IMAGERY AND VERBAL TRAITS IN EARLY AND MIDDLE ADOLESCENTS: AN INITIAL ANALYSIS

by

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ABSTRACT

This investigation represented an initial enquiry into the preferred thinking styles of young and middle adolescents. Elkind's theories of the imaginary audience and the personal fable (see e.g., Elkind, 1967), derived from the Piagetian concept of developmental egocentrism, were offered as plausible reasons to infer a heightened use of and preference for an imaginal style of thinking in this age group. The developmental tasks that obtain during this period as suggested by Erikson (1950) were cited as a codicil.

A modified version of the Individual Differences Questionnaire (IDQ, Paivio & Harshman, 1983), made linguistically accessible to this adolescent age group, was used in the assessment of over 700 early and middle adolescents. The data generated by this instrument were factor analyzed following the procedures previously outlined by Paivio and Harshman (1983). Further multivariate analyses were carried out when the replicability and stability of the factor solutions had been established.

The modified IDQ yielded two factors which corresponded to the original (nominal) verbal and imaginal scales. Further, a six factor solution was deemed to be the best representation of the simple structure of the factor space. This replicated the previous study by Paivio and Harshman (1983). In the present study an imaginal factor was primary in both the two and six factor solutions.

Multivariate analyses using a subset of 40 items from the IDQ, balanced for trait and polarity, suggested a strong bias toward an imaginal style of thinking for this sample. No significant age differences were found within the study. A small, significant effect for sex obtained, the females scoring higher on all items (on average) than the males. A noticeable polarity effect was discovered such that negatively worded items (disconfirmation of a trait) were scored with more assurance than positive items. Implications for the classroom were suggested.

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DEDICATION

To J.

To RC, to SC, and to all the little C's.

CHAPTER ONE

Introduction

In the early 1970's, Allan Paivio and his associates developed the Individual Differences Questionnaire (IDQ, see Paivio, 1971; Paivio & Harshman, 1983) a research instrument aimed at assessing both verbal and imaginal traits, including preferences, abilities and habits. The construction of this instrument came at a time both of renewed and growing interest in such traits and of research in the area of mental imagery, which had, between the 1920's and the late 1950's, effectively and rather thoroughly been ostracized (Holt, 1964). This state of affairs, however, was ameliorated when it became apparent that S-R theory (Hebb, 1960) could not answer all questions on cognition and development.

The IDQ, the construction of which was based on dual coding theory (Paivio, 1971; 1978), was initially administered to undergraduate university samples with some very positive and interesting results (Paivio & Harshman, 1983). One outcome of this research was the realization, often considered but never thoroughly investigated, that imagery plays an important role in day to day cognition.

Research on memory development and memory strategies in children has contributed much to the understanding of encoding and retrieval processes in children (see Pressley, 1977, for a review), but there appears to be a continuing need of research in this area throughout the developmental span. To date, research in the area of adolescent cognitive development is limited compared to the body of child and adult research extant. To contribute to this area of apparent neglect was one of the aims of this investigation.

The IDQ, which in the earlier research (Paivio & Harshman, 1983) yielded six stable factors, three defined around verbal traits and three around imaginal, was reevaluated and modified slightly to be accessible linguistically and contextually to a younger population--namely early and middle adolescents. The resulting 86 item device was subsequently administered to more than 800 junior and senior high school students, ranging in age from 13 years to approximately 20 years of age. The experimental hypothesis was that early and middle adolescents would show a heightened preference for imaginal thinking vs. verbal/linguistic, contrary to earlier predominant theories (Bruner, Olver & Greenfield, 1966).

CHAPTER TWO

Literature Review

Introduction

The literature examining adolescents' use of imagery is sparse compared to the body of research so far generated on adults and children. This gap in the literature, from about age 12 years (grade 6) to around age 17-18 years (post-secondary) may be the result of two separate trends. First, it has often been held that, with the onset of formal operations, usually said to occur at about age 11 years (Gander & Gardiner, 1981; Gardner, 1982), two things obtain: the use of images and imagination decreases as the child's new grasp of abstract concepts stimulates propositional thinking (Pressley, 1982); and, language skills maximize (Bruner et al., 1966). The assumption that language-based propositional thinking was ascendant precluded much research into the use of imagery/imagination from this onset. The second factor, much more practical and a-theoretical, was that, conjecturally, close to hand samples abound on the university campuses of the world, where much of the research is carried out. Constraints operate to use that which is most easily accessible.

In those studies that have included adolescents (Pressley, 1977; Rowher, 1973; Rowher, Raines, Eoff, & Wagner, 1977) at least in both the areas of spontaneous use of imagery strategies for enhanced learning (Pressley & Levin, 1980) and in the ability to use and usefulness of imagery stragegies, developmental increases obtain with age through grade 12. If young adclescents (e.g., 13-15 year olds) do spontaneously use imagery strategies more frequently than do younger children (e.g., 4-8 year olds, Pressley, Levin, & Bryant, 1983) or adults, what might be the reason(s)?

Adolescent Egocentrism

Egocentrism is a central tenet in Piagetian and neo-Piagetian development (Elkind, 1967; Inhelder & Piaget, 1955/1958). Egocentrism refers to an inability to "differentiate the nature of the subject-object interaction or the subject-object relationship" (Muuss, 1982, p. 249). For the young infant this results in an inability to conceive of object permanency apart from himself or herself, for the young child it reflects an inability to separate the names of objects from the objects themselves, and for the

older child (e.g., 7-11 years, the concrete operational) this egocentrism is associated with a lack of separation between the mental constructions of the child--the hypotheses of experience--and the actual data, or "real facts" (Elkind, 1967).

With the advent of adolescence, these prior developmental tasks, or conquests of subject-object relations, are usually achieved, and one sees the emergence of formal operational thinking (Elkind, 1967; Inhelder & Piaget, 1955/1958). For adolescents, the ability to conceptualize their own thoughts or think about thinking, (formal operations or operations on operations), brings with it the ability to conceptualize the thoughts of others. And therein lies the egocentric trap. In thinking about the thoughts of others the adolescent "fails to differentiate between the objects toward which the thoughts of others are directed and those which are the focus of his own concern" (Elkind, 1967, p. 1029).

Elkind also suggested that, as a result of the physiological changes that occurred in the adolescent (as well as the psychological; see also Erikson, 1950; A. Freud, 1936/1968; Muuss, 1962) the adolescent becomes singularly

self-preoccupied. This "self concern", coupled with an inability to differentiate between self- and other-thinking, leads the adolescent to "assume that other people are as obsessed with his behavior and appearance as he is himself. It is this belief that others are preoccupied with his appearance and behavior that constitutes the egocentrism of the adolescent" (Elkind, 1967, pp. 1029-1030). This adolescent egocentrism, which is self-focussing in any social or public situation (even where there is no "public") led Elkind to suggest the concept of the "imaginary audience" (Elkind, 1967; Elkind & Bowen, 1979).

The idea that adolescents create in their minds'-eye an audience, of which they are individually the focus of attention, was given as a basis for much of adolescent experience and behavior. Such behaviors as a young male adolescent spending hours in front of the mirror combing his hair and posing this way and that, or a young female adolescent playing with her make up and mode of dress for hours on end could be explained in light of the imagined audience's reaction to each one's appearance (Garrison & Garrison, 1975; Elkind, 1967; Muuss, 1982).

In addition to the idea of the imaginary audience, another concept was defined by Elkind, the "personal fable," (Elkind, 1967), which results from a tendency to over-differentiate feelings. Adolescents tend to regard themselves as unique and special, and as having experiences of such intensity and richness that no one else could possibly "know how it feels." The "personal fable" is a story the adolescent "tells himself and which is not true" (Elkind, 1967, p. 1031). Such "myths" as immortality and the impossibility of pregnancy or serious personal injury (indestructability) and much of adolescent delinquency could be attributed to a "belief" in this personal fable (Muuss, 1982). (Blos, 1962, commented on the vicarious nature of the adolescent's imagination at this time. Couched in neo-Freudian ego-concerns, Blos suggested that at this time there was a very thin line between inner and outer experiences--between fantasy as imagination and as "imagined reality.")

While Elkind interpreted adolescent development from a cognitive perspective, E. H. Erikson viewed the same period from an ego-psychoanalytic perspective. In theorizing on human development Erikson (1959,1968) postulated eight

separate stages, sometimes referred to as the Eight Ages of Man (Yussen & Santrock, 1978). Each stage focusses on development in the context of a reconciliation of biological pressures and sociocultural expectations, resulting in stage-specific conflicts which could be resolved more or less positively (healthy vs. unhealthy). The central conflict that emerges at the time of puberty is that of personal identity vs. role confusion (Erikson, 1950).

Erikson suggested both that there was a discontinuity with previous development at puberty and that the young adolescent experienced a physiclogical revolution. The young adolescent, therefore, became preoccupied with how he or she appeared to others (i.e., the image of the self). This was, therefore, seen as the time to develop a strong ego identity. This task (to establish one's own identity) involved the attempt to reconcile the previous experiences of childhood with the emerging, and initially alien, somesthetic and emotional self-images and then further to take this reconciliation and make it a part of future plans--a truly mammoth task.

Erikson suggested that the task of identity establishment focussed not only cn somatogenic/sexual

experiences, but also on the development of a vocational identity (Erikson, 1950,1968; Yussen & Santrock, 1978). The selection of an occupational role, and tentative steps toward this, gives adolescents something objective to which they, as well as others, can identify and which subsequently reflects on each one's role in the society. Frequently adolescents identify with popular figures, especially those who are media prominent. This is the time when adolescents imagine roles to see which, if any, match their own self-concept. Erikson (1959) stated that it was at this time that society allowed a period of "psychosocial moratorium," in effect allowing for wild imaginal experimentation in order to converge on some self- and other-satisfying role(s). Some of this experimentation would take place in acting out the various roles that accompany being students, children, workers and friends, but much experimentation would take place in the mind of the adolescent--"what if"? The frequency and intensity of adolescent "love affairs" reflect the constraints of this developmental period, this in turn bearing on the imaginal quality of the adolescent's life at this period (Elkind, 1967/1968; Muuss, 1962). Piaget called it the metaphysical

age par excellance (Piaget, 1964/1967, p. 64) in which, in the imagination of adolescents, they reconstruct the universe anew. It is a period of heightened idealism, with a refusal to accept reality (Muuss, 1982). Anna Freud (1936/1968) suggested that this was a period of increased fantasy activity internally and exhibitionism, publicly.

This egocentric/egodiffusive behaviour and thought lessens as the adolescent matures, starting around age 15 years and continuing thereafter (Elkind, 1967; Elkind & Bowen, 1979; Enright, Lapsley, & Shukla, 1979; Inhelder & Piaget, 1955/1958; Muuss, 1962). Elkind suggested the decline was associated with the establishment of mature formal operations when the imagined audience was gradually replaced by genuine social interaction. Erikson suggested that the obtaining of a job signalled the beginning of the end of the conflict (i.e., identity vs. role confusion). The maturing adolescent becomes more sociocentric (Enright, Shukla, & Lapsley, 1980; Muuss, 1982) and ego-integrated (Muuss, 1962).

This author suggests that the concepts of Elkind (personal fable and imaginary audience) lead one to view adolescents as particularly labile in their thinking,

repeatedly using their imagination to envision themselves as they feel they really are (personal fable) and as they might or would appear at any given time to others (imaginary audience). This is the period when adolescents are freed from the constraints of concrete, real-world-bound thinking (Inhelder & Piaget, 1955/1958), and they may let loose the reigns of imagination, conceiving themselves in many disparate roles and getting a feel of them in their minds' eye. Those thoughts or imaginings that are the more appealing and are operationally plausible can be behaviourally verified. But the possibility exists to create many more in the imagination than could conceivably be acted out. Using the imagination thusly, could seem, intuitively, to suggest a more imaginal style of thinking generally. Habituation in imagery tends to lead to use in all areas of thinking (Paivio, 1971).

The idea that imagery might be elevated in adolescents is one which was not reported in the earlier literature on imagery (Pick & Pick, 1970). The most popular school of thought (particularly in the 1960's) was that of Bruner and his colleagues (Bruner, 1964; Bruner et al., 1966; Elkind, 1981; Pressley, 1982). Bruner postulated three seemingly

discontinuous stages of cognitive development (Bruner, 1964; Bruner, et al., 1966; Paivio, 1971). The first stage (during infancy) was called "enactive" (p. 12, 1966) and was roughly equivalent to Piaget's sensorimotor stage. The second stage was the "ikonic" (p. 21, 1966) where the child represented "the world to himself by an image or spacial schema that [was] relatively independent of action" (Bruner, et al., 1966, p. 21). Bruner suggested that children's imagery during this stage was characterized by features found in their perception. He considered this stage to be one characterized by sluggish and distractable thinking. At what age this stage was over is not quite clear from Bruner's writing (see Bruner, 1964; Bruner, et al., 1966), but it may occur as early as age 7 years or as late as 10 or 11 years (Bruner, 1964). The last stage was the "symbolic" in which language was the most important feature despite Bruner referring to "proto-symbolic" activity (Bruner, et al., 1966). Bruner concentrated "almost exclusively on language" (Paivio, 1971, p. 19). In language Bruner found the apogee of cognitive development--the "extraordinarily swift [cognitive] system" (Bruner, et al., 1966, p. 40) and implied that the previous systems of representation would no longer operate, being superseded.

Bruner based his views on his evolutionary understanding of man's development. He saw cognitive growth not in terms of capacity--for the child had the capacity of the adult--but rather technology, in which each stage was characterized by mastery of certain techniques passed on by the culture. To date there has been little empirical evidence to support Bruner's ideas (Elkind, 1981; Pressley, 1982).

Imagery

Introduction

Interest in the nature and function of imagery has grown exponentially in the last 25 years, outwardly signalling, at this "reinception," the inability of behaviouristic S-R associationism to answer all (or, perhaps, even the most interesting) questions on human cognition. Toward the end of the last century imagery was considered a seminal concept in the study of the mind. Historically imagery concerns precede the time of Plato and Aristotle (both of whom saw the concept as central to thought), and the use of imagery as a mnemonic was common in both the Greek and Roman cultures (Horowitz, 1983; McKeller,

1972). Imagery is discussed in the writings of the major philosophers from that time to this present century (Horowitz, 1983; Marks, 1972; McKeller, 1972). At the turn of the century, some of the major figures in psychology were contributing research on the properties of imagery, men such as Galton, Fechner, Titchener, Boring, Freud and Jaensch (McKeller, 1972).

The decline in the importance of imagery took place on several fronts. In the Würzberg school it was discovered that subjects, trained to report on their thinking processes, could not, in fact, always do so. Problem solving could take place without conscious use of imagery (Horowitz, 1983). On another front, Ebbinghaus (1885/1964) concentrated on rote learning of nonsense words to fathom and chart the process of memory: his research is still seen as germane to the understanding of memory processes. Thirdly, psychology witnessed the ascendency of behaviourism and of its champion, J. B. Watson, who denied even the existence of imagery, let alone that it could be studied empirically (Watson, 1913). As a result of these (and other) influences, imagery as a major factor in defining human faculties was "ostracized" (Holt, 1964).

Behaviourism, however, could not answer all the important questions, even on human behaviour (Kosslyn, 1983), let alone on such concepts as cognition, perception or language acquisition. Imagery was not dead for those 30-40 years (Paivio, 1971), but real interest in the concept did not reoccur until the early 1960's (Holt, 1964). With the reemergence of interest in imagery came also a reemergence of interest in the previous research, particularly that dealing with imagery types (Galton, 1907), imagery vividness (Betts, 1909) and imagery control (Gordon, 1949). The use of self-report measures became frequently associated with this new research, of which, comment shall be made later.

Definition

There appear to be two disparate approaches to the conceptual definition of imagery. On the one hand there are those who view imagery as a hypothetical construct and use various operational definitions (Holt, 1972; Paivio, 1971). On the other hand, there are those who, like J. T. E. Richardson (1980), suggest a need to go beyond mere operationalism. They assert both that imagery has an

empirical, phenomenological existence and that the experience of imagery is undeniable (Kosslyn & Pomerantz, 1977).

Identifying imagery as a theoretical construct with various operational definitions is standard and uncontroversial (J. T. E. Richardson, 1980). Most definitions of imagery have some conception/description of its "percept-like" qualities: "a quasi-perceptual phenomenon occurring in conscious experience" (Marks, 1977, p. 275); "material occurring in consciousness not immediately preceeded by perceptual uptake" (Gowan, 1978, p. 23); "a mental likeness of a perceived or perceptible phenomenon that can be represented in visual, auditory, tactile, or other sensory forms" (Hall, 1981, p. 61).

Paivio (1971) suggested that there was no necessity of conscious experience of imagery for it to mediate overt behaviour (see also Bugelski, 1977), a position which psychoanalytic tradition (with its dualism) has always maintained (Holt, 1972; Horowitz, 1983). Holt (1972), on the other hand, argued that "consciousness may make a considerable difference" (p. 10) and, therefore, suggested both that image be used for the phenomenal content of

sensory experience and that presentation be used for the mediating process, sans awareness; to date this position has not been largely followed. J. T. E. Richardson (1980) and Marks (1977) pointed out that most operational definitions of imagery tacitly assume that there is a conscious awareness on the part of subjects when mental imagery is evoked (by various stimuli) and of strategy use to remember (such stimulus material).

The phenomenological point of view is stated by J. T. E. Richardson (1980) in the following:

> Like both sensations and emotions, mental images are conscious mental episodes of a definite temporal duration. Unlike emotions, mental images do not seem to have a characteristic, natural (that is, non-verbal), behavioural manifestion....Unlike sensations, mental images do not yield information about the world, and the formation of mental images may be a volutary activity....Like sensations, emotions, and thoughts, mental imagery manifests an epistomological assymetry between its ascription to oneself and its ascription to others: the ascription of mental imagery to oneself is incorrigible, in that

> one cannot be mistaken about whether one has a mental image [italics added], and it is criterionless, in that it cannot be based upon any process of observation....so the notions of consciousness and self-consciousness are crucial in discussing mental imagery (p. 34).

On this basis J. T. E. Richardson argued that the investigation of mental imagery should place primary emphasis on verbal reports of imagery, attempting to formalize them in a system of protocol questionnaires. Behavioural manifestations of imagery are seen only as symptomatic, are useful only as correlates of the empirical phenomenon, and do not constitute logically adequate evidence for the assumption of mental imagery. J. T. E. Richardson distinguished between the empirical phenomenon of imagery (postulated as universal) and a hypothetical construct used to explain the faculty of imagery, the former being the experience of imagery and the latter the physiological states of the mechanism causally responsible for that experience.

For the present study (the phenomenological position notwithstanding) the definition of Gordon (1972) appears the

most complete: "the perception of forms, or colors, or sounds, or smells, or movements, or tastes in the absence of an actual external stimulus which could have caused such perception. This does not mean that such external stimuli did not present themselves in the past or that the image is necessarily independent of such past experience but...at the time of the perception no such stimulus is present" (p. 63). To this definition the author would add the concept of fantasy or daydream imagery, in which events or forms or sensations which have not presented themselves previously may be generated and manipulated (viz.,future-thinking or speculation).

Development

Piaget and Inhelder (1966/1971) suggested that images are not utilized until relatively late and, therefore, were probably not acquired until later development. Classifying images into either reproductive or anticipatory, they stated that reproductive images appear with the onset of symbolic function (language) somewhere at the outset of the preoperational stage (1 1/2 - 2 years of age). Anticipatory images developed concurrently with operational thinking,

initially with concrete operations. Piaget and Inhelder suggested that there seemed to be a parallel development in imagery, perception and intelligence, but that the development of imagery was not autonomous, appearing both to support cognitive development and, yet, to be based on cognitive development. Regarding reproductive images they stated that "it is self-evident that the preoperational images, just as any other kind of images, will promote the acquisition, or at least the fixation and consolidation of data" (p. 376). "The image...makes a positive contribution [to cognition]; it plays a part in improved knowledge....[but] in no way serves to prepare for comprehension of the transformation [i.e., operation] as such" (p. 377). Anticipatory images on the other hand "constitutes an auxillary that is not only useful to, but in many instances <u>necessary for the functioning of the operations</u> [italics added]" (p. 378). The image and imaginal thought, while lacking veridicality, act as an impetus to deduction enabling a rough outline of what the operations refine and bring to a logical conclusion.

The image allows the child/adolescent, like the creative adult, only on a smaller scale, to make global

predictions or broad generalizations before detail can be managed and to deduce more precisely the transformations themselves. It was the opinion of Piaget and Inhelder that the image, while perhaps not critical to cognitive development, engendered quicker development and a more thorough comprehension and anticipation of future possible events.

Tower (1983) suggested that imagery benefits not only cognitive but also affective and social development. Cognitively, imagery fosters the development of attention and concentration by self-reinforcement of pleasureable activity. It facilitates memory development by encouraging rehearsal and broadening encoding strategies. It develops organization of thinking and leads to increased discrimination between fantasy and reality, peripheral from central information, and the concept of self vs. others. It encourages originality and flexibility in thinking. The exercise of imagery facilitates language development (Tower, 1983).

Affectively, imagery promotes elaboration and differentiation of self identity, encourages risk-taking behaviour in novel situations, and encourages the

development of non-verbal cue perception. Imaginative skills are associated with emotional regulation, behavioural self-control and intrinsic motivation. Imagery is also useful in regulating and relieving stress, allowing emotional "acting-out" to resolution to take place in the imagination.

Socially, Tower (1981) stated that those showing imaginal characteristics tended to be the most sought-out by others, the most open to relations with others, and the most self-secure in those relations. She suggested that imaginative skills contributed to the development of a sense of "social place"--one's role in society (see also Erickson, 1959). Finally, it appears that the imaginative child/adolescent/adult is more receptive to learning from others. The imaginative person tends to be a better learner overall (Tower, 1983).

Function

The capacity to image seems to be universal: ability may vary but the potential is probably unrestricted (Gordon, 1972; Marks, 1972; A. Richardson, 1969). Gordon (1972), in fact, suggested that the innate releasing mechanism,

discussed in animal research, appears to behave much in the way that images function: helping to relate the multiplicity of objects and events in the (stimulus) world to the animals' species specific behaviour(s). The image functions by structuring and creating order that is meaningful out of the apparent sensory overload that occurs from natural experience.

The image functions as a time bridge so that events of the past can be held and meaning made of them in the present context (Gordon, 1972). Similarly, present and past experiences can be projected to the hypothetical future, allowing possible outcomes to be analysed and reduced to the most meaningful and manageable few. This use of imagery in time also helps to render past and present obstacles and failures more tolerable for the sake of future satisfaction. Images are the "raw material" of imagination, and Gordon (1972) suggested that symbolic thought could not function without imagery.

Imagery is associated with greater self-confidence in those who report its use--irrespective of performance. In the field of competitive sports it functions both in this affective manner, which, if not enhancing performance,

precludes inferior performance due to lack of self-assurance, and as an adjunct to physical practice (viz., mental practice; see Suinn, 1983).

Fox (1914) reported that imagery functions as a substitute for percepts where the latter would be used in problem solving. He suggested that images were generally aroused when difficulty to understand a proposition produced mental conflict, and served to reduce that conflict, particularly in novel situations. This led Sheehan (1972) to argue that a critical function of imagery lay in its usefulness in incidental recall or non-intentional learning. (The need to recall inadequately encoded material was thought to cause mental conflict and imagery was utilized to problem-solve.)

Imagery also functions as a memory device (Marks, 1972; Paivio, 1971). Marks (1972) suggested that those who report good imagery were able to utilize a source of information that seemed unavailable to those who reported only vague or dim imagery. (This is most obvious in tests of picture recall.)

Marks (1972) also distinguished between the literal and associative functions of imagery in memory. The literal

function is apparent when subjects form an "exact" image of the stimulus pattern and in retrieval subsequently "read-off" information from that image. (This appears to be a relatively weak function, Marks, 1972, although Sheehan and his associates have reported positive findings, Sheehan, 1966, 1967b, Sheehan & Neisser, 1969.) Imagery functions associatively when subjects use imagery to form an association between two or more stimuli. Imagery in paired-associate learning and mnemonic "mental walks" are two consistently viable uses of associative imagery (Paivio, 1971).

Measurement

Betts' Questionnaire Upon Mental Imagery, an apparently unwieldy device reporting across seven sensory modalities was modified by Sheehan which resulted in a 35-item questionnaire (QMI; Sheehan, 1967a). The QMI has been positively related to creativity (in men), improvement in physical skills (with mental practice), field independence (in women) and extroversion-introversion (see Ernest, 1977; Sheehan, Ashton, & White, 1983). Marks (1973) thought that the QMI was too expansive and modified it to create the

Vividness of Visual Imagery Questionnaire (VVIQ) working on the premise that, by limiting interest to one modality, less confusing results might obtain. The VVIQ has been positively related to paired-associate recall, hypnotizability, frequency of dream recall and memory performance (see Sheehan, et al., 1983). The VVIQ appears to measure not only imagery vividness but also, to some extent, imagery control (Ernest, 1977), as does Gordon's Test of Visual Imagery Control (Gordon, 1949).

Singer and Antrobus (1963, 1972) developed the Imaginal Processes Inventory (IPI) which focussed on imagination, fantasy and daydreaming and the "stream of mental consciousness" which they suggested reflected an ongoing manifestation of man's image-making capacities. Two of the scales deal particularly with visual and auditory imagery in daydreams. Singer and Antrobus (1972) have used the IPI with encouraging results in clinical settings (Sheikh & Jordan, 1983).

On the assumption that the ability to image could be inferred from behaviour (Paivio, 1971), a body of research has accrued using various spatial abilities tests to separate individuals (presumably) on imagery ability (for

reviews see Ernest, 1977; Paivio, 1971). In addition to spatial abilities, other performance measures such as mental rotation of images, selective interference effects, visual tracking, pursuit learning (with imagery) and various eidetic tests have been used to provide correlations between imagery and paired-associate learning, short and long term memory and cognitive growth (Ernest, 1977). As performance measures are not the subject of this thesis, they will not be further discussed. They are mentioned only for reference.

In recent years Allan Paivio's work has been dominant in the field. His research has established both the basic patterns and the methodological foundations for all subsequent research. His aim from the outset was to build a rigorous, empirical methodology which, while studying a "mentalistic" concept such as imagery, would satisfy even the most radical behaviourist (J. T. E. Richardson, 1980).

Paivio identified two types of coding or representation used by people in psychological tasks: "images and verbal processes are viewed as alternative coding systems or modes of symbolic representation" (Paivio, 1971, p. 8). These two systems are highly specialized systems for organizing,

encoding, transforming, storing and retrieving information and yet are highly interconnected. The image system is used to deal with perceptual information and the verbal system with linguistic information (Paivio, 1978, 1979). J. T. E. Richardson (1980) suggested that this led to identifying three levels of processing: the representational, where the sensory trace arouses the appropriate symbolic system; the referential, where the representations of one system arouse corresponding representations in the other (interconnections); and the associative, involving associations within or between systems. That any or all systems are involved is task dependent. Based on dual coding theory, Paivio and his associates developed the Individual Differences Questionnaire (IDQ), described in more detail elsewhere.

There have, however, been questions whether self-reported imagery ratings predict subsequent performance. One problem has been the assumption that any of several tasks indicate imagery processes, an assumption which may be tenuous at best (J. T. E. Richardson, 1980). Where factor analyses have been used, questionnaires consistently loaded on factors separate from performance

measures, particularly from spacial relations tests (DiVesta, Ingersoll, & Sunshine, 1971; Forisha, 1975). This in itself does not necessarily reflect ill on any particular measurement, but it may indicate that the wrong questions are being asked. Very little of the literature, however, has been concerned with the IDQ (see White, Sheehan, & Ashton, 1977). This does not mean that the IDQ could not be prone to some of the most obvious pitfalls of self-report measures (e.g., possible incongruence between introspection and actual process); but the IDQ is addressed, in a sense, to different psychological characteristics. Such measures as the QMI or VVIQ typically deal with vividness or control of images, and there is, perhaps, some justification in allowing the argument that individuals might be using unique (personal) baselines for judging their own vividness or control. The IDQ does not seek specific ratings of various imagery properties, but rather an indication, on a yes or no basis only, of an individual's professed preferences, habits and abilities. It is easier to argue that a person would know whether he or she had or had not used imagery in different situations than whether that imagery was rated "5" compared to someone else's "7" (i.e., on a Likert-type scale).

J. T. E. Richardson (1978) distinguished between coding ability and coding preference. He suggested a need for research in the area of preference. A. Richardson (1983) made the same distinction, allowing that cognitive style referred to the habitual preference for performing tasks one way or another, and stated that he found no logical or empirical reason for neglecting data developed from a systematic concern for experiential events. The modified form of the IDQ was used in the hopes of adding to these data.

Chapter Conclusions

Because children exhibit observable behaviours and respond to verbal questioning confirming a vivid and active imaginative life, which, has been suggested, diminishes as the child gets older (see Kosslyn, 1983), it was assumed that verbal cognition was on the ascendency to the exclusion of the imaginal (Bruner, et al., 1966). The literature linking imagery with adolescents is minimal. There are, however, enough data to suggest definite developmental trends in the use and preference for imaginal strategies (Pressley, 1977). The ability to imagine allows humans to

alter in some degree reality itself and allows them to be active designers of their own future rather than passive recipients of events impinging upon them. Bleuler (1912/1951) called the imagination process autism, the un-reality factor, which McKeller (1972) used to differentiate between autistic and reality thinking (A-thinking; R-thinking). A-thinking was the world of imagination and was non-reality-based. R-thinking was based on logic. He likened A-thinking to raw material, creativity and authorship and R-thinking to the process of editing or editorship (McKeller, 1963). Such characteristics appear to be in the domain of adolescents.

It is this author's understanding, based on his interpretation of the theoretical perspectives of Elkind, Erikson and Piaget that early and middle adolescents should be different from adults in their self-reported imagery and verbal traits. The hypothesis is that adolescents will be higher self-reported imagers given the developmental tasks they are facing.

CHAPTER THREE

Method

Introduction

This chapter describes the subjects used in the experiment, the instrument developed to assess adolescents' imaginal and verbal traits and the procedure used to gather the data. A note on the limitations deriving from the method used in this study will be given in Chapter 5.

Subjects

The subjects of the study were early and middle adolescents enrolled in one senior and two junior high schools in Victoria. The students were enrolled in grades 8 to 12, and they were from all streams of the schools' programs. In the senior high school, all students taking English were used (virtually the whole school). In one junior high school, the whole school was assessed. In the other, the majority of grade 8 and 9 students were examined. The students ranged in age from 13 years and 2 months to 21 years and 9 months (with one mature student). The median age was 15 years and 4 months at the time of the study.

There were 857 protocols collected from the three schools, with roughly an equal number collected from each school. Of these, 799 were retained, 58 protocols being discarded from the study because of (a) insufficient data--no protocol was retained with 12 or more items unanswered--or, (b) because of obvious noncompliance. These data were used in the initial factor analyses. In the subsequent analyses, only those cases for which there were complete demographic data reported were used. This resulted in further reducing the number of subjects to 720. Table 1 represents the demographic data of the student sample used for the multivariate means analyses.

The schools were located both in the city core and in the outlying suburban community. No distinctions were made regarding race or socioeconomic status. The subjects were, however, assessed for familial organization. The breakdown of family structure, which was coded for 706 subjects, is summarized in Table 2. In all cases participation was voluntary, and no name identification of individual students was used.

Table 1

Student Sample for Multivariate Means Analyses on the IDQ

Age*	Sex		
	Males	Females	Total
n ≥ 18	43	35	78
17 ≤ n < 18	44	31	75
16 1/2 ≤ n < 17	53	49	102
16 ≤ n < 16 1/2	43	57	100
15 1/2 ≤ n < 16	49	53	102
15 ≤ n < 15 1/2	54	48	102
14 ≤ n < 15	29	43	72
13 ≤ n < 14	42	47	89
Total	357	363	720

*n = age in years at the time of testing

Table 2

Parenting Structure of Subjects' Families

	Sex			
Parenting	Male	Female	Total	%
Guardianship	13	16	29	4.11
Single Parent	80	98	181*	25.64
Both Parents	255	235	496**	70.25
Total	348	349	706***	100.00

*3 cases, no designated sex

**6 cases, no designated sex

***Includes * & **

Instrumentation

The Questionnaire on Imagery, Verbal Habits and Thinking Skills (see Appendix B-1), a modified form of the IDQ originally developed by Allan Paivio and his associates, was the only research instrument used. The IDQ was an 86 item device originally developed at the University of Western Ontario to assess imaginal and verbal habits, preferences and abilities (Paivio & Harshman, 1983).

The IDQ was reworded by the author to be linguistically accessible to the younger population. The essential meaning of each item remained unaffected and no items were deleted. The version of the IDQ used in the present study asked the subjects to respond either "True" (scored 0) or "False" (scored 1) according to the criteria of how each statement reflected their own experience. Each item was in the form of an "I" statement (see Appendix A-2). Opscan computer sheets were provided for the students on which to mark their answers. Accordingly, a set of scores based on this binary choice scoring system was collected for each subject over the whole device and all subsequent analyses were carried out on these data. The instrument was used in a small pilot study, and it was found to be both readable and

comprehensible by 8 to 10 year old students, and it, therefore, was felt to be easily accessible to the target samples.

Ernest (1977) reported that the IDQ had predictive value of individual performance that other self-report measures have often lacked. Marks (1977) reported that the scale showed reliability over time, and Hiscock (1978) reported that alpha-coefficient reliability was "satisfactory" (.80 for the imaginal scale, .83 for the verbal). A. Richardson (1977), using a subset of the device, found it reliable and valid, both behaviorally and physiologically.

Two problems associated with self report measures, response set and narrow focus, have been addressed by the IDQ. The instrument covers broad verbal and imaginal traits and has both positively and negatively worded versions of most items. Previous research with the IDQ found it free from response-set effects and social desirability bias (Ernest, 1977; Hiscock, 1978).

Procedure

The revised IDQ was administered in class time by the designated classroom teachers. It was felt that this offered the least interruption to normal routine. The distribution and administration of the questionnaires were handled by each high school at times that were individually most convenient. The author was available in all cases for consultation. A standardized introduction and explanation (see Appendix A-1) was given to each teacher to read before administering the revised IDQ. Generally, administration was straightforward and was completed within forty minutes(maximum). All data collection was done within a three week period in April, 1985.

Hypotheses

If there is indeed a developmental trend in imagery use with the onset of adolescence generally resulting in increased use of imagination, then this group should report higher imagery than an older population (or younger--but this was not addressed in this study).

Specifically (a) early adolescents will report higher imaginal habits than middle adolescents, (b) middle

adolescents will report higher imaginal habits than late adolescents, and (c) late adolescents will report similar imaginal habits to adults.

Ha: Early > Middle > Late $\geq$ Adult

Ho: Early = Middle = Late = Adult

Definitions

1. Adolescence: Pressley et al., (1983) suggested that adolescence could cover the period from age 10 years to, and including, 22 years of age. Mitchell (1979) commented that adolescence covered too many years and too many complex behaviors to be understood as one definable period. For the purposes of this study, early adolescence will be operationally defined as 12-14 years of age and middle adolescence as 15-17 years of age. In order to assess more sensitively any developmental trends, in particular, to see if there are any obvious transitional periods, the two, broad, operationally defined categories will be further divided into eight discrete age groups.

2. Imagery: See above for definition(pp. 18-19)

CHAPTER FOUR

Results

Introduction

This chapter discusses the results of data analyses on the questionnaire on thinking styles returned from three local high schools. The study was initially a replication of a study by Paivio and Harshman (1983), but it was conducted on a younger population; as such, initial factor analysis was carried out using the SPSS procedure FACTOR (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) with iteration on the diagonal to estimate communalities and oblimin (oblique) rotation. Firstly, two factors were extracted to allow the comparison of the scales (verbal vs. imaginal), and secondly, six factors were extracted using various DELTA parameters for comparison with Paivio and Harshman. Along with these initial analyses, various orthogonal solutions were generated using VARIMAX rotation in the SPSS-X package. Using the information generated by the factor analyses, factor-based item sets were created and operationally defined by the included variables. The subsequent "sets" were analysed by multiple analyses of variance (MANOVAs) on 720 cases for which there were

sufficient demographic data. These analyses will be discussed in detail below.

The data were read by an optical scanner into a computer file. After the data were entered, the file was checked for accuracy against the original protocols, and any corrections necessary were made. All protocols with twelve or more missing items were deleted from the study.

Factor Analyses

"Two of the greatest necessities of factor analysis are large samples and replication....Replication is too seldom practiced in any research. And it is particularly needed in factor analytic studies" (Kerlinger, 1973, p. 681; note); this point has been made elsewhere (Cattell, 1978; Gorsuch, 1983). Because of these necessities, one aim of the present study was to establish the viability and replicability of the verbal and imaginal traits identified by the IDQ.

Two Factor Extraction. Initially two factors were extracted and rotated to approximate simple structure using OBLIMIN rotation provided by SPSS. This program allows for the choice of more or less oblique solutions via a parameter value (DELTA). A series of delta values was used ranging

from - 0.5 to 0.8. As in the previous study, the factors degenerated at delta values in excess of 0.5. Solutions between ± 0.5 were similar. The correlations between the two factors were higher than those reported by Paivio and Harshman (1983; - .20 at delta = - 0.5; - .22 at delta = 0.0; - .30 at delta = 0.5). The factor accounting for the most amount of variance in the two factor solution was the imagery factor (68.3% of the common variance). This is the first indication that these adolescents are more habitual in their imagery use than the original, older (university) sample of Paivio and Harshman. The loadings for the two factor solution are given in Appendix C-2.

The purpose of conducting an initial analysis generating two factors was to assess the nominal scaling of the items (see Paivio & Harshman, 1983). These two factors did reproduce the nominal scaling of the items, imagery items loading on Factor 1 and verbal items on Factor 2. The factor pattern in the present study corresponded very closely to that reported by Paivio and Harshman, including reversal of the nominal scaling of Item 74. In the present study Item 80 also loaded substantially (- .43) on the imagery factor. This may have been a result of rewording

the item, and, therefore, it may be more appropriately scored as imaginal. Twenty-four imagery and 26 verbal items had loadings of .30 or more on the factor pattern matrix, thus indicating the balance of the instrument. Though loadings of less than an absolute value of .30 are significant with an N = 799, these were not of interest in this study, accounting for a small portion of the variance. Hereafter, only loadings $\geq |.30|$ are reported as salient; this follows the Paivio and Harshman tact.

Factor congruence coefficients (Tucker, 1951) were calculated. For the imagery factor, $r_{cc} = .94$, and for the verbal factor, $r_{cc} = -.95$, a high degree of relationship was obtained (Gorsuch, 1983). Since the sign of a factor is arbitrary, a high negative correlation is equivalent to a high positive correlation, as one can merely "reflect" the whole factor, naming it in the opposite direction (Cattell, 1978; Gorsuch, 1983). Since the first step of replication proved successful, further analysis was carried out with an eye to the six factor model presented by Paivio and Harshman.

Principal Components Analysis. A principal component analysis was conducted on the data using the SPSS-X package

(SPSS, Inc., 1983) and rotated by VARIMAX to approximate simple structure. Twenty-eight factors were extracted using the Kaiser-Guttman criterion of eigenvalues greater than 1.0. Clearly this resulted in too many factors to make any clear interpretation. A common problem in using 1.0 as a cutoff when the number of variables exceeds 30 is the indication of too many factors (Cattell, 1978; Cureton & D'Agostino, 1983; Gorsuch, 1983). Cattell (1978) and Cureton and D'Agostino (1983) suggested using the scree plot (Cattell, 1978) to help decide the appropriate number of factors. Using the scree plot (see Figure 1) it was decided that a six to eight factor solution would best represent the data.

On the rule of thumb that it is better to overestimate slightly than to underestimate the number of factors (Cattell, 1978), both eight factor and seven factor solutions were generated using both principal components and principal factor methods. In each case this resulted in six factors which more or less resembled the six factor solution found by Paivio and Harshman. The variance, however, was more dispersed among the factors. These solutions produced either one (seven factor) or two (eight factor) factors that

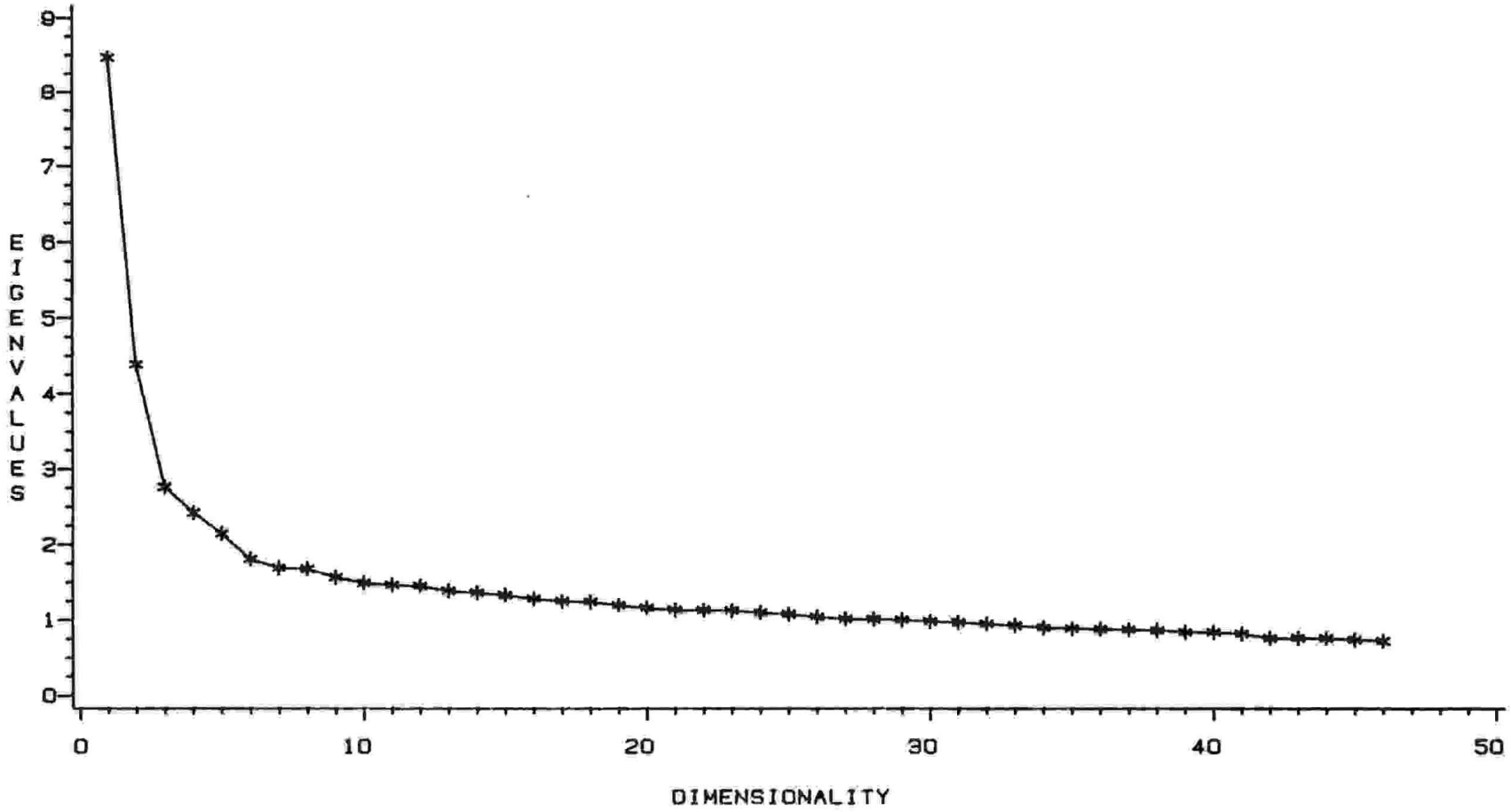

FIGURE 1. SCREE PLOT OF SUCCESSIVE EIGENVALUES

were uninterpretable. A six factor solution, therefore, appeared to be the most tenable.

Six Factor Extraction. With the decision to accept a six factor solution, SPSS was used with OBLIMIN rotation and various delta values between - 0.5 and 0.8. Again it was found that solutions between ± 0.5 were similar but that they "collapsed" after 0.5. Also, again, as delta values increased the correlations among the factors were also higher, reaching a highest value of - .45 at delta = 0.5.

Inspection of the correlation matrix revealed many smaller correlations. Using dichotomous data this was expected, as there are ceiling effects on the correlations (Comrey, 1973). The resultant loadings on the factors are also smaller. Bartlett's (1950) test of sphericity was performed, therefore, to test the notion that the correlations in the matrix represented random deviations from zero; this was rejected ($p<.0001$).

A perusal of the factor pattern matrix (Delta = 0) indicated a close match to that found in Paivio and Harshman. The factor accounting for the most variance in this six factor space was an imagery factor, and, therefore, the order of the factors was not identical in the two

studies. Tucker's (1951) coefficients of congruence were calculated on the factor patterns from the two studies on those factors that generally had the same salient loadings. With the exception of the fifth factor in both studies (which in the Paivio and Harshman study consisted of only two salient variables) the two solutions are very similar (see Table 3).

Even though there was a poor match on Factor 5, it did not seem profitable to reduce further the test space to five factors. A re-examination of the scree plot advised retaining six factors. Again the caution to over- rather than underestimate the number of factors was taken into consideration. Reanalysis using principal components analysis and VARIMAX rotation also indicated accepting a six factor solution.

Table 4 gives the inter-factor correlations found in both studies. The intercorrelations among the first four factors are higher in the present study than those reported by Paivio and Harshman, again, perhaps, indicating a reliance on one style of thinking to the exclusion of another.

Table 3

Congruence Coefficients of Six Factors from Paivio and Harshman (1983) and Present Study

PRESENT STUDY	r_{cc}	Paivio & Harshman
Factor 1	.99	Factor 2
Factor 2	.82	Factor 3
Factor 3	- .93*	Factor 1
Factor 4	.92	Factor 4
Factor 5	.39	Factor 5**
Factor 6	.73	Factor 6

*Factor 3 can be reflected thereby making the coefficient of congruence positive.

**Factor 5 consisted of only two salient variables, which also loaded on Factor 1 (Factor 3, present study).

Table 4

Factor Intercorrelations for Six Factor Solution: From Paivio and Harshman (1983) and Present Study

FACTOR	1	2	3	4	5	6
1		- .13	- .24	.19	- .26	.20
2	- .01		.15	.18	- .03	- .07
3	- .29	.03		.23	.04	- .04
4	- .13	- .00	.18		.07	.02
5	.08	- .06	.00	.02		- .08
6	.15	.26	- .01	- .01	.02	

NOTE: Correlations in the lower half of the matrix from Paivio and Harshman (1983), those in the upper half from the present study.

Interpretation. For the complete listing of all items with loadings across all factors, see Appendix C-3. The factor loadings for those variables with loadings $\geq$ | .30 | on the factors are found in Appendix C-4. These are taken from the factor pattern matrix obtained from the principal factors solution (Delta = 0).

From the items loading on Factor 1, this factor can be seen to represent both a positive and consistent use of imagery or, in other words, "habitual imagery use." The first three items affirm the use of imagery "often," and later items reflect the ease of imagery use. This factor accounted for the most variance, and it could be considered the primary factor. In all analyses it accounted for approximately twice the variance of any other factor (see Table 5). The other factors, by virtue of their eigenvalues and less stability over analyses, could be considered secondary, with Factors 2, 3 and 4 being major secondary and 5 and 6 minor secondary factors. Factor 2, following Paivio and Harshman (1983), could be labelled "concern for the correct use of words." The third factor in this six factor solution is interpreted as "good verbal expression and fluency." Items, such as "I am able to express my thoughts

Table 5

Variance Explained by Six Rotated Factors: Victoria Sample

FACTOR	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT
1	8.42	9.8	9.8
2	4.36	5.1	14.9
3	2.75	3.2	18.1
4	2.41	2.8	20.9
5	2.15	2.5	23.4
6	1.81	2.1	25.5

clearly" and "I am a good story teller," load high on this factor. A person high on this factor (when the loading signs are reflected) both professes ease of expression in both written and verbal modes and has a healthy vocabulary. Factor 4 represents "poor reading abilities" and "the preference for other forms of communication." Factor 5 is a bipolar factor of imagery abilities. Depending on the

direction of the loading, scores on this factor would suggest either better or poor imagery. This factor has very little congruence with any reported by Paivio and Harshman. Factor 6 is a "vividness of dreams and imagination" factor, or, couched in psychoanalytic terms, a "primary process thinking" factor (Paivio & Harshman, 1983).

Aside from the poor replication of Factor 5, the present study found six interpretable factors with very good matching to those reported previously. It would appear, thus, that the IDQ is useful with a younger (adolescent) population, returning consistent and identifiable factors. It was decided, therefore, to continue the analysis using a multiple analysis of variance approach.

Data Organization

From the initial factor analyses, a set of 40 variables was chosen according to certain critiera (see Appendix B-2 for complete list). First, those variables that consistently had salient loadings on the various factors were chosen. These were grouped initially according to trait (verbal or imagery) and subsequently according to polarity (items expressed in an affirmative manner vs. items

expressed in a disconfirmative manner). Second, the variable "sets" were balanced so that an equal number of items appeared in each. Twenty items each were considered sufficient to represent either trait, and polarity was counterbalanced in each trait by having similar (if not identical) items represented by both positively (positive) and negatively (negative) worded statements. This last consideration resulted in using a few items that had loadings less than .3 in some of the analyses. The mean scores of these grouped items were used in all subsequent analyses. In the trait analyses the means were calculated for 20 verbal items (VX) and 20 imagery items (IX). The preference analyses used the means of 10 items for each variable (used in the previous analyses): Verbal Positive (VP); Verbal Negative (VN); Imagery Positive (IP); and Imagery Negative (IN).

In order to test the second hypothesis of interest, that performance was related to developmental level, and to ascertain where (if any) a transition zone in style of preferred thinking might occur, the subjects were divided into eight discrete age groups. The resulting groups were summarized by age and sex in Table 1 (see p. 34).

Multiple Analyses of Variance

Initially an 8 x 2 x 2 (Age x Sex x Trait) multiple analysis of variance (MANOVA) with repeated measures on trait was performed using SPSS-X procedure MANOVA (SPSS, Inc., 1983). As stated, trait consisted of 20 pooled verbal items and 20 pooled imagery items. No distinction was made for polarity of the items. Positive items were recoded (True=1, False=0) so that a higher score indicated the intent of the item. The MANOVA used unique sums of squares in all cases, so that each term was, in effect, ordered last in the design. This represents a conservative approach to analysis.

There was a significant main effect for sex, $F(1, 704) = 9.59$, $p<.01$. As shown in Figure 2, the females consistently scored all items (on average) higher than did the males. There was no significant age effect or sex x age interaction. There was a very large effect for trait, $F(1, 704) = 634.21$, $p<.001$, showing the habitual tendency to, or preference for, an imaginal style of thinking (see Figures 3 and 4). There was also a significant age x trait interaction, $F(7, 7704) = 3.04$, $p<.01$. Though statistcally significant, this effect was not particularly large; it

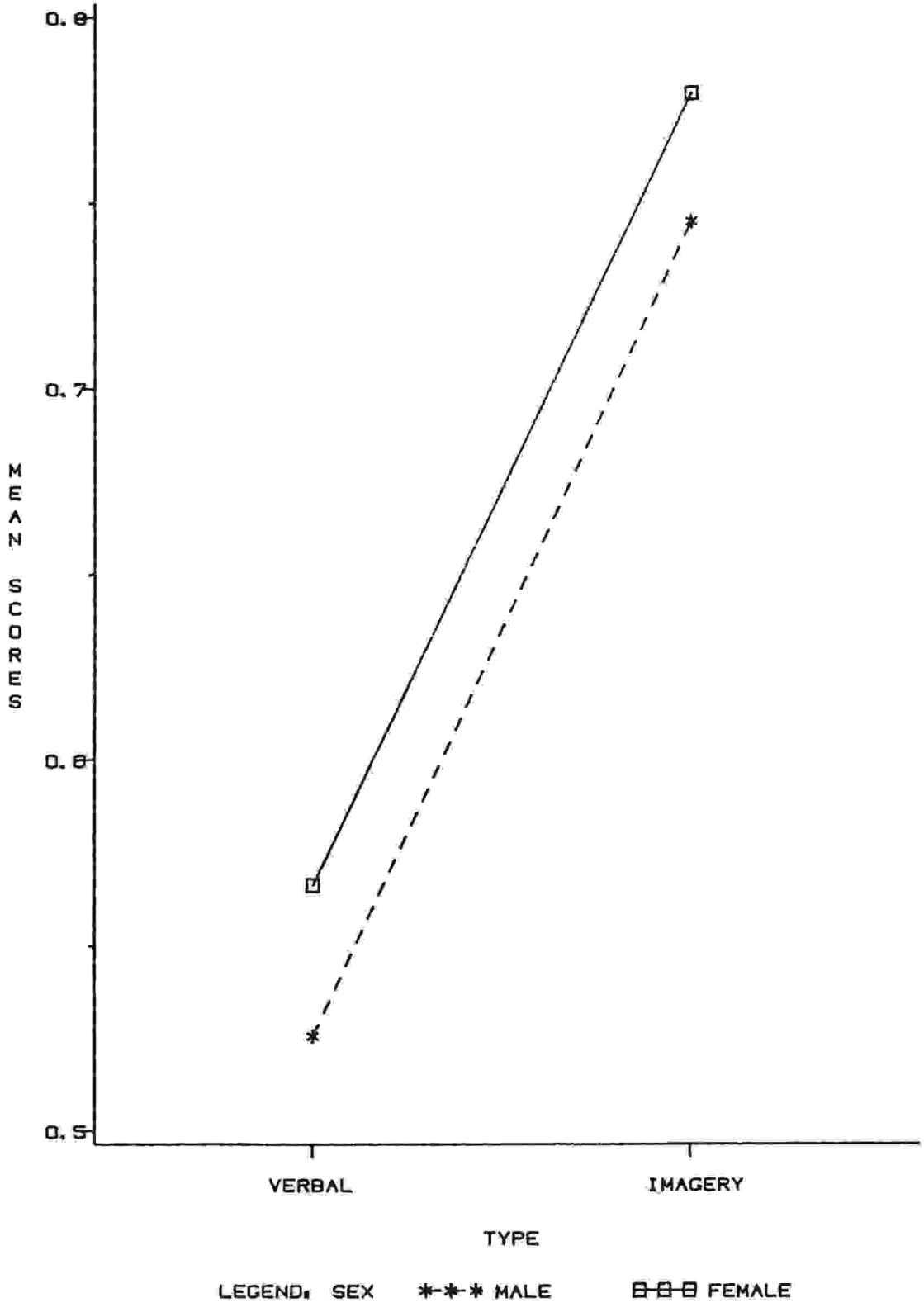

FIGURE 2. MEAN SCORES ON POOLED "TRAIT" VARIABLES FOR MALES AND FEMALES

appeared to be due to changes in the rank order of the age groups between the two variables. The main effect for age (as noted) was not significant. Simple effects for the differences between the imagery and verbal variables were calculated for each age group (pooled over sex) and for both sexes (pooled over ages). All were significant, $p<.001$. These effects can readily be seen in Figures 3 and 4.

In addition to the analyses for the overall effects for verbal and imaginal traits, the imagery and verbal variables were subdivided by polarity (VP, VN, IP, IN), and an 8 x 2 x 4 (Age x Sex x Response) MANOVA with repeated measures on response was performed. As was done previously, the positive items were recoded so that a "real" preference was scored 1. The effects of responding, therefore, would not be confounded by reciprocal responses on the positive and negative items. Again there was a main effect for sex, $F(1, 704) = 9.54$, $p<.01$, with age and age x sex non-significant. The effect for response was significant $F(3, 2112) = 431.99$, $p<.001$. There was also a significant age x response interaction, $F(21, 2112) = 2.37$, $p<.01$. All other effects were non-significant.

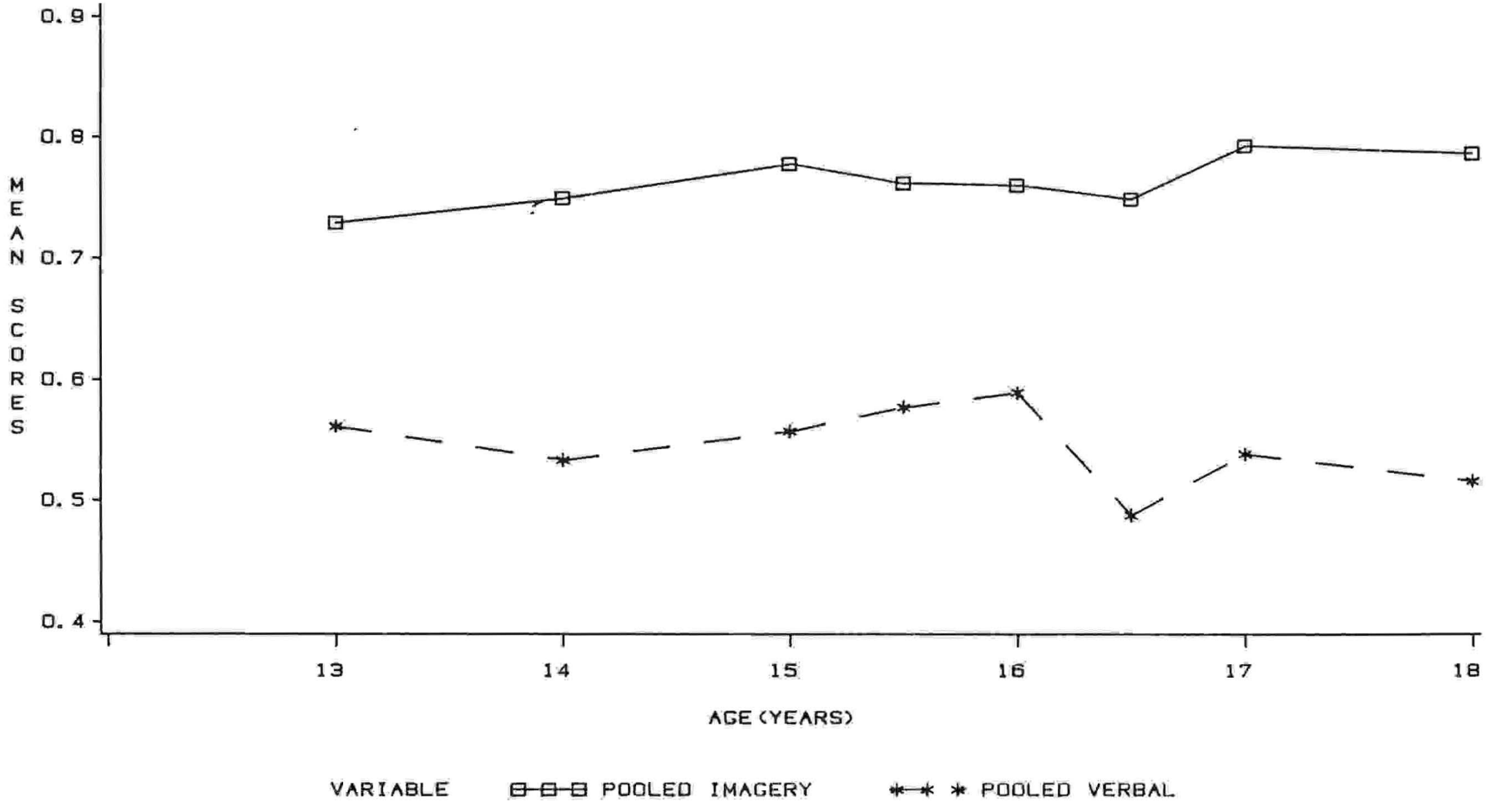

FIGURE 3. MEAN SCORES BY AGE FOR 20-ITEM VERBAL AND IMAGERY VARIABLES

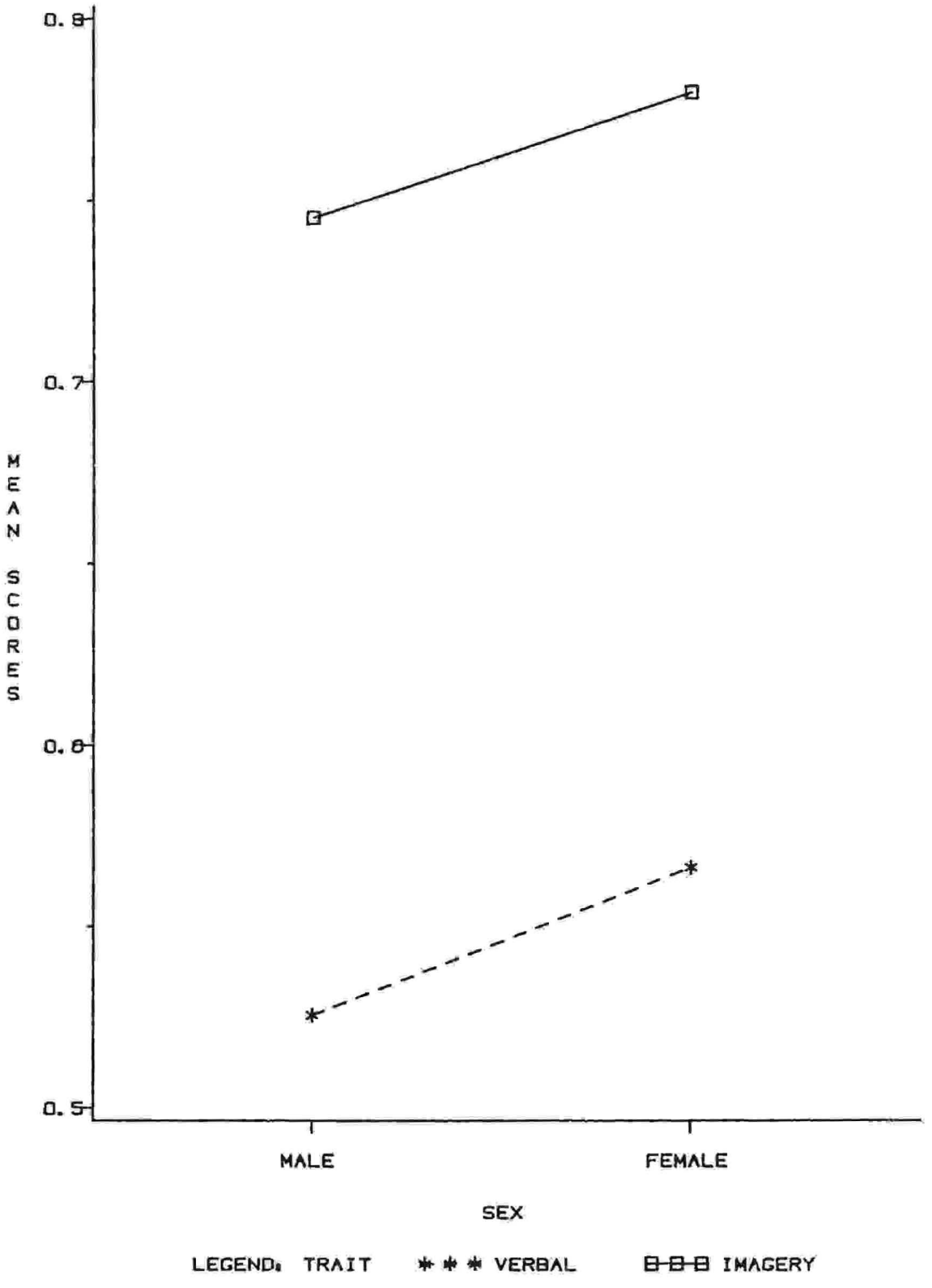

FIGURE 4. PREFERRED COGNITIVE STYLE DIFFERENCES FOR MALES AND FEMALES

A Priori Univariate Analyses

A priori contrasts were constructed to assess differences in responding to the four variables. All significant univariate results are, therefore, reported, though the overall F(s) might be non-significant (see Winer, 1971). It appears that any inference, of course, must be made with caution, and these results are reported primarily in a descriptive sense. The contrasts ordered were: (1) VP vs. VN; (2) IP vs. IN; and (3) VP + VN vs. IP + IN.

Although the multivariate F for the sex x response interaction did not reach significance, the univariate F for contrast 2 (IP vs. IN) was significant, $F(1, 704) = 5.93$, $p<.025$. As shown in Figure 5, the females showed a greater polarity effect than did the males on the imagery variables. All other interactions involving sex and response type were non-significant. While the overall age x response interaction was significant, only the univariate F on contrast 3 reached significance, $F(7, 704) = 3.03$, $p<.01$. This is illustrated in Figure 6, with a change in the ordinal position of the age groups occurring between VN and IP, much as in the overall trait effects. With no

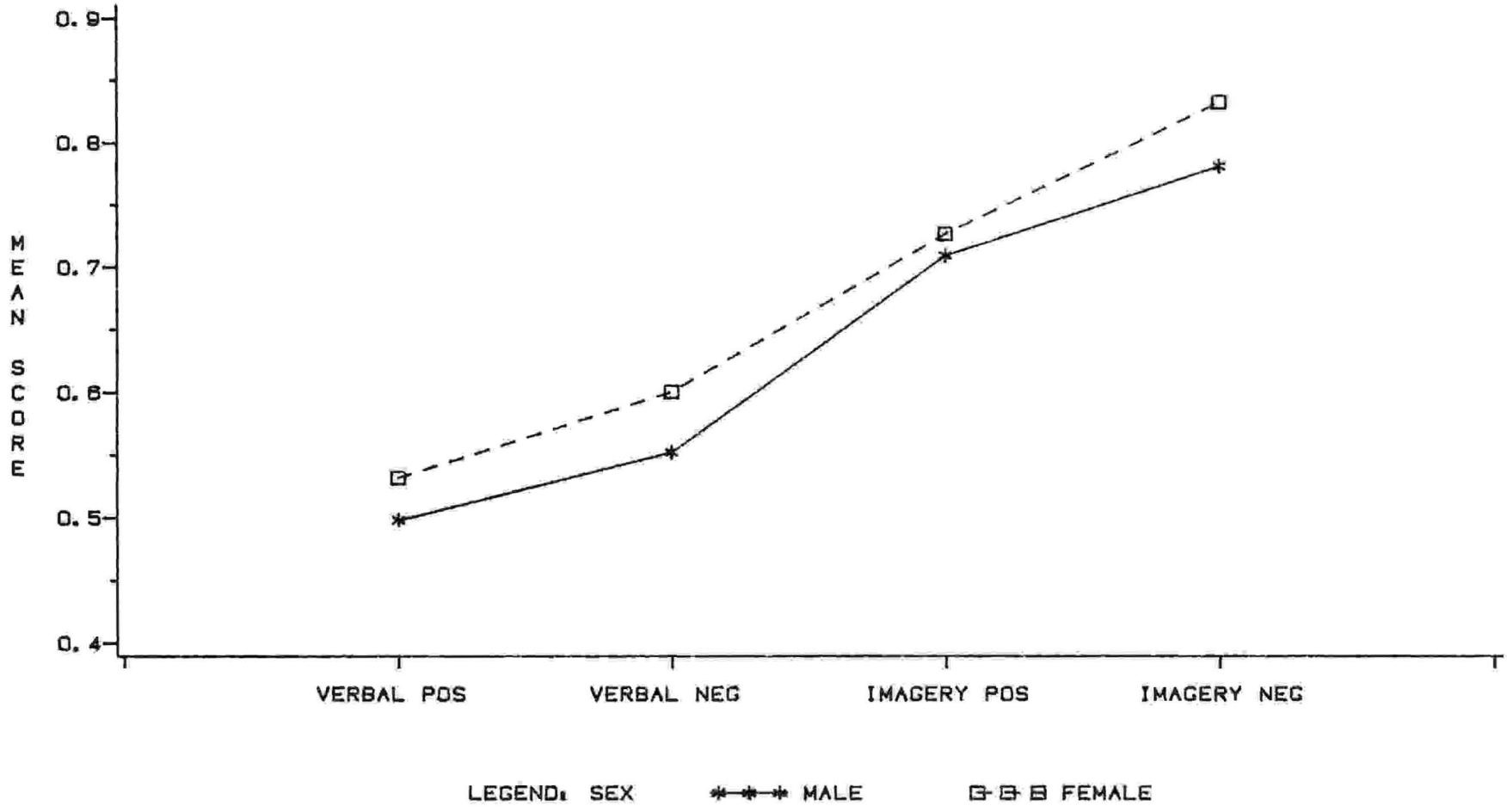

FIGURE 5. MEAN RESPONSE EFFECTS ON COGNITIVE STYLE VARIABLES AS A FUNCTION OF SEX

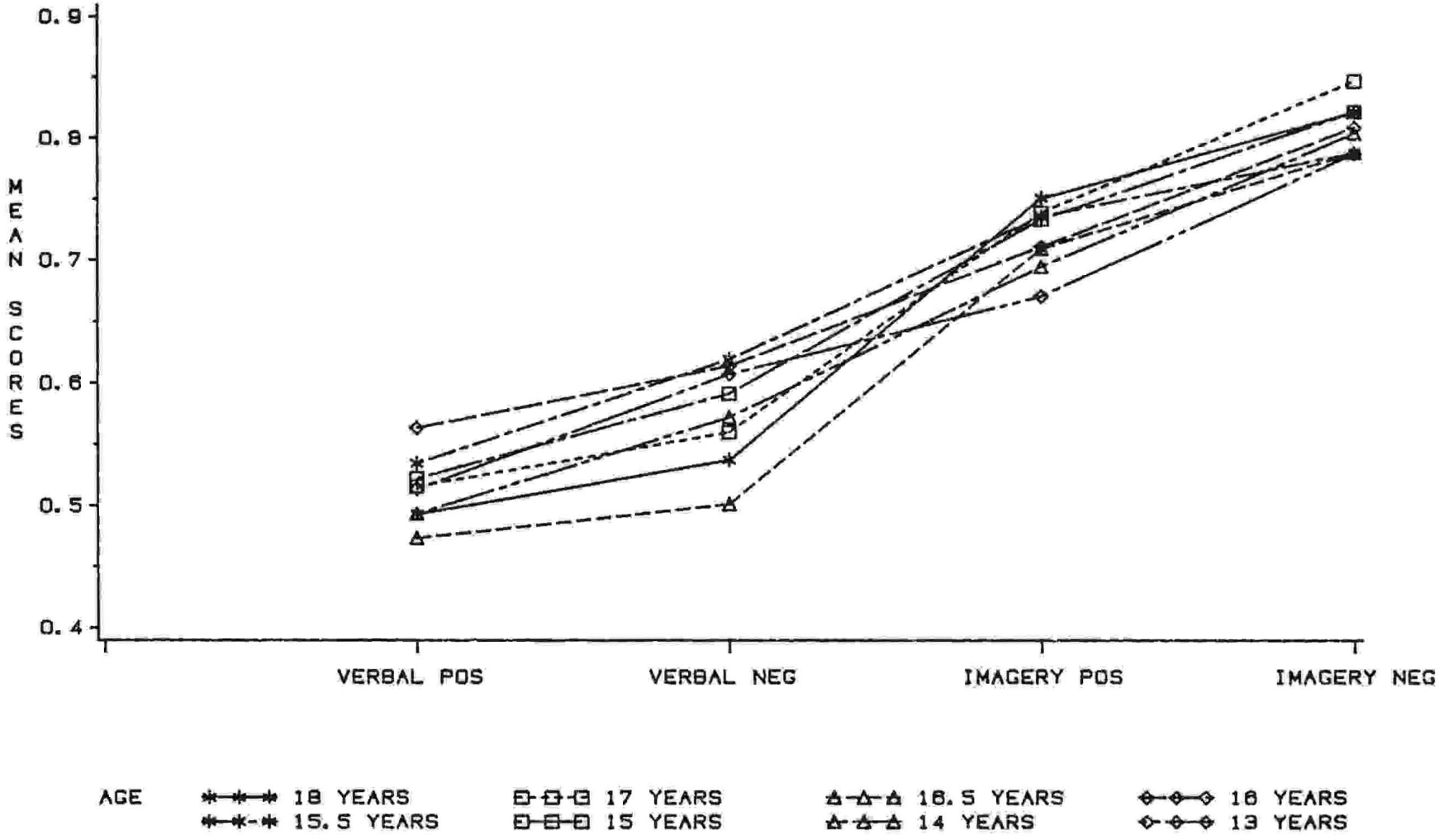

FIGURE 6. RESPONSE BY AGE INTERACTIONS ON THINKING STYLE VARIABLES

significant main effect for age this may prove difficult to interpret as it indicates a lower verbal preference for the older adolescents and a higher verbal preference for the younger. The reverse is true for the imagery preferences. All univariate F's were significant for the variable contrasts on response. Roy-Bargman step-down F-tests were employed to assess the contribution of each contrast (see Table 6). It is readily apparent that, while there is some significant difference between positive and negative item responses, the largest effect was between the two modes of thinking, with an imaginal style of thinking being preferred over a semantic style of thinking.

Exploratory Analyses

While there are no clear guidelines (but see Tukey, 1969), it has been common practice to follow significant MANOVA(s) with univariate ANOVA(s) on each of the p variates (Bray & Maxwell, 1982). This procedure may not "protect" the F values, but it has been used as an exploratory procedure. As this was an essentially heuristic study, ANOVAs were carried out on the data to see if any effects which might be obscured in the multivariate space would

Table 6

Roy-Bargman Step-down F-Tests on Ordered Contrasts of Two Verbal (VP, VN) and Two Imaginal (IP, IN) Variables: Response Effects

CONTRAST	HYPOTHESIS MS	ERROR MS	STEPDOWN F*
VP vs. VN	1.30	.017	75.21
IP vs. IN	2.05	.016	125.54
VP + VN vs. IP + IN	26.68	.052	515.81

*All F's significant, $p<.001$.

appear to give direction for further studies. While alpha inflation could be a problem, these analyses are reported with this consideration. (The ANOVA, in fact, generates the same results essentially as a MANOVA with no repeated measures.)

An initial ANOVA on VX and IX gave the same results as the MANOVA. Using the four polarity variables, an ANOVA

yielded significant effects for sex and for age on VN, Fsex (1, 704) = 6.49, $p<.025$, Fage (7, 704) = 2.89, $p<.01$, a significant sex x age interaction on IP, F(7, 704) = 2.41, $p<.025$, and a significant effect for sex on IN, F(1, 704) = 14.99, $p<.001$. All other effects were non-significant (see Figure 7).

While the reliability of these effects could be questioned on the basis of alpha inflation, they are given to supplement the multivariate analyses. There was a noticeable trend (but non-significant, except on VN) of lower scores for the 16 1/2 year olds on both imagery and verbal variables, except for the males who showed the similar decrement, but at age 15 1/2 - 16 years on the imagery variables. Why this consistent effect was found is not known. Nor can the male anomaly be explained; if the male scores on the imagery variables were advanced one-half to one year, the profiles on the variables would be identical.

With one exception, tests for simple effects for variable differences were significant for all ages (pooled over sex) and both sexes (pooled over age). There was an interesting trend noticed on the verbal variables: starting

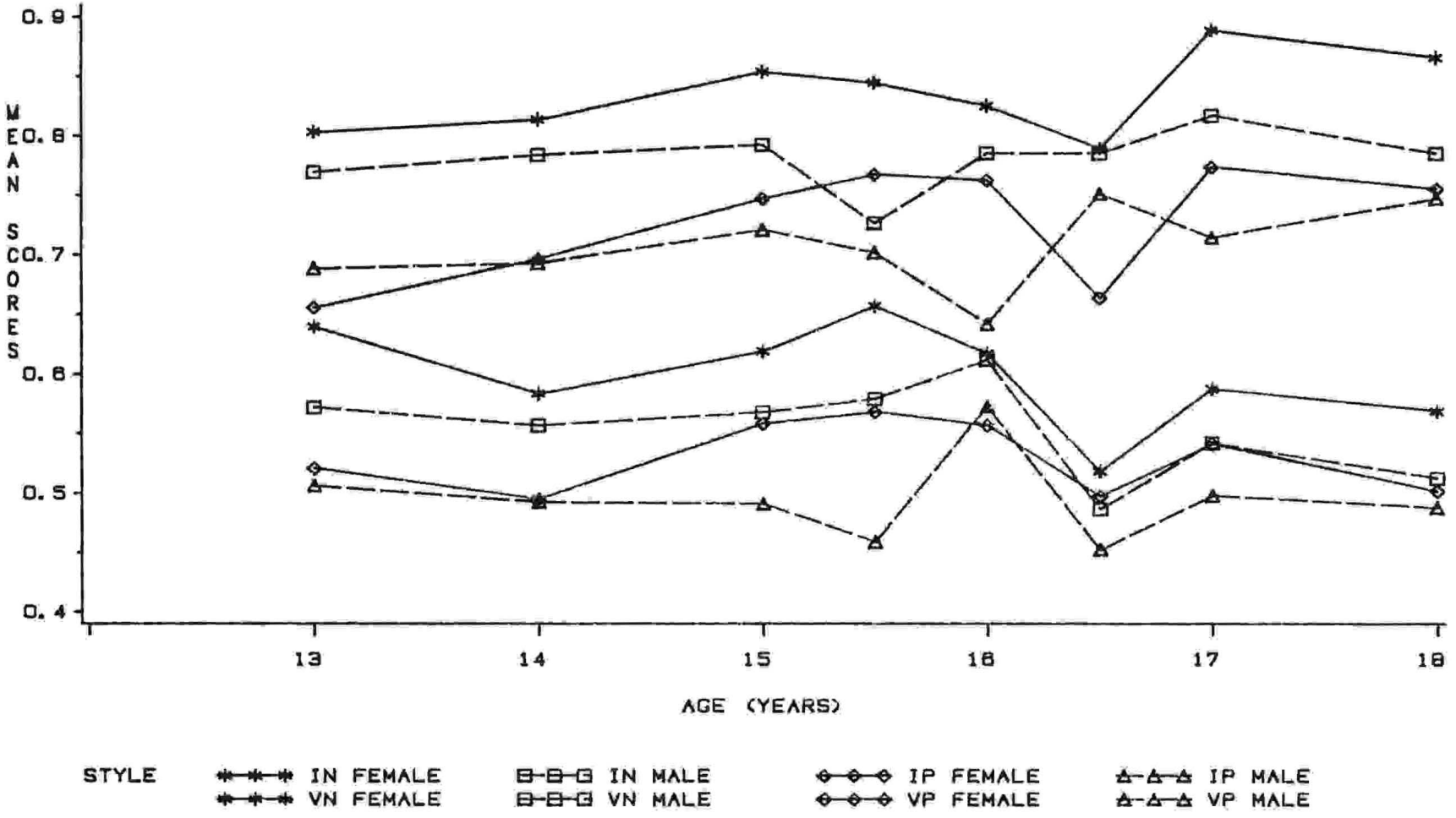

FIGURE 7. THINKING STYLE PREFERENCES AND POLARITY EFFECTS AS A FUNCTION OF AGE AND SEX ON VERBAL POSITIVE (VP), VERBAL NEGATIVE (VN), IMAGERY POSITIVE (IP) AND IMAGERY NEGATIVE (IN) VARIABLES

at age 16 years, polarity effects diminished, reaching non-significance at age 16 1/2 years. No such effect was seen for the imagery variables. This can all be seen in Figure 7 (Appendices D-5 & D-6 give the ANOVA summary tables).

Family Structure Effects

In addition to the above data, the subjects were asked for information (anonymous) on their family structure. This information was coded for 706 subjects and was summarized previously in Table 2 (p. 35). A one-way analysis of variance was performed on the four polarity variables by family structure. There were significant trends found in both verbal positive (VP) and imagery positive (IP) variables, and similar, but non-significant trends in the negative variables. In part, because of the largely disparate number of subjects per group, simple comparisons proved non-significant (except single parents vs. both parents on VP). Because this variable was not included in the initial hypotheses, and since these effects, though, perhaps, interesting for trend, were not large enough for group comparisons (with one exception), this variable was

not included in the main analyses. It is reported as a comment.

Summary

A factor analysis on the data collected on 799 junior and senior high school students found that the IDQ yielded one primary imagery factor and four or five secondary verbal and imagery factors. The IDQ showed a high level of replicability (except for "Factor 5") on this younger population. Multivariate and univariate analyses on four pooled-item variable sets, describing positive and negative polarity verbal and imaginal traits revealed a main effect for sex--the females in this sample scoring higher, on average, on all variables--and minor, but significant age x response and sex x response interactions. A most interesting result was the difference in preferences for an imaginal style of thinking over a verbal style, the imaginal being preferred over all age groups and for both sexes.

CHAPTER FIVE

Discussion

Several conclusions might be suggested by the results of this study:

1. The IDQ, both as developed by Paivio and his associates and as reworded for access to a younger population, is both replicable and useful with young and middle adolescents. The IDQ returned six interpretable factors across different methods of extraction. The item loadings or structure differences which did occur were to be expected with this type of analysis (see Cattel, 1978; Gorsuch, 1983). The IDQ apparently returns either an imagery (present study) or a verbal factor (Paivio & Harshman, 1983) as primary, noted by the large eigenvalues of the first factor compared to the remaining factors. The IDQ also returns approximatley five secondary factors of both imaginal and verbal content. Of these five factors, two or three could be said to be major secondary, having higher eigenvalues and more general stability and interpretability. The remaining factors, though both consistent and interpretable, are, perhaps, more tenuous across studies. Factor 5, described by Paivio and Harshman

(1983) as "use of images to solve problems" (p. 477), had very little congruence with factors in the present study. This may, perhaps, be explained by Paivio and Harshman's decision to allow a separate factor ("the use of images to solve problems") which consisted of only two salient items, both of which also had salient loadings on another factor. There was a suggestion that this factor might have been an artifact of test construction (Pavio & Harshman, 1983). The two items, Item 5, "By using mental pictures of the elements of a problem, I am often able to arrive at a solution" and Item 11, "I often use mental pictures to solve problems" are a word- and sense-similar doublet. Paivio and Harshman considered these to be the seed of a second imagery factor. In the present study both Item 5 and Item 11 had salient loadings only on Factor 1, "habitual use of imagery", and basically zero hyperplane loadings on the other five factors. It appears, perhaps, that five factors could adequately represent the data. Given the plot of eigenvalues, however, there was nothing to indicate further reducing the solution. As also noted, solutions of either seven or eight factors generated results which appeared uninterpretable. Following the suggestion of Paivio and

Harshman (1983, p. 467) to drop those items which do not have substantial loadings, however, might result in an instrument which lends itself to a stable, five factor solution. This is, however, at this point, problematic.

2. This adolescent sample reports a significantly elevated use of imagery, a vivid imagination, and non-verbal styles of thinking, while it does not report a particular lack in the verbal area. The noticeably higher correlations among the factors in this study, however, could indicate a dependence on one style of thinking, to the exclusion, perhaps, of the other. It appears reasonable to assert that imaginal thinking has preeminence among this population.

3. While there was no significant effect found for age, only a <u>partial</u> failure to support the hypothesis of age differences could be asserted. When one considers that "adolescence" may well continue into the twenties (Mitchell, 1979; Pressley et al., 1983), the age groups in the present study represent, perhaps, only early and middle adolescence. These adolescents clearly report higher imaginal thinking. Making inference from the data reported by Paivio and Harshman, whose older (university) subjects had primary verbal factors in both the two and six factor solutions,

would allow one to suggest verbal preeminence. The converse is the case in the present study. A comparison, therefore, might indicate that a transition in reported preferences for thinking styles might take place after university entrance.

4. There was a consistent, small, but significant, sex effect suggested by this particular questionnaire. Paivio and Harshman (1983) mentioned an effect for sex, but they did not elaborate. They rather deferred to a forthcoming report. In the present study, with one exception, the females returned higher scores across age groups and for variables with both positive and negative intents. This was clearly seen in the MANOVA results. For some reason, these adolescent females appear to be more sure of their thinking habits. Ashton and White (1980) reported that sex differences found using the Questionnaire Upon Mental Imagery (QMI) were an artifact of the instrument, a result of demand characteristics. A. Richardson (1977) reported, however, that the IDQ was relatively free from such effects. That females report higher imagery, across all age ranges, has been previously reported (see Ernest, 1977; White, et al., 1977), but there has been no known previous indication of the tendency to report prolixity concomitantly. This

sex-specific tendency may, perhaps, only obtain on questionnaires. The idea of cognitive differences should not, however, be ruled out without further investigation.

5. There is a noticeable effect for item valence over both sex and age groups. Items worded in the disaffirmative were scored with more confidence (higher) than statements of affirmation. This "I'm very sure I do not not..." effect may be found on other occasions where similar propositional statements are expressed in both affirmative and oppositve conditions to offset (or, perhaps, control for) response set effects. At least for this age group, the effect has not been reported elsewhere in the literature. Certainly any researcher using the IDQ should be aware of this tendency.

6. One quarter of this sample responding reported living with only one parent. And there was a trend associated with family structure on the reporting of imaginal and verbal traits. Interestingly, those living in dyadic families were more willing to affirm the positive, although there was a similar, but non-significant, trend noticed on the negative variables. For this sample of adolescents between 13 and 18 years of age, family structure appears to be a variable to consider in cognitive research.

It is quite clear from the data that this particular age group reports an habitual imaginal style of thinking. This was the largest effect found in the data, and it might just go contrary to the idea of a forced literate society which precludes imagery. This is, however, quite in line with Piagetian and neo-Piagetian Theory (Brainerd, 1978; Piaget & Inhelder, 1966/1971; Pick & Pick, 1970). As mentioned previously, Piaget (Piaget & Inhelder, 1966/1971) suggested that both styles of thinking could be used volitionally, would be mutually supportive, and were usually situation specific. Brainerd (1978) suggested imagery was a form of abstract thought, which, with the advent of formal operations, should be in evidence in the adolescent age group. Brainerd further reported alarm at the tendency to view imagery as akin to fantasy or non-productive play, and he suggested that imagery played a central role in adolescent development, citing, for instance, the use of imagery/imagination for preferred-role establishment. This idea is very much in line with those of both Elkind and Erikson.

Elkind (1967; Elkind & Bowen, 1979) suggested that adolescent egocentrism (and, thus, the trappings that go

with it) both starts to decline around 15 years of age and continues to decline thereafter. No similar decline in the reported use of imagery, however, was seen at this age in this study. (The only noticeable trend in the data was the lowered scores on both styles of thinking around 16 years of age.) The maturing process reported by Elkind does not, perhaps, have an effect on imagery use until later in the developmental period (i.e., university).

Clearly Bruner's position (Bruner, 1964; Bruner, et al., 1966) is not tenable for this age group. And since all curricular streams in these schools were assessed, one might suggest that these students are using an imaginal style of thinking, commonly, with no apparent overall detriment to "academic" thinking. With the reported preference for imaginal thinking, however, one can only conjecture regarding the increase in learning which might accrue if this preference were developed, encouraged, or enhanced in the classroom. The use of the semantic, in this age group, seems not to preclude the use of the ikonic.

Limitations and Delimitations

Sample

1. In so far as intact classes were used, random sampling was obviated. The schools were chosen on an ad hoc basis, and no school contacted refused to participate. Given both that there was no systematically biased selection of students and that the schools were located in different geo-economical areas, an assumption of representativeness (at least for the Victoria area) could be defended.

2. The age range sampled was originally considered to be both wide enough and appropriate enough to establish clear, age-specific, differences; this did not obtain within the study. In future research the use of an age range of roughly 10-11 years to 23-24 years of age is recommended.

Analyses

Gorsuch (1983) recommended that, whenever possible when comparing factor analytic results, as much data as possible should be utilized. Insofar as only the factor patterns were available from Paivio and Harshman (1983), factor matching is reported given this limitation.

Methodology

The questionnaire used was administered in one form only (i.e., items were presented in only one order). No random block design was employed. There is, therefore, the possibility of a confounding factor, for neither warm-up nor fatigue effects were controlled. In future studies this should probably be considered.

Imagery Differences

As this study was somewhat heuristic, focussing primarily on replication and initial adjudication of age differences in reported imagery use, no attempt was made to show exactly why adolescents show higher imagery habits. The theoretical basis for this assumption was defended previously, but it remains theoretical.

Implications

There are several considerations in approaching the imagery question with school-attending adolescents. That they report prominent imagery habits is found in the data,

but whether or not they use imagery to help them learn in an academic setting was not addressed. Would both instruction in imagery strategies for learning and support and encouragement of the natural tendencies of these adolescents--in the classroom--contribute to their learning experience? From the literature reported briefly below, this would seem (encouragingly) so.

Clark, Deshler, Shumaker, Alley and Warner (1984) reported that teaching learning disabled adolescents (13-17 years old) imagery strategies significantly increased their learning and comprehension. A similar effect on reading comprehension, with poor readers, was reported by Peters and Levin (1984), where imagery instruction vastly improved the comprehension of poor readers. Rowher, in several studies (e.g., 1970, 1973;Rohwer & Litrownik, 1983), related that elaboration strategies (among them, imagery) improved memory performance. Interestingly, this effect was particularly noticeable in prose reading tasks with low ability students. Saigh and Fouad (1984) suggested that imagery techniques could be effectively used to reduce test anxiety in test anxious students, with the result of raising their overall GPA.

Paivio (1980) likened the use of imagery to a private audio-visual aid to learning, and he suggested that the use of in-class audio-visual (AV) material could augment "private" AV aids. Paivio further suggested both that interactive imagery had a powerful effect on the recall of material and that it could, in some cases, be superior to external AV aids. Similarly, Pressley (1977) suggested that, for older children, imagery instructions are, in some cases, as useful as augmentive illustrations.

Begg and Anderson (1976) suggested that imagery instructions enhanced recall by providing a way of organizing unfamiliar and disparate material into units, a strategy which facilitated both organization at the time of coding and redintigration at the time of recall.

There are, however, further considerations. Roodin (1983) has commented that curricular models have tended to focus on productive thinking, emphasizing <u>verbal</u> explanation and comprehension. This, in itself, does not obviate the use of imagery, as material coded imaginally by older children can be recalled to give a verbal response (Dilley & Paivio, 1968). There is a need, however, to consider the high reported preference for imaginal styles of thinking in

adolescents. A better balanced curriculum is probably warranted. Also, there is, in this author's opinion, a need to instruct students in the uses of imagery for enhanced learning in academics. This should, perhaps, take the form of example and "hands on" experience. Select populations, as reported, may be particularly aided by imagery instruction.

Chapter Summary

The use of the IDQ to assess adolescent thiking habits appears to be appropriate. In terms of validity and reliability, the IDQ appears both factor analytically valid and test-retest reliable (Ernest, 1977; A. Richardson, 1977; White, et al., 1977). The current information generated from the IDQ indicates a clear and strong bias toward imaginal thinking in both young and middle adolescent age groups. This supports directly the theories of both Elkind and Piaget and, indirectly, of Eriksonian theory. The Brunerian position appears untenable. The import that these findings might have on in-class instruction was discussed, with the suggestion that encouragement of imagery use in the classroom could have a positive effect on learning.

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Appendices

APPENDIX A

INSTRUCTIONS

Appendix A-1

Instructions to Teachers

Directions:

DEAR TEACHER:

1. Please give each student a questionnaire, plus a blue computer sheet.
2. Please read the directions with the students.
3. Please record:
    - A. Initials of name
    - B. Sex
    - C. Birth date
    - D. Grade
    - E. Special code
        - i. 0 = Guardian
        - ii. 1 = Single Parent
        - iii. 2 = Two Parents
4.

PLEASE TURN THE BLUE SHEET OVER TO START AT STATEMENT 1.

THANKS SO MUCH!!

Appendix A-2

Instructions to Students

We are requesting your voluntary participation in the completion of this questionnaire. About 15 minutes of your time will be required to answer the questions. Your answers will be confidential since you are not to put your name on the questionnaire. You are free to withdraw from the study at any time without incurring ill will or in any way affecting your school standing or your grade in this course.

DIRECTIONS:

All information will be recorded on the computer answer sheets. DO NOT MARK THE QUESTIONNAIRE SHEETS.

I will give directions for filling in the computer answer sheet to record your birth date, sex, grade and school.

The statements on the following pages represent ways of thinking, studying and problem solving, which are true for some people and not for others. Read each statement and decide whether or not it is true for you. Then mark your answer on the separate answer sheet.

If you agree with the statement or decide that it does describe you, answer TRUE (A). If you disagree with the statement or feel that it does not describe you, answer FALSE (B). Answer the statements as carefully and honestly as you can. The statements are not designed to assess the goodness or badness of the way you think. They are attempts to discover the ways you think in various situations. There are no right or wrong answers.

In marking your answers on the answer sheet, be sure that the number you are answering is the same as the number on the answer sheet.

Answer every statement either TRUE (A), or FALSE (B), even if you are not completely sure of your answer. If there are any questions, please raise your hand.

APPENDIX B

THE QUESTIONNAIRE ON IMAGERY, VERBAL HABITS AND THINKING SKILLS

Appendix B-1

Questionnaire on Imagery, Verbal Habits and Thinking Skills

1. I have no difficulty in expressing myself verbally.
2. Listening to someone tell his experience does not make me see mental pictures of what is described.
3. When reading a story I usually form a mental picture of the scene or room that has been described.
4. Essay writing is difficult for me.
5. By using mental pictures of the parts of a problem, it helps me solve the problem.
6. I enjoy being able to rephrase my thoughts in many ways for variety's sake when both writing and speaking.
7. I enjoy visual arts, such as paintings, more than reading.
8. I tell jokes and stories poorer than most people.
9. I enjoy doing work that requires the use of words.
10. My daydreams are sometimes so real I feel as though I actually experienced the scene.
11. I often use mental pictures to solve problems.
12. I enjoy reading an interesting story even if it is not particularly well written.
13. I find it difficult to find enough synonyms or alternate forms of a word when writing.
14. I have difficulty expressing myself in writing.
15. My knowledge and use of grammar needs much improvement.
16. I would rather work with pictures than words.

17. I memorize material largely by saying a thing over to myself.

18. I enjoy learning new words and putting them into my vocabulary.

19. I do not have a vivid imagination.

20. I can easily picture moving objects in my mind.

21. Most of the time my thinking is verbal, as though talking to myself.

22. If given the choice, I would rather listen to a good speaker than visit an art gallery.

23. I find that I am more critical of the writer's style than the content when reading literature.

24. I can form mental pictures to almost any word.

25. I have only fuzzy mental pictures of scenes I have experienced.

26. My vocabulary is not as large as I would like.

27. When doing mental arithmetic, such as addition, I do not actually picture the numbers.

28. I can easily think of syncnyms for words.

29. I think that most people think with mental pictures whether they are completely aware of it or not.

30. I am able to express my thoughts clearly.

31. I remember things I have done myself, much better than things I have read.

32. My powers of imagination are higher than average.

33. I consider myself a fast reader.

34. I have a large vocabulary.

35. I find it easy to see in my mind the faces of people I know.

36. My grades are lower because I am a poor reader.

37. It bothers me when I see a word used wrongly.

38. I don't believe that anyone can think in terms of mental pictures.

39. I can easily form a mental picture of Prime Minister Mulroney.

40. It's easy for me to write essays and reports.

41. I would rather have a verbal description of an object or person, than a picture.

42. I can close my eyes and easily picture a scene I have experienced.

43. I have a photographic memory.

44. I feel a picture is worth a thousand words.

45. I cannot make a picture of a friend's face when I close my eyes.

46. When someone describes something that happens to him, I sometimes find myself picturing the events that happened.

47. I can add numbers by picturing them written on a blackboard.

48. I have found it easy in the past to learn a second language.

49. When I hear or read a word, lots of other words often come to mind.

50. I seldom dream.

51. I read rather slowly.

52. I am usually able to say what I mean in my first writing of an essay or letter.

53. I am good at thinking up puns.

54. I never use mental pictures or images when trying to solve problems.

55. While I have often seen pictures of him, I cannot remember exactly what President Reagan looks like.

56. I often remember work I have studied by imagining the page on which it is written.

57. Studying the use and meaning of words has become a habit with me.

58. I speak or write what comes into my head without worrying greatly about my choice of words.

59. Not enough people pay attention to the way in which they express themselves.

60. I enjoy solving crossword puzzles and other games.

61. I find it difficult to form a mental picture of anything.

62. Memorizing by repeating something over is time consuming and doesn't work well for me.

63. My dreams are extremely vivid.

64. I am better than average in the way I use words.

65. I read a great deal.

66. I am continually aware of whether sentences are properly written.

67. My thinking often consists of mental pictures or images.

68. I do not form a mental picture of people or places when reading of them.

69. I often have difficulty in explaining things to others.

70. My daydreams are not very clear or real.

71. I find it easier to learn from someone showing me than from written instructions.

72. I often enjoy the use of mental pictures to remember the past.

73. I often use mental pictures or images to help me remember things.

74. When remembering a scene, I talk to myself rather than use mental pictures.

75. I try hard to express myself clearly and accurately in both talking and writing.

76. I have never done well in learning languages.

77. The proper use of words is not as important as what they say.

78. I have better memory for things I have read, rather than things I have experienced.

79. I am disturbed by people who argue about how to use words.

80. I have difficulty seeing pictures to help me remember words.

81. I often have ideas that I have trouble telling in words.

82. I think that puns are the lowest form of humour.

83. Just before falling asleep I often find myself seeing events that have happened.

84. I prefer to read instructions about how to do something, rather than have someone show me.

85. I am a good story teller.

86. I spend very little time trying to learn new words.

Appendix B-2

Items Used for Multiple Analyses of Variance

Verbal Positive:

1. (1.) I have no difficulty in expressing myself verbally.
2. (18.) I enjoy learning new words and putting them into my vocabulary.
3. (22.) If given the choice, I would rather listen to a good speaker than visit an art gallery.
4. (28.) I can easily think of synonyms for words.
5. (30.) I am able to express my thoughts clearly.
6. (33.) I consider myself a fast reader.
7. (40.) It's easy for me to write essays and reports.
8. (52.) I am usually able to say what I mean in my first writing of an essay or letter.
9. (65.) I read a great deal.
10. (85.) I am a good story teller.

Verbal Negative:

1. (4.) Essay writing is difficult for me.
2. (7.) I enjoy visual arts, such as paintings, more than reading.
3. (8.) I tell jokes and stories poorer than most people.
4. (13.) I find it difficult to find enough synonyms or alternate forms of a word when writing.

5. (14.) I have difficulty expressing myself in writing.

6. (36.) My grades are lower because I am a poor reader.

7. (51.) I read rather slowly.

8. (69.) I often have difficulty in explaining things to others.

9. (81.) I often have ideas that I have trouble telling in words.

10. (86.) I spend very little time trying to learn new words.

Imagery Positive:

1. (3.) When reading a story I usually form a mental picture of the scene or room that has been described.

2. (10.) My daydreams are sometimes so real I feel as though I actually experienced the scene.

3. (11.) I often use mental pictures to solve problems.

4. (24.) I can form mental pictures to almost any word.

5. (29.) I think that most people think with mental pictures whether they are completely aware of it or not.

6. (32.) My powers of imagination are higher than average.

7. (35.) I find it easy to see in my mind the faces of people I know.

8. (42.) I can close my eyes and easily picture a scene I have experienced.

9. (46.) When someone describes something that happens to him, I sometimes find myself picturing the events that happened.

10. (63.) My dreams are extremely vivid.

Imagery Negative:

1. (2.) Listening to someone tell his experience does not make me see mental pictures of what is described.
2. (19.) I do not have a vivid imagination.
3. (25.) I have only fuzzy mental pictures of scenes I have experienced.
4. (38.) I don't believe that anyone can think in terms of mental pictures.
5. (45.) I cannot make a picture of a friend's face when I close my eyes.
6. (50.) I seldom dream.
7. (54.) I never use mental pictures or images when trying to solve problems.
8. (68.) I do not form a mental picture of people or places when reading of them.
9. (70.) My daydreams are not very clear or real.
10. (80.) I have difficulty seeing pictures to help me remember words.

NOTE: a) Numbers in brackets are numbers from original questionnaire.
b) Order of items (1-10) is arbitrary.

APPENDIX C

FACTOR ANALYTIC TABLES

Appendix C-1

Mean Scores and Standard Deviations on 86 Items from the Questionnaire on Imagery and Verbal Habits

PAIRWISE DELETION OF CASES WITH MISSING VALUES

	MEAN	STD DEV	CASES
V01	.36981	.48306	795
V02	.77945	.41488	798
V03	.14768	.35501	799
V04	.50692	.50027	795
V05	.33668	.47287	796
V06	.42623	.49484	793
V07	.55945	.49676	799
V08	.68797	.46361	798
V09	.61887	.48597	795
V10	.41332	.49274	796
V11	.40402	.49101	797
V12	.35169	.47780	799
V13	.49937	.50031	797
V14	.59273	.49163	798
V15	.56266	.49637	798
V16	.48176	.49998	795
V17	.26658	.44245	799
V18	.36045	.48043	799
V19	.78545	.41077	797
V20	.17544	.38058	798
V21	.51443	.50011	797
V22	.57107	.49523	795
V23	.72292	.44784	794
V24	.43985	.49668	798
V25	.84481	.36232	799
V26	.35132	.47768	797
V27	.48120	.49996	798
V28	.55834	.49690	797
V29	.21438	.41065	793
V30	.42516	.49468	795
V31	.16877	.37478	794
V32	.41509	.49305	795
V33	.57591	.49451	797
V34	.63237	.48246	797
V35	.19975	.40006	796
V36	.81430	.38911	797
V37	.56838	.49561	797
V38	.89724	.30383	798
V39	.41782	.49351	797
V40	.52704	.49958	795

- - - FACTOR ANALYSIS - - -

	MEAN	STD DEV	CASES
V41	.74307	.43721	794
V42	.11404	.31805	798
V43	.63145	.48272	795
V44	.31824	.46609	795
V45	.84105	.36586	799
V46	.16667	.37291	798
V47	.52261	.49980	796
V48	.61355	.48724	797
V49	.40829	.49183	796
V50	.82785	.37775	790
V51	.56658	.49586	796
V52	.45169	.49797	797
V53	.61791	.48621	793
V54	.76633	.42343	796
V55	.82811	.37753	797
V56	.55528	.49725	796
V57	.67714	.46787	796
V58	.47111	.49948	796
V59	.32494	.46865	794
V60	.36307	.48119	796
V61	.87845	.32697	798
V62	.72841	.44506	799
V63	.31242	.46377	797
V64	.58512	.49301	793
V65	.54648	.49815	796
V66	.59068	.49202	794
V67	.25532	.43631	799
V68	.81054	.39212	797
V69	.59574	.49105	799
V70	.74684	.43510	790
V71	.19724	.39816	796
V72	.16270	.36933	799
V73	.22334	.41674	797
V74	.79449	.40433	798
V75	.22028	.41469	799
V76	.55528	.49725	796
V77	.54340	.49843	795
V78	.81439	.38903	792
V79	.47111	.49948	796
V80	.71772	.45039	790
V81	.44501	.49728	791
V82	.64848	.47775	788
V83	.23864	.42652	792
V84	.78299	.41247	788
V85	.49116	.50024	792
V86	.44828	.49764	783

Appendix C-2

Loadings of 86 Variables on Two Rotated Factors: Factor Pattern Matrix (SPSS)

OBLIMIN ROTATION PATTERN MATRIX:

	FACTOR 1	FACTOR 2
VAR01	- .02014	- .32887
VAR02	- .37332	.08279
VAR03	.34735	- .13072
VAR04	- .12325	.42920
VAR05	.43656	- .02661
VAR06	.18608	- .26460
VAR07	.04647	.27712
VAR08	.01251	.24798
VAR09	.04720	- .49775
VAR10	.22980	.03139
VAR11	.42250	- .04251
VAR12	.14105	- .05236
VAR13	- .03063	.42571
VAR14	- .08553	.41293
VAR15	- .07171	.40038
VAR16	.13713	.39567
VAR17	.20454	- .08343
VAR18	.16186	- .33882
VAR19	- .25753	.16979
VAR20	.43685	- .03543
VAR21	.08005	- .00475
VAR22	.01697	- .09902
VAR23	- .06955	- .04069
VAR24	.36009	- .18625
VAR25	- .35766	.01943
VAR26	.08891	.21343
VAR27	- .19702	.01690
VAR28	.02355	- .45305
VAR29	.38593	.00204
VAR30	.04650	- .45279
VAR31	.14947	.20774
VAR32	.26344	- .13643
VAR33	.03217	- .42553
VAR34	.01892	- .48370
VAR35	.30925	.03653
VAR36	- .13119	.31009
VAR37	.08751	- .30429
VAR38	- .32668	- .00088
VAR39	.28521	- .14702
VAR40	.06352	- .48380

F A C T O R A N A L Y S I S

	FACTOR 1	FACTOR 2
VAR41	- .13573	- .12530
VAR42	.45251	.06641
VAR43	.14177	- .13686
VAR44	.33032	.00927
VAR45	- .31229	- .03814
VAR46	.48254	- .00812
VAR47	.22254	- .09079
VAR48	.01699	- .26464
VAR49	.15062	- .26293
VAR50	- .29584	- .00178
VAR51	- .06280	.42408
VAR52	.07937	- .34007
VAR53	.06722	- .24875
VAR54	- .47606	.02574
VAR55	- .34231	.05692
VAR56	.19886	- .09452
VAR57	- .01316	- .39412
VAR58	.03662	.15576
VAR59	.05520	- .04816
VAR60	.04399	- .12998
VAR61	- .49212	- .00042
VAR62	- .22347	.15870
VAR63	.29627	- .01696
VAR64	.02263	- .51026
VAR65	- .00563	- .44261
VAR66	.03912	- .34796
VAR67	.57272	.01740
VAR68	- .47355	.03173
VAR69	- .04130	.34826
VAR70	- .29249	.02910
VAR71	.20798	.21398
VAR72	.51105	.02952
VAR73	.59890	.01859
VAR74	- .34763	- .01532
VAR75	.16763	- .09041
VAR76	- .06907	.33385
VAR77	- .02795	.21453
VAR78	- .23688	- .12632
VAR79	.00481	.05844
VAR80	- .43117	.07743
VAR81	.00041	.32087
VAR82	- .16794	.07398
VAR83	.36927	.01475
VAR84	- .17584	- .20041
VAR85	.11030	- .38434
VAR86	- .01973	.44024

Appendix C-3

Loadings of 86 Variables on Six Rotated Factors:

Factor Pattern Matrix (SPSS-X)

OBLIMIN ROTATION KAISER NORMALIZATION. PATTERN MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
V01	-.03237	-.02094	-.46706	.07559	.00845	-.03578
V02	-.42278	-.02542	.03089	.07694	.02398	.09192
V03	.43345	.04125	-.01559	-.16186	.06438	-.04334
V04	-.04887	.20288	.33437	.10417	.07141	-.00763
V05	.51645	-.07674	.00033	.10891	.04613	.04482
V06	.14004	-.31836	-.10852	-.00089	-.04580	.09518
V07	.01498	.08564	-.08396	.48424	-.06387	.08325
V08	.06882	-.12074	.46030	-.04346	.01427	-.00271
V09	-.01560	-.34951	-.26139	-.17956	-.02897	.03150
V10	.03799	.02220	.05865	-.07546	-.01937	.50663
V11	.54081	-.05691	.00046	.09119	.10719	.05572
V12	.00964	-.08172	.15825	-.29463	-.17840	.02495
V13	-.12918	.09237	.34608	.10290	-.10906	.14353
V14	-.03366	.19350	.36801	.03083	.04652	.00168
V15	-.10399	.06795	.31619	.16262	-.00363	.15642
V16	.12416	.34306	.06547	.25577	-.00157	.15164
V17	.02601	-.22918	.02175	-.04648	-.24878	.07810
V18	.12289	-.37736	-.09873	-.08270	-.03760	.05325
V19	-.17542	-.09447	.18581	.13046	.02983	-.14331
V20	.40849	.09988	-.05149	-.05458	-.01141	.14395
V21	.00330	-.03035	-.00912	.02082	.00029	.21573
V22	.12830	-.15998	.04529	-.00527	.10687	-.05697
V23	-.08158	-.17265	-.05068	.13882	.02412	.10535
V24	.35384	-.02530	-.18780	.00547	.06326	.18091
V25	-.25649	-.08125	.10852	.01988	.20750	.04790
V26	-.03319	-.16136	.23982	.11432	-.18545	.09230
V27	-.27815	.01663	-.01967	-.01971	-.06294	.02714
V28	.09072	-.13878	-.37432	-.07138	.13291	-.02700
V29	.27284	-.12922	.05585	.01894	-.15686	.14560
V30	-.06455	-.04993	-.66186	.08794	-.05828	.04365
V31	.00132	-.00092	-.07431	.33051	-.33232	-.09201
V32	.18483	.09590	-.23123	.00719	.09713	.39180
V33	-.01270	.08216	-.10416	-.67186	.10963	.10313
V34	.13658	-.03188	-.37744	-.19048	.21310	-.04465
V35	.10638	.03122	-.06502	.00183	-.29273	.06954
V36	.01001	-.02432	.16238	.41001	.18454	.05058
V37	.08587	-.40316	-.02673	-.08386	-.00763	.01037
V38	-.23487	-.11901	.04844	.11421	.25161	.14465
V39	.23406	-.10776	-.14081	.02380	-.10970	-.00217
V40	.01381	-.18795	-.43325	-.06083	-.00067	.04170

- - - - - - - F A C T O R A N A L Y S I S - - - - - -

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
V41	-.05088	-.29576	.05214	.04289	.08461	-.04196
V42	.25433	.12586	-.11435	.03600	-.31864	.03935
V43	.11517	-.08638	-.14258	.05075	.01544	.12089
V44	.19806	-.03330	-.03007	.03669	-.13702	.17471
V45	-.06936	.01268	.03484	.03295	.39366	.00752
V46	.42328	-.05755	.02764	-.00413	-.13191	.05186
V47	.27328	-.19863	.00204	.08469	.02871	.01832
V48	.03528	-.33672	.02745	-.15261	-.01539	-.06013
V49	.18690	-.23450	-.12743	.00710	.13408	.17048
V50	-.07998	-.06608	.06123	.08633	.26211	-.13878
V51	.01229	-.06222	.09934	.68921	-.01770	-.03413
V52	-.02559	-.14300	-.33917	-.02799	-.07256	.08441
V53	.09598	-.03011	-.26893	.00342	.10009	.09097
V54	-.51497	-.00673	-.01502	.01680	.03898	.02135
V55	-.18411	-.08550	.16846	.03251	.23741	-.02320
V56	.20633	-.20070	.05125	-.01691	.00932	.07262
V57	.03800	-.44053	-.13031	-.02513	.17590	.14870
V58	.03169	.18875	.05648	.02919	.07892	.16326
V59	-.02046	-.16228	.02523	-.00810	-.10862	.03412
V60	-.05526	-.16403	.02646	-.14385	-.06796	.12692
V61	-.35207	-.06470	-.01683	.15798	.28649	.05143
V62	-.01351	.18031	.07348	.11262	.28253	-.06429
V63	.08453	.14837	-.13087	-.06488	-.11639	.36126
V64	.02951	-.18936	-.33711	-.19573	.09039	.03838
V65	.00630	-.11620	-.04210	-.54455	.17376	.12074
V66	.09959	-.41085	-.12292	.00861	.05273	-.06157
V67	.58274	.03729	.00540	.03738	-.02694	.10040
V68	-.43187	-.01144	-.02499	.11272	.15899	.06932
V69	.09279	-.11312	.58054	.02082	.13232	.04316
V70	-.13330	-.12023	.05178	.14540	.07048	-.29226
V71	.02680	.08681	.09070	.05433	-.26207	.08345
V72	.39500	-.00988	.03747	-.02464	-.17684	.11755
V73	.55954	-.01931	.05915	-.01805	-.12230	.06521
V74	-.28255	-.01723	-.03371	.07571	.20128	.09550
V75	.00565	-.23504	-.01602	.00165	-.22800	.05672
V76	-.02858	.23305	.09226	.23371	.07967	.07143
V77	-.09362	.26978	.04182	.01459	-.04309	.08289
V78	-.06666	.01109	.03209	-.13708	.39774	.17397
V79	-.03382	-.01442	.07270	.00926	.02556	.15704
V80	-.34332	-.01009	.07917	.05548	.16374	-.03030
V81	.06971	-.04227	.48618	-.00032	.10185	.12820
V82	-.06968	.04224	.02424	.08784	.16952	.05069
V83	.26139	-.08543	.06702	-.01267	-.12360	.17574
V84	-.03512	-.12865	-.06357	-.06226	.23922	.00134
V85	-.01590	.03833	-.56772	.00417	-.0327	.15218
V86	-.01534	.32298	.19804	.15569	-.0398	.00004

Appendix C-4

Salient Items: 6 Rotated Factors from Factor Pattern Matrix - SPSS

FACTOR	LOADING	ITEM	DESCRIPTOR
1	.579	67.	My thinking often consists of mental pictures or images.
1	.553	73.	I often use mental pictures or images to help me remember things.
1	.541	11.	I often use mental pictures to solve problems.
1	.516	5.	By using mental pictures of the parts of a problem, it helps me solve the problem.
1	- .511	54.	I never use mental pictures or images when trying to solve problems.
1	.430	3.	When reading a story I usually form a mental picture of the scene or room that has been described.
1	- .426	2.	Listening to someone tell his experience does not make me see mental pictures of what is described.
1	.419	46.	When someone describes something that happens to him, I sometimes find myself picturing the events that happened.
1	- .418	68.	I do not form a mental picture of people or places when reading of them.

FACTOR	LOADING	ITEM	DESCRIPTOR
1	.406	20.	I can easily picture moving objects in my mind.
1	.390	72.	I often enjoy the use of mental pictures to remember the past.
1	- .352	61.	I find it difficult to form a mental picture of anything.
1	.350	24.	I can form mental pictures to almost any word.
1	- .339	80.	I have difficulty seeing pictures to help me remember words.
2	- .445	57.	Studying the use and meaning of words has become a habit with me.
2	- .410	66.	I am continually aware of whether sentences are properly written.
2	- .403	37.	It bothers me when I see a word used wrongly.
2	- .375	18.	I enjoy learning new words and putting them into my vocabulary.
2	- .347	9.	I enjoy doing work that requires the use of words.
2	.337	16.	I would rather work with pictures than words.
2	- .334	48.	I have found it easy in the past to learn a second language.
2	.323	86.	I spend very little time trying to learn new words.

FACTOR	LOADING	ITEM	DESCRIPTOR
2	- .315	6.	I enjoy being able to rephrase my thoughts in many ways for variety's sake when both writing and speaking.
3	- .661	30.	I am able to express my thoughts clearly.
3	.580	69.	I often have difficulty in explaining things to others.
3	- .563	65.	I am a good story teller.
3	.480	81.	I often have ideas that I have trouble telling in words.
3	- .467	1.	I have no difficulty in expressing myself verbally.
3	.463	8.	I tell jokes and stories poorer than most people.
3	- .427	40.	It's easy for me to write essays and reports.
3	- .375	34.	I have a large vocabulary.
3	- .372	28.	I can easily think of synonyms for words.
3	.368	14.	I have difficulty expressing myself in writing.
3	.344	13.	I find it difficult to find enough synonyms or alternate forms of a word when writing.
3	- .337	64.	I am better than average in the way I use words.

FACTOR	LOADING	ITEM	DESCRIPTOR
3	- .336	52.	I am usually able to say what I mean in my first writing of an essay or letter.
3	.327	4.	Essay writing is difficult for me.
3	.318	15.	My knowledge and use of grammar needs much improvement.
4	.683	51.	I read rather slowly.
4	- .667	33.	I consider myself a fast reader.
4	- .551	65.	I read a great deal.
4	.487	7.	I enjoy visual arts, such as paintings, more than reading.
4	.394	36.	My grades are lower because I am a poor reader.
4	.339	31.	I remember things I have done myself, much better than things I have read.
5	.402	45.	I cannot make a picture of a friend's face when I close my eyes.
5	.390	78.	I have better memory for things I have read, rather than things I have experienced.
5	- .312	42.	I can close my eyes and easily picture a scene I have experienced.

FACTOR	LOADING	ITEM	DESCRIPTOR
5	- .308	31.	I remember things I have done myself, much better than things I have read.
6	.496	10.	My daydreams are sometimes so real I feel as though I actually experienced the scene.
6	.401	32.	My powers of imagination are higher than average.
6	.360	63.	My dreams are extremely vivid.
6	- .305	70.	My daydreams are not very clear or real.

APPENDIX D

MULTIPLE ANALYSIS OF VARIANCE TABLES

Appendix D-1

Composite-Variable Means and Standard Deviations:

Age x Sex x Response MANOVA

Variable .. IMAGE1VP

FACTOR	CODE	MEAN	STD. DEV.	N	95% CONF. INTERVAL	
AGE*	1					
SEX**	0	.50127	.22964	35	.42238	.58016
SEX	1	.48760	.24356	43	.41264	.56255
AGE	2					
SEX	0	.54194	.23349	31	.45629	.62758
SEX	1	.49773	.20853	44	.43433	.56112
AGE	3					
SEX	0	.49705	.23106	49	.43068	.56342
SEX	1	.45220	.23035	53	.38871	.51569
AGE	4					
SEX	0	.55673	.27789	57	.48299	.63046
SEX	1	.57261	.22628	43	.50297	.64225
AGE	5					
SEX	0	.56792	.25778	53	.49687	.63898
SEX	1	.49887	.24473	49	.42857	.56916
AGE	6					
SEX	0	.55833	.24826	48	.48625	.63042
SEX	1	.49095	.20382	54	.43531	.54658
AGE	7					
SEX	0	.49483	.20411	43	.43202	.55765
SEX	1	.49234	.25337	29	.39596	.58872
AGE	8					
SEX	0	.52074	.25304	47	.44645	.59504
SEX	1	.50628	.25048	42	.42823	.58434
FOR ENTIRE SAMPLE		.51533	.23862	720	.49787	.53279

Cell Means and Standard Deviations (CONT.)

Variable .. IMAGE2VN

FACTOR	CODE	MEAN	STD. DEV.	N	95% CONF. INTERVAL	
AGE	1					
SEX	0	.56857	.25061	35	.48248	.65466
SEX	1	.51234	.22219	43	.44396	.58072
AGE	2					
SEX	0	.58746	.25457	31	.49408	.68083
SEX	1	.54091	.19207	44	.48251	.59930
AGE	3					
SEX	0	.51814	.22243	49	.45425	.58203
SEX	1	.48616	.23247	53	.42209	.55024
AGE	4					
SEX	0	.61184	.26567	57	.54135	.68233
SEX	1	.61705	.21705	43	.55026	.68385
AGE	5					
SEX	0	.65702	.23165	53	.59317	.72087
SEX	1	.57891	.21229	49	.51793	.63989
AGE	6					
SEX	0	.61898	.25976	48	.54355	.69441
SEX	1	.56770	.21019	54	.51032	.62507
AGE	7					
SEX	0	.58320	.20526	43	.52004	.64637
SEX	1	.55661	.27422	29	.45230	.66092
AGE	8					
SEX	0	.63948	.21863	47	.57529	.70367
SEX	1	.57189	.24177	42	.49655	.64723
FOR ENTIRE SAMPLE		.57688	.23411	720	.55975	.59401

Cell Means and Standard Deviations (CONT.)

Variable .. IMAGE3IP

FACTOR	CODE	MEAN	STD. DEV.	N	95% CONF. INTERVAL	
AGE	1					
SEX	0	.75556	.17733	35	.69464	.81647
SEX	1	.74755	.20122	43	.68562	.80947
AGE	2					
SEX	0	.77419	.20161	31	.70024	.84814
SEX	1	.71477	.20419	44	.65269	.77685
AGE	3					
SEX	0	.66349	.19480	49	.60754	.71945
SEX	1	.75199	.20790	53	.69469	.80930
AGE	4					
SEX	0	.76340	.18430	57	.71450	.81230
SEX	1	.64186	.23728	43	.56884	.71488
AGE	5					
SEX	0	.76792	.18374	53	.71728	.81857
SEX	1	.70159	.23478	49	.63415	.76903
AGE	6					
SEX	0	.74792	.15977	48	.70152	.79431
SEX	1	.72099	.21294	54	.66287	.77911
AGE	7					
SEX	0	.69638	.20440	43	.63348	.75929
SEX	1	.69272	.19768	29	.61753	.76791
AGE	8					
SEX	0	.65532	.23481	47	.58638	.72426
SEX	1	.68810	.21472	42	.62119	.75501
FOR ENTIRE SAMPLE		.71828	.20632	720	.70319	.73338

Cell Means and Standard Deviations (CONT.)

Variable .. IMAGE4IN

FACTOR	CODE	MEAN	STD. DEV.	N	95% CONF. INTERVAL	
AGE	1					
SEX	0	.86571	.13048	35	.82089	.91054
SEX	1	.78527	.19053	43	.72664	.84391
AGE	2					
SEX	0	.88853	.16263	31	.82888	.94818
SEX	1	.81742	.17947	44	.76286	.87199
AGE	3					
SEX	0	.78594	.18789	49	.73197	.83991
SEX	1	.79015	.18712	53	.73857	.84172
AGE	4					
SEX	0	.82593	.18671	57	.77639	.87547
SEX	1	.78605	.18971	43	.72766	.84443
AGE	5					
SEX	0	.84528	.17272	53	.79767	.89289
SEX	1	.72653	.23642	49	.65862	.79444
AGE	6					
SEX	0	.85463	.16144	48	.80775	.90151
SEX	1	.79275	.17851	54	.74402	.84147
AGE	7					
SEX	0	.81731	.19733	43	.75658	.87804
SEX	1	.78391	.18974	29	.71173	.85608
AGE	8					
SEX	0	.80331	.19556	47	.74589	.86073
SEX	1	.76931	.20691	42	.70483	.83379
FOR ENTIRE SAMPLE		.80697	.18866	720	.79317	.82077

*Age: 1 = 18+ 2 = 17 - 18 3 = 16 1/2 - 17

4 = 16 - 16 1/2 5 = 15 1/2 - 16

6 = 15 - 15 1/2 7 = 14 - 15 8 = 13 - 14

**Sex: 0 = Female 1 = Male

Appendix D-2

MANOVA Summary Table: Two Trait Variables

* * * * * A N A L Y S I S   O F   V A R I A N C E * * * *

SUMMARY TABLE:TRAIT EFFECTS

SOURCE/BETWEEN	SS	DF	MS	F	P
WITHIN CELLS	35.6340	704	.0506		
CONSTANT	595.0992	1	595.0992	11757.0208	.000
AGE	.4943	7	.0706	1.3952	.204
SEX	.4855	1	.4855	9.5911	.002
AGE X SEX	.2452	7	.0350	.6920	.679

SOURCE/WITHIN	SS	DF	MS	F	P
WITHIN CELLS	18.2727	704	.0260		
TRAIT	16.4611	1	16.4611	634.2054	.000
AGE X TRAIT	.5516	7	.0788	3.0362	.004
SEX X TRAIT	.0000	1	.0000	.0019	.966
AGE X SEX X TRAIT	.2255	7	.0322	1.2411	.278

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Appendix D-3

MANOVA Summary Table: Four Response Variables

* * * * * A N A L Y S I S   O F   V A R I A N C E * * * * *

SUMMARY TABLE:POLARITY EFFECTS (UNIQUE SS)

SOURCE/BETWEEN	SS	DF	MS	F	P
WITHIN CELLS	71.3328	704	.1013		
CONSTANT	1190.1670	1	1190.1690	11746.0584	.000
AGE	.9897	7	.1414	1.3954	.204
SEX	.9664	1	.9664	9.5377	.002
AGE X SEX	.4867	7	.0695	.6862	.684

SOURCE/WITHIN	SS	DF	MS	F	P
WITHIN CELLS	60.5040	2112	.0286		
RESP	37.1267	3	12.3756	431.9906	.000
AGE X RESP	1.4123	21	.0672	2.3475	.001
SEX X RESP	.1168	3	.0389	1.3584	.254
AGE X SEX X RESP	.7264	21	.0346	1.2074	.234

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APPENDIX D-4

Univariate And Multivariate Homogeneity Of Variance Tests On Four Response Variables

* * * * A N A L Y S I S O F V A R I A N C E * * * *

Univariate Homogeneity of Variance Tests

Variable .. IMAGE1VP

Cochrans C(44,16) =	.08513, P =	1.000 (app.)
Bartlett-Box F(15,243522) =	.71178, P =	.775

Variable .. IMAGE2VN

Cochrans C(44,16) =	.08653, P =	1.000 (app.)
Bartlett-Box F(15,243522) =	.85778, P =	.613

Variable .. IMAGE3IP

Cochrans C(44,16) =	.08434, P =	1.000 (app.)
Bartlett-Box F(15,243522) =	.99920, P =	.452

Variable .. IMAGE4IN

Cochrans C(44,16) =	.10111, P =	.179 (app.)
Bartlett-Box F(15,243522) =	1.22557, P =	.243

- -

Multivariate test for Homogeneity of Dispersion matrices

Boxs M =	167.84075	
F with (150,267597) DF =	1.07811, P =	.243 (Approx.)
Chi-Square with 150 DF =	161.81070, P =	.241 (Approx.)

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Appendix D-5

MWITHIN Sex Summary Table:

Simple Variable Effects for Sex

* * * * * A N A L Y S I S O F V A R I A N C E * * * * *

SIMPLE SEX* EFFECTS SUMMARY TABLE:

VERBAL POSITIVE VS VERBAL NEGATIVE

SOURCE	SS	DF	MS	F	P
WITHIN CELLS	12.39264	718	.01726		
MWITHIN SEX(1) X RESP	.85782	1	.85782	49.70023	.000
MWITHIN SEX(2) X RESP	.52500	1	.52500	30.41745	.000

SIMPLE SEX EFFECTS SUMMARY TABLE:

IMAGINAL POSITIVE VS IMAGINAL NEGATIVE

SOURCE	SS	DF	MS	F	P
WITHIN CELLS	12.18143	718	.01697		
MWITHIN SEX(1) X RESP	2.02491	1	2.02491	119.35248	.000
MWITHIN SEX(2) X RESP	.91171	1	.91171	53.73796	.000

*Sex: 1 = Female 2 = Male

Appendix D-6

MWITHIN Age Summary Table:

Simple Variable Effects for Age

* * * * * A N A L Y S I S O F V A R I A N C E * * * * *

SIMPLE AGE* EFFECTS SUMMARY TABLE:

VERBAL POSITIVE VS VERBAL NEGATIVE

SOURCE	SS	DF	MS	F	P
WITHIN CELLS	12.23692	712	.01719		
MWITHIN AGE(1) X RESP	.07495	1	.07495	4.36108	.037
MWITHIN AGE(2) X RESP	.07309	1	.07309	4.25269	.040
MWITHIN AGE(3) X RESP	.03935	1	.03935	2.28967	.131
MWITHIN AGE(4) X RESP	.12765	1	.12765	7.42742	.007
MWITHIN AGE(5) X RESP	.36631	1	.36631	21.31336	.000
MWITHIN AGE(6) X RESP	.24402	1	.24402	14.19842	.000
MWITHIN AGE(7) X RESP	.22278	1	.22278	12.96208	.000
MWITHIN AGE(8) X RESP	.39040	1	.39040	22.71511	.000

SIMPLE AGE EFFECTS SUMMARY TABLE:

IMAGINAL POSITIVE VS IMAGINAL NEGATIVE

SOURCE	SS	DF	MS	F	P
WITHIN CELLS	12.13361	712	.01704		
MWITHIN AGE(1) X RESP	.19235	1	.19235	11.28689	.001
MWITHIN AGE(2) X RESP	.43321	1	.43321	25.42077	.000
MWITHIN AGE(3) X RESP	.31547	1	.31547	18.51183	.000
MWITHIN AGE(4) X RESP	.47667	1	.47667	27.97086	.000
MWITHIN AGE(5) X RESP	.13885	1	.13885	8.14791	.004
MWITHIN AGE(6) X RESP	.39681	1	.39681	23.28503	.000
MWITHIN AGE(7) X RESP	.42733	1	.42733	25.07564	.000
MWITHIN AGE(8) X RESP	.60375	1	.60375	35.42814	.000

*Age: 1 = 18+ 2 = 17 - 18 3 = 16 1/2 - 17

4 = 16 - 16 1/2 5 = 15 1/2 - 16

6 = 15 - 15 1/2 7 = 14 - 15 8 = 13 - 14

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Imaginal and Verbal Traits in Early and Middle Adolescents: An Initial Analysis

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