. The infant ventures forth to investigate his environment and to play with other infants, and gradually spends more and more time "off" his mother. His expeditions take him further and further away from her, and she becomes increasingly permissive and retrieves him less promptly and less frequently. However, alarm or threat of separation, quickly bring mother and infant together again.

2. Background to the study

- The term 'attachment', as originally introduced by Bowlby (1958, 1969) and as used by Ainsworth (1963, 1964, 1967), implies an ethological and evolutionary viewpoint, and hence has connotations not necessarily shared by those with other theoretical orientations.
- The interaction between exploratory and attachment behaviours has been highlighted in field studies of ground-living nonhuman primates (e.g., Southwick, Beg, & Siddiqi 1965; DeVore 1963; Goodall 1965; Schaller 1965) as well as studies of such species in captive colonies (see Hinde, Rowell, & Spencer-Booth 1964, 1967) and in laboratories (e.g., Harlow 1961; Harlow & Harlow 1965; Mason 1965).
- Up to the time of this study, only two strange-situation studies had been guided by an ethological-evolutionary point of view. Harlow (1961) used a strange situation to demonstrate the security function of surrogate cloth mothers for infant rhesus macaques. Ainsworth and Wittig (1969) made a preliminary report of the attachment-exploration balance in human 1 year olds. Other studies e.g. Arsenian (1943), Cox and Campbell (1968), Rheingold (1969), focused on exploratory behaviour and reported that the presence of the mother supports it, but paid scant attention to attachment behaviour and its hierarchical manifestations in reunion episodes as well as during separation.
- Naturalistic studies of the attachment-exploration balance are very time consuming; the interaction between the two sets of behaviours must be observed over a wide range of situations. A short-cut alternative is to utilise a controlled strange or unfamiliar situation in which the child, with and without his mother, is exposed to stressful episodes of different kinds. Ainsworth and Bell therefore believed interaction between attachment behaviour, exploration, separation anxiety, and fear of the strange could be observed in a controlled laboratory environment - the strange or unfamiliar situation.
- The purpose of this study was to highlight some distinctive features of the ethological-evolutionary concept of attachment, by citing reports of the interactions between the infant's attachment behaviour and other behaviours i.e. exploration, separation anxiety, and fear of the strange; by illustrating these interactions through a report of the behaviour of 1 year olds in a strange situation; noting parallels between strange-situation behaviour and behaviour reported in other relevant observational, clinical, and experimental contexts.
- This study serves as a useful illustration of the shifting balance between exploratory and attachment behaviour implicit in the ethological-evolutionary view of attachment, (Ainsworth & Bell, 1970).

Exploration and Separation: Illustrated by the Behavior of One year-olds in a Strange Situation

Ainsworth, M. D. S. & Bell, S. (1970)

3. Research method

- This was a controlled observation in which participants were observed (from an adjoining room through a one-way mirror) as they participated in the 'strange situation'. The observed and recorded interactions between the infant and its mother during the enactment of the 'strange situation' provided the data.

4. Sample

- 56 participants who were family-reared infants of white, middle-class parents, who were originally contacted through paediatricians in private practice.
- 23 of the infants, who had been observed longitudinally from birth onward, were observed in the strange situation when 51 weeks old.
- 33 of the infants were studied in the context of an independent project (Bell in press at the time this study was published), were observed when 49 weeks old.
- The mothers of the 56 children also participated by enacting the standardised procedure pertaining to the 'strange situation'.

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5. Outline of the procedure/study

The 'strange situation'

- During the course of a longitudinal, naturalistic investigation of infant-mother attachment covering the first year of life, there is often little opportunity in the home environment to observe the balance of attachment and exploratory behaviours under conditions of novelty and alarm. Therefore, a laboratory situation was devised as a test situation to which the participants were introduced when nearly 1 year old. Ainsworth and Bell wanted to observe the extent to which the infant could use his mother as a secure base from which he could explore a strange environment, with fear of the strange kept in abeyance by her presence. They also wanted to observe the extent to which attachment behaviour might gain ascendancy over exploratory behaviour under conditions of alarm introduced by the entrance of a stranger and under conditions of separation from and reunion with the mother.

The procedure

- The strange situation was comprised of eight episodes which followed in a standard order for all participants. The situation was designed to be novel enough to elicit exploratory behaviour, and yet not so strange that it would evoke fear and heighten attachment behaviour at the outset. The approach of the stranger was gradual, so that any fear of her could be attributed to unfamiliarity rather than to abrupt, alarming behaviour. The episodes were arranged so that the less disturbing ones came first. Finally, the situation as a whole was intended to be no more disturbing than those an infant was likely to encounter in his ordinary life experience.
- A room was arranged so that there was a 9 x 9-foot square of clear floor space, marked off into 16 squares to facilitate recording of location and locomotion. At one end of the room was a child's chair heaped with and surrounded by toys. Near the other end of the room on one side was a chair for the mother, and on the opposite side, near the door, a chair for the stranger. The baby was put down in the middle of the base of the triangle formed by the three chairs and left free to move where he wished. Both the mother and the female stranger were instructed in advance as to the roles they were to play.

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5. Outline of the procedure/study

- The 'strange situation' was composed of eight discrete episodes:
 - Episode 1 (M, B, O). Mother (M), accompanied by an observer (O), carried the baby (B) into the room, and then O left.
 - Episode 2 (M, B). M put B down in the specified place, and then sat quietly in her chair, participating only if B sought her attention. Duration three minutes.
 - Episode 3 (S, M, B). A stranger (S) entered, sat quietly for one minute, conversed with M for one minute, and then gradually approached B, showing him a toy. At the end of the third minute M left the room unobtrusively.
 - Episode 4 (S, B). If B was happily engaged in play, S was non-participant. If he was inactive, she tried to interest him in the toys. If he was distressed, she tried to distract him or to comfort him. If he could not be comforted, the episode was curtailed - otherwise it lasted three minutes.
 - Episode 5 (M, B). M entered, paused in the doorway to give B an opportunity to mobilize a spontaneous response to her. S then left unobtrusively. What M did next was not specified - except that she was told that after B was again settled in play with the toys she was to leave again, after pausing to say "bye-bye." (Duration of episode undetermined.)
 - Episode 6 (B alone). The baby was left alone for three minutes, unless he was so distressed that the episode had to be curtailed.
 - Episode 7 (S, B). S entered and behaved as in episode 4 for three minutes, unless distress prompted curtailment. (Ainsworth & Wittig 1969, planned a somewhat different procedure for episode 7, which was attempted for the first 14 Ss but, as it turned out, approximated the simpler procedure re-ported here, which was used for the remaining Ss.)
 - Episode 8 (M, B). M returned, S left, and after the reunion had been observed, the situation was terminated.
- The behaviour of the participants (infants) was observed from an adjoining room through a one-way vision window.
- Two observers dictated continuous narrative accounts into a dual channel tape recorder which also picked up the click of a timer every 15 seconds. (This represents the procedure now considered standard. For the first 14 participants, however, the dual channel recorder was not available, so one observer dictated, while the other made written notes. For the second 33 participants, the author, Bell, was the sole observer.) The protocols were subsequently transcribed and consolidated, then coded.
- Reliability of observation was checked by separate codings of the dictated reports made by the two authors in four cases observed by both. Product-moment coefficients of 0.99 were found for each of loco motor, manipulatory and visual exploration, and one of 0.98 for crying.

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5. Outline of the procedure/study

- The narrative record yielded two types of measure. A frequency measure was used for three forms of exploratory behaviour - loco motor, manipulatory, and visual - and for crying. A score of 1 was given for each 15 second time interval in which the behaviour occurred. The maximum was 12 for an episode, since the standard length of an episode was three minutes, and longer or shorter episodes were pro-rated. Frequency measures were obtained for episodes 2 through to 7. Product-moment reliability coefficients for two independent coders for eight randomly selected cases were as follows: exploratory locomotion, 0.99; exploratory manipulation, 0.93; visual exploration, 0.98; crying, 0.99. The second measure was based upon detailed coding of behaviours in which the contingencies of the mother's or stranger's behaviour had to be taken into consideration. The codings were then ordered into 7-point scales on the assumption that not only could the same behaviour be manifested in different degrees of intensity, but that different behaviours could serve the same end under different intensities of activation. There were five classes of behaviour thus scored:

(i) Proximity- and contact-seeking behaviours include active, effective behaviours such as approaching and clambering up, active gestures such as reaching or leaning, intention movements such as partial approaches, and vocal signals including "directed" cries.

(ii) Contact-maintaining behaviours pertain to the situation after the baby has gained contact, either through his own initiative or otherwise. They include: clinging, embracing, clutching, and holding on; resisting release by intensified clinging or, if contact is lost, by turning back and reaching, or clambering back up; and protesting release vocally.

(iii) Proximity- and interaction-avoiding behaviours pertain to a situation which ordinarily elicits approach, greeting, or at least watching or inter-action across a distance, as when an adult entered, or tried to engage the baby's attention. Such behaviours include ignoring the adult, pointedly avoiding looking at her, looking away, turning away, or moving away.

(iv) Contact- and interaction-resisting behaviours included angry, ambivalent attempts to push away, hit, or kick the adult who seeks to make contact, squirming to get down having been picked up, or throwing away or pushing away the toys through which the adult attempts to mediate her interventions. More diffuse manifestations are angry screaming, throwing self about, throwing self-down, kicking the floor, pouting, cranky fussing, or petulance.

These four classes of behaviour were scored for interaction with the mother in episodes 2, 3, 5, and 8, and for interaction with the stranger in episodes 3, 4, and 7.

(v) Search behaviour was scored for the separation episodes 4, 6, and 7. These behaviours included: following the mother to the door, trying to open the door, banging on the door, remaining oriented to the door or glancing at it, going to the mother's empty chair or simply looking at it. Such behaviours implied that the infant was searching for the absent mother either actively or by orienting to the last place in which she was seen (the door in most cases) or to the place associated with her in the strange situation (her chair).

In scoring these five classes of behaviour, the score was influenced by the following features: the strength of the behaviour, its frequency, duration, and latency, and by the type of behaviour itself - with active behaviour being considered stronger than signalling.

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6. Key findings

- Overall, the infants of the present sample showed little alarm in the pre-separation episodes of the strange situation. Their attachment behaviour was not activated; they tended not to cling to the mother or even to approach her. They used her as a secure base from which to explore the strange situation.
- There was a sharp decline in all forms of exploratory behaviour from episode 2 when the baby was alone with his mother to episode 3 when the stranger was present also.
- Exploration remained depressed throughout episode 4 when the baby was left with the stranger.
- Visual and manipulatory exploration recovered significantly in episode 5, aided by the mother's attempts to interest the baby again in play, although similar efforts by the stranger in episodes 4 and 7 were ineffective.
- Visual and manipulatory exploration declined again in episode 6 after the mother departed for a second time, leaving the baby alone.
- All forms of exploratory behaviour declined to their lowest point in episode 7 after the stranger had returned but while the mother was still absent.
- To supplement the visual exploration score, which measured visual orientation to the physical environment, visual orientation to the mother and to the stranger were also coded. The only noteworthy findings were
 - In episode 2, the baby looked at the toys and other aspects of the physical environment much more frequently than at the mother, at whom he glanced only now and then, keeping visual tabs on her.
 - In episode 3, the stranger, the most novel feature of the environment, was looked at more than the toys, and the mother was looked at no more frequently than before.

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6. Key findings

- Crying: Findings suggested that the strange situation does not in itself because alarm or distress as crying was minimal in episode 2. Crying did not increase significantly in episode 3 ($p = .068$), which suggested that the stranger was not in herself alarming for most participants, at least not when the mother was also present. The incidence of crying rose in episode 4 with the mother's first departure; but declined upon her return in episode 5. It then increased sharply in episode 6 when the mother departed a second time, leaving the baby alone. It did not decrease significantly when the stranger returned in episode 7, which suggested that it is the mother's absence rather than mere aloneness that was distressing to most of the babies, and that the greater incidence of crying in episode 6 than in episode 4 is largely due to a cumulative effect.
- Search behaviour during separation: The mean strength of search behaviour was moderate in episode 4, significantly stronger in episode 6, and moderate again in episode 7. Some infants (37%) cried minimally if at all in episode 6, and yet searched strongly. Some (20%) cried desperately, but searched weakly or not at all. Some (32%) both cried and searched. All but four participants reacted to being left alone with either one or other of these attachment behaviours.
- Proximity-seeking and contact-maintaining behaviours: Efforts to regain contact, proximity or interaction with the mother occurred only weakly in episodes 2 and 3 but were greatly intensified by brief separation experiences. Contact-maintaining behaviour was negligible in episodes 2 and 3, but rose in the first reunion episode (5), and rose even more sharply in the second reunion episode (8). In the case of both classes of behaviour the increase from episodes 2 through 5 to 8 was highly significant ($p < .001$). Some participants showed these behaviours in relation to the stranger as well. Some infants were picked up by the stranger in episodes 4 and 7 – in an attempt to comfort them – and some of these did cling to her and/or resist being put down again. However, proximity-seeking and contact-maintaining behaviours were displayed much less frequently and less strongly to the stranger than to the mother.
- Contact-resisting and proximity-avoiding behaviours: Contact-resisting behaviour directed toward the mother occurred very rarely in the pre-separation episodes because the mother had been instructed not to intervene except in response to the baby's demands, in the reunion episodes, some participants resisted contact with the mother, but many did not. About one third of the sample avoided the stranger at some time in episode 3 – ignoring her, avoiding meeting her eyes, or moving further away from her. The incidence of these behaviours declined in episode 4, and even in episode 7 remained less than in episode 3. About half the sample avoided neither mother nor stranger, but those who showed this behaviour in any strength to one did not show it to the other.

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7. Possible conclusions

- One of the conditions which facilitates approach and exploration of a novel or unfamiliar situation is the presence, in reasonable but not necessarily close proximity, of an infant's mother - the object of attachment.
- The presence of the mother (or attachment figure) can tip the balance in favour of exploring the novel or unfamiliar situation rather than avoiding it or withdrawing from it.
- Absence of the mother (or attachment figure) tends to heighten attachment behaviour and lessens exploration of a novel or unfamiliar situation.
- Based on the findings of this and other studies including naturalistic studies of mother-infant interaction, and studies of mother-child separation and reunion in both human and nonhuman primates, Ainsworth and Bell made the following propositions for a comprehensive concept of attachment:
 1. Attachment is not coincident with attachment behaviour. Attachment behaviour may be heightened or diminished by conditions - environmental and intra-organismic - which may be specified empirically. Despite situationally determined waxing and waning of attachment behaviour, the individual is nevertheless predisposed intermittently to seek proximity to the object of attachment. It is this predisposition which may be conceived as having an inner, structural basis -- that is the attachment. Its manifestations are accessible to observation over time. However a short time-sample (as used in this study) may be misleading.
 2. Attachment behaviour is heightened in situations perceived as threatening, whether it is an external danger or an actual or impending separation from the attachment object that constitutes the threat.
 3. When strongly activated, attachment behaviour is incompatible with exploratory behaviour. On the other hand, the state of being attached, together with the presence of the attachment object, may support and facilitate exploratory behaviours. Provided that there is no threat of separation, the infant is likely to be able to use his mother as a secure base from which to explore, manifesting no alarm in even a strange situation as long as she is present. However under the circumstances of this study, the relative absence of attachment behaviour - of proximity-promoting behaviour - does not necessarily mean the attachment is weak.
 4. Although attachment behaviour may diminish or even disappear in the course of a prolonged absence from the object of attachment, the attachment is not necessarily diminished; attachment behaviour is likely to re-emerge in full or heightened strength upon reunion, with or without delay.
 5. The incidence of ambivalent (contact-resisting) and probably defensive (proximity-avoiding) patterns of behaviour in the reunion episodes of the strange situation are a reflection of the fact that attachment relations are qualitatively different from one attached pair to another i.e. there are individual differences in the quality of attachment. These qualitative differences, together with the sensitivity of attachment behaviour to situational determinants, make it difficult to assess the strength or intensity of an attachment. It may therefore be wiser to explore qualitative differences, and their correlates and antecedents, than to attempt premature quantifications of strength of attachment.

Gendered voices in children's advertising

Johnson, F. L. & Young, K. (2002)

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Gendered voices in children's advertising

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1. Theory/ies on which the study is based

- Advertising - on television, billboards, public transport, the internet, in newspapers, magazines, and cinemas - invades the consciousness of almost everyone.
- Sponsors pay large amounts to place adverts in locations where the largest segment of the targeted audience is likely to see and hear them, and they rely on new, creative approaches both to instil and fuel the desire for more and more consumption.
- In a consumer-oriented culture, advertisers must position the products they represent as enhancements to both happiness and desirable life styles. Image serves as the link between product and consumer motivation: get the consumer to buy into the image associated with the product, and purchase becomes more likely. "In short, the advertising image-system constantly propels us toward things as means to satisfaction", (Sut Jhally, 1995).
- To keep the consumer system going, new strategies must be constantly invented to keep the buyer motivated to spend money, not only to replace old items or replicate product choices but also to stock the newest available goods and services. Children's advertisements similarly present novel strategies, most often aimed at exploiting themes of fun and fantasy.
- The vast array of ever-interesting adverts can, however, simultaneously be short blasts of new representational forms and depictions of dominant ideology, especially in their representations of identity possibilities. Since the middle of the 20th century, adverts have been increasingly targeted to special audiences, each of which is a "segment" for potential profitability through consumption. Children are one of these special audiences.
- Along with being cultivated as consumers, children are also the targets of what Jhally (1995) terms "image-based influence". One main type of image-based influence targets gender identity, and uses it to link products to their consumers.

Television as a cultural resource for children

- Adverts for children serve as training for consumer culture; hence, their role in enculturation and socialisation should not be underestimated (Alexander & Morrison, 1995).
- Through adverts, children learn that products for sale offer life style enhancements, fun, peer group status, and up-to-date coolness i.e. children's viewing of adverts prepares them well for their roles as capitalist consumers.
- Advertisers target children by appealing to their distinctiveness from adults and their power as "sovereign, playful, thinking consumers" (Kapur, 1999).
- For today's children, advertisements are formative in their cultural environment more intensely and pervasively than ever before.
- Adverts offer children models for how to act, interact and speak (refer back to the core study by Bandura et al).
- Children extrapolate commercials' content into other situations and play venues.
- Some of the models used in commercials for children map onto the significant foci of dominant ideology - gender, race, ethnicity, class. Adverts are therefore part of each child's learning about gender.

Gendered voices in children's advertising

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1. Theory/ies on which the study is based

- Gender codes in children's advertising.
- Past research on television commercials directed to children has shown that conventional sex roles underlie the content of many adverts e.g. Thompson and Zerbinos (1995) in their study of 175 episodes from 41 different cartoon programs, found both that male leads significantly outnumbered female leads (99% to 55%), and that male and female characters portrayed gender stereotypic roles.
- Research by Welch et al. (1979) found that girls in adverts talked less than boys if the advert targeted both genders but talked a lot more in commercials targeted at just girls.
- Johnson and Young (2002) proposed that even in the modern context of 'Girl Power' and gender equality, much of the language and discourse scripted into commercials still present verbal images of gender that conform to traditional stereotypes for enacting and performing a gendered life: the images engage discourses that place girls (and women) in constrained positions and boys (and men) in action-oriented positions – girls are portrayed as 'sweet' whilst boys are portrayed as 'wild'.

Television advertisements as a cultural environment

- It has long been established that television contributes to the cultural environment of children. 'Young children get exposed to many ideas about social life for specifically child-oriented programming and advertising', (Kline, 1993).
- Commercials comprise an alarming amount of viewing time. Research conducted on over 10,000 adverts taken from seven television programme sources in early 1990 in the USA (Kunkle and Gantz, 1992) showed a range of 10:24 minutes (Nickelodeon) to 13:26 advertising per hour of children's programming. The 1990 Children's Television Act (USA) regulated the amount of air-time that can be devoted to commercials: 12 minutes per hour on weekdays and 10.5 minutes per hour on weekends. Most adverts run for 30 seconds, with a few 15 second spots appearing also. This equates to 24 adverts per hour on weekdays and 21 per hour on weekend days.

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2. Background to the study

- Children are one market segment that has grown dramatically in importance (see Pecora, 1995). As initiates into consumer culture, children are being cultivated to spend their own and their parents' money on a vast array of products - mainly in the toy, breakfast food, and snack categories. These three categories have not changed much over the years, but what has changed are increases in quantity and product differentiation, along with a more rapid pace in the presentation of new products.
- McNeal (1998) reported that children (in America) spent \$23 billion as consumers in 1997, and he projected their spending would rise to \$35 billion by 2001, with an additional direct influence on spending by parents of \$300 billion in response to the litany of "I want this!" - "Get me that!" - "Please Mommy/Daddy, please!" - "Here's my Christmas list."
- Research (e.g. Jhally, 1995) has shown that television commercials directed to children use gender images as a source of meaning. These gender images display appearances and activities linked with gender. Based on their examination of child-focused TV commercials, Johnson and Young suggest that they also present an array of linguistic markers that bolster the more visually obvious gender representations; some of which can be heard easily while others are more subtle.
- Children play with a vast array of toys and eat trendy foods and snacks—many of which are introduced to them through advertising. This non-adult market was the focus of this study. The purpose of this study was to provide a critical examination of discourse in television commercials made for and marketed to children in order to determine the degree to which the language codes that are used call upon gender as a meaningful cultural category for selling.

3. Research Method

- This was a content analysis, a research method in which observations of human behaviour are often made indirectly by looking at the content of communications produced by those involved.
- Johnson and Young coded filmed material shown in television adverts relating to boys' and girls' toys in an attempt to address two research questions:
 - (i) Do advertisers script language differently for males and females in adverts directed to pre-school and early elementary school boys and girls?
 - (ii) How is gender used as a discourse code to link products to gender roles?

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4. Sample

- As this was a content analysis study, there were no direct participants per se.
- Samples of children's television programmes in the cartoon genre were video recorded from commercial networks, regional independent New England stations, and Nickelodeon in the fall (autumn) of 1996 and 1997 and again in the fall of 1999.
- Three different programme sources were used to ensure that the sample included advertisements from a broad range of cartoon programmes (the Disney Channel and the Cartoon Network were not included because at the time the sample was collected, they were premium cable selections in the regional market and, thus, available only through expanded cable subscription).
- The 1999 sample was added to the original two year sample so any differences that might have occurred in the gender targeting of commercials could be checked.
- Fifteen half-hour programmes were taped for fall 1996 and fall 1997, and 24 half-hour programmes were taped in the fall of 1999 (actual time for each programme is approximately 27 minutes because of commercial and station content between programmes). The total number of commercials included within the time boundaries marking the beginning and ending of the programmes, exclusive of network and station promotions, was 478 (149 for the 1996 programmes; 133 for the 1997 programmes; 196 for the 1999 programmes). The range of commercials per programme was 8.2 to 8.9 (commercials aired between programmes were not included in the analysis).

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5. Outline of the procedure/study

- To learn more about the broad themes and more specific discourse style relevant to what children might be learning about gender from televised commercials, adverts broadcast on different types of television channels were collected for analysis. Emphasis was placed on elements of the gendered voice, specifically on four aspects:

Voice-overs

Verb elements

Speaking lines given to girls and boys

The conspicuous use of the word power in a number of adverts oriented to boys.

- The adverts were classified in one of five product categories:

(i) Food items, mainly breakfast cereals, snacks and drinks

(ii) Toys

(iii) Educational and public service announcements e.g. anti-drug messages

(iv) Recreational facilities or locales e.g. 'Water Country', 'Chuck E. Cheese's and fast food restaurants e.g. McDonald's.

(v) Video and movie promotions.

NB: the 1999 sample included additional adverts for adult products and miscellaneous services which were coded as 'other' e.g. adverts for VISA cards, Ford Trucks.

- The commercials for toys were selected as the focus for analysis. Of the 188 such adverts broadcast during the sample period, there were 147 different adverts (i.e. 22% were repeats). The toy adverts were transcribed by their gender target audience using three categories:

(i) Adverts targeted to boys in which boys were depicted

(ii) Adverts targeted to girls in which girls were depicted

(iii) Adverts targeted to both boys and girls either because both genders were featured or because there was no gender content.

NB: The coding was guided by the gender of the children portrayed rather than the nature of the toy itself; and adverts explicitly oriented to one gender rather than the other were coded as such even if a child of the other gender could be seen either in the background or for a few seconds. Nine of the adverts (4.8%) in which girls could be seen were classified as 'boy oriented' because the girls were either completely in the background or were hard to detect without replaying the adverts.

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5. Outline of the procedure/study

- Two attributes were considered to determine the particular patterns in gendered aspects of voice-overs in adverts:
 - (i) The gender of the voice-over
 - (ii) Whether the voice-over was gender-exaggerated. (Male voice exaggeration was typified by masculine, aggressive voice qualities and for girls by feminine, high-pitched and/or sing-song voice qualities.)
- Five categories were established to distinguish particular types of verb elements that might be relevant for gender imaging:
 - (i) Action verbs e.g. crawl, fly, jump, race, ram, throw
 - (ii) Competition/destruction verb elements e.g. crush, fire on, knocked out, pounce, slam, stomp
 - (iii) Agency/control verb elements e.g. control, defeat, rule, take
 - (iv) Limited activity verb elements e.g. beware, get, go, know, look, talk, wait, watch
 - (v) Feeling and nurturing verb elements e.g. cuddle, loves, taking care of, tuck you in.

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6. Key findings

- Results showed a greater proportion of toy adverts in 1996 and 1997 (42.3% and 42.9% respectively) compared to 34.7% in the 1999 adverts.

TABLE 1. Distribution of commercials

Category	Sample 1 – 1996	Sample 2 – 1997	Sample 3 - 1999	Combined
Food, drinks, snacks	47.7% (71)	41.4% (55)	45.9% (90)	45.2% (216)
Toys	42.3% (63)	42.9% (57)	34.7% (68)	39.3% (188)
Educational & public service	3.4% (5)	7.5% (10)	3.1% (6)	4.3% (21)
Recreation	2.7% (4)	2.3% (3)	6.1% (12)	4.0% (19)
Video & movie promotions	4.0% (6)	6.0% (8)	3.1% (6)	4.2% (20)
Other	NA	NA	7.1% (14)	2.9% (14)
Total	149	133	196	478

- Commercials promoting toys made up 39.3% of the sample.
- Results showed a greater proportion of toy adverts in 1996 and 1997 (42.3% and 42.9% respectively) compared to 34.7% in the 1999 adverts.

TABLE 2. Gender orientation of toy commercials

Gender orientation	1996	1997	1999	Combined
Boy oriented	47.6% (30)	42.1% (24)	70.6% (48)	54.8% (103)
Girl oriented	30.2% (19)	49.1% (28)	23.5% (16)	33.0% (62)
Boy & girl	22.2% (14)	8.8% (5)	5.9% (4)	12.2% (23)
Total	n = 63	n = 57	n = 68	n = 188

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6. Key findings

- Overall, boy-oriented adverts exceeded girl-oriented adverts and there were relatively few adverts directed to both boys and girls.
- Differences in gender-orientation did however appear for the three years sampled: for 1996, boy-oriented adverts outnumbered girl-oriented and boy/girl oriented; for 1997 the boy-oriented and girl-oriented were similar in number but greater than boy/girl oriented adverts; for 1999, boy-oriented adverts heavily dominated the sample.
- All commercials were grouped together for the analysis of gender representations in language
- The names of many of the advertised toys vividly positioned verbal images of boys and girls in their cultural context e.g. 'Big Time Action Heroes' and 'Tonka Mega Crew' stressed size as critical in male-oriented toys whilst 'Juice 'n Cookies Baby Alive' and 'Bedtime Bottle baby' signified parenting as a female-linked quality. For further examples see Table 3 below.

TABLE 3. Sample toy names by gender orientation

Boy-oriented toys	Girl-oriented toys
Dragon Flyz	Take Care of Me Twins
Big Time Action Hero	Fluffy My Come Here Puppy
Electronic Karate Fighters	Juice 'n Cookies Baby Alive
Beast Wars Transformers	Girl Talk
Mars Attack Action Figures	Star Fairies
Total Justice Super Heroes	California Roller Girl
Super Man – The New Adventures Video Game	Clueless Fashion and Makeup Dear Diary
Tonka Magna Crew	Tea Bunnies
Play Doh Demolition Derby	Fashion Magic Fingernail Fun Salon Set
War Planets	Bedtime Bottle baby
Super Soaker Extra Power Water Gun	Star Castle Light Up Gem Stone and Seashell Castles
Anamorphs Transformers	Bowling Party Stacie
Vortex Power Bat	Friend Link
Super Sonic Power Crash Pit Racers	Potty Dotty

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6. Key findings

- In relation to the types of toys advertised: for boys, action figures such as Karate Fighters and Star Wars characters were most common (37% of boy-oriented toys); for girls, the most common categories were 'posable figures' e.g. Barbie Dolls, animal figures (44% of girl-oriented toys).
- There was a distinct rise in the emphasis on hand-held electronic games by 1999: there were 16 such adverts in 1999 compared to one in 1997 and none in 1996.
- A male voice-over was heard in every one of the boy-oriented and boy/girl oriented adverts.
- The vast majority (89%) of the voice-overs in girl-oriented adverts contained female voices though there were some with male voices.
- In all but twelve commercials, the voices heard were those of adults. In these a girl's voice was heard in eight girl-oriented adverts and a boy's voice in only one boy-oriented advert.
- Exaggerated gender stylisation was used in commercials for both boy-oriented and girl-oriented toys (80% and 87% respectively), though this was not common in adverts for boy/girl-oriented toys.

TABLE 4. Frequency of verb element type by gender orientation of commercial

Verb element type	Boy-oriented	Girl oriented
Action	68	51
Competition/destruction	113	9
Agency and control	103	24
Limited activity	151	268
Feelings/nurturing	0	66

- There were clear gender-linked patterns in the identified verb elements e.g. there was a large difference in feeling/nurturing verb elements between boy-oriented and girl-oriented adverts, verb elements related to competition/destruction were heard frequently in boy-oriented adverts but rarely in girl-oriented adverts.
- Of the 188 adverts, 41% (78) included speaking in turns. More than half of the girl-oriented and boy-girl oriented adverts contained speaking in turns (55% and 53% respectively) compared to the boy-oriented adverts where only 26% included speaking lines.
- In commercials where boys and girls appeared together there were many instances of scripted elements of gender relations – boys dominant, girls subservient; boys strong and powerful, girls weak, gossipy, powerless.
- The use of the word 'power' in adverts oriented to boys was extremely conspicuous. One-fifth (21%) of the adverts for boy-oriented toys contained the words 'power' or 'powerful'. Of 45 power words, 28 were nouns e.g. 'more power than before', 'pump up the power' and 'power' was used 17 times as an adjective e.g. 'power pack', 'power base'. 'Power' was only heard once in girl-oriented toy adverts.

Gendered voices in children's advertising

Johnson, F. L. & Young, K. (2002)

7. Possible conclusions

- In television commercials/advertisements, the act of naming linguistically engages semantic notions that reinforce gender polarisation and direct attention to certain attributes of gender ideologies / the sharply polarised gender models shown in television adverts, coupled with the verbal images created for boys and girls recycle conventional gender ideology rather than minimising or challenging gender stereotyping.
- The type of toys advertised for boys and girls reinforces traditionally polarised ideas about the play activities of boys and girls.
- The use of voice-overs in television commercials generally matches the toy's targeted gender.
- Advertisers, when constructing voice-overs for TV toy commercials, strive to accentuate gender.
- When watching television commercials, children are presented with verbal models that reinforce the language stereotype that girls (and women) engage in talk while boys (and men) prefer action to words.
- Polarised patterns of language continue to be modelled in consumer advertisements directed to children.
- Toy makers and their advertisers either make no effort to associate or may consciously avoid associating girl-toys with power or their potential to transfer power to their users.



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