THE RELATIONSHIP BETWEEN TELEVISION VIEWING AND SCHOOL CHILDREN'S PERFORMANCE ON MEASURES OF IDEATIONAL FLUENCY AND INTELLIGENCE: A FIELD STUDY

by

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We accept this thesis as conforming to the required standard

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Date July 26, 1977
A field study was conducted in order to examine the relationship between television viewing and school children's performance on measures of ideational fluency and intelligence. Alternate Uses and Pattern Meanings tasks (measures of ideational fluency), and the Wechsler Intelligence Scale for Children (WISC) Vocabulary and Block Design subtests (measures of intelligence) were administered to Grade four and Grade seven children in three British Columbia towns which varied in television reception. All three towns were studied at two times (Phases One and Two), two years and four months apart. One of the towns did not have television reception at the time of Phase One data collection but acquired it soon afterward. Thus at Phase Two, residents of this town had had television reception (CBC) for two years. The second town received CBC at both phases of data collection. The third town received one Canadian (CBC) and three U.S. (ABC, CBS, NBC) channels at both phases. During Phase Two data were collected both from the same children as in Phase One, and from a second cross-sectional sample (Grades 4 and 7) of children in each of the three towns. The total number of subjects in both phases was 443. The results suggested that television exposure is not related to performance on the WISC Block Design and Vocabulary subtests, or to performance on the Pattern Meanings task. The results did indicate, however, that television exposure has a negative effect on performance on the Alternate Uses task.
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I would like to express my appreciation to the residents of "Notel", "Unitel", and "Multitel" for their willingness to allow such a large project (the present study was one of several investigations) to be carried out in their towns. Particular thanks are due the principals, teachers, and personnel of the schools in each town for patiently enduring the bulk of the studies. I am grateful especially to each of the delightful children who served as subjects. For conscientious help with data collection I would like to thank Hugh Westrup and Helen Zorn.

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This investigation was one of many carried out under the umbrella of a large project entitled "The Impact of Television: A Natural Experiment Involving Three Communities." All of the work of the current investigation was that of the present author.
Introduction

Although interest in the impact of television on human development is widespread, and television programs (e.g., Sesame Street) have sometimes been designed to stimulate development, the relationship between cognitive development and television exposure remains unclear. The present study was designed to assess the impact of television viewing on the performance of school-aged children on measures of ideational fluency and measures of intelligence, and to assess the relationship between ideational fluency and intelligence. The current investigation was the second phase of a project which is both longitudinal and cross-sectional in nature.

There are two theoretical frameworks within which to view the measures employed in the present investigation. The source of the diverging views is the two different systems available to researchers for understanding human abilities: the first emerged from the work of Thurstone, beginning with his demonstration (1938) of seven or eight primary ability factors, and blossomed in the more recent work of Cattell and Horn (Horn & Cattell, 1966; Horn, 1968; Cattell, 1971), and the second is based on the Structure of Intellect model developed by Guilford (1956) and his associates with its more numerous list of unitary ability factors.

In terms of the first system the work of the present study can be seen as an attempt to assess the impact of television viewing on three well established primary abilities; verbal (v), spatial (s), and ideational fluency (Fi), which are well documented in the individual differences literature (Thurstone, 1938; French, 1951; Horn, 1968; Cattell, 1971; Hakstian & Cattell, 1973).
However, as the measures of ideational fluency employed in the present study have been used widely in the field of creativity and were originally chosen partly because many investigators believed them to be appropriate "tests" of creativity, it is necessary to consider at greater length the place of the present study within the theoretical framework originating with the work of Guilford (1950), and carried on by many investigators interested in the field of creativity.  

It is only in the last twenty-five years that creativity as a construct has been systematically investigated, and large scale empirical attempts to understand the complex human capability labelled "creativity" have occurred. A brief historical introduction may provide those unfamiliar with the ideational fluency measures with a history of their development as tasks specifically designed to measure a dimension of cognitive functioning somewhat different from the traditional notion of intelligence.

Getzels (1975) divided the investigation of creativity into three historically overlapping periods, each marked by a salient emphasis: "genius", "giftedness", and "creativity". Systematic work on the problem was initiated in 1869 by the publication of Galton's *Hereditary Genius: An Inquiry into Its Laws and Consequences*. The investigation of genius persisted into the first part of the twentieth century. With the increasing popularity of the intelligence metric and the publication of

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1 It should be noted that the concepts of fluency, ideational fluency, associative fluency, etc. per se did not originate with Guilford's work. Cattell (1971) has pointed out that substantial earlier work was done on these concepts by Spearman (1927), Bernstein (1924), Hargreaves (1927), Studman (1935), Cattell (1950), Pinard (1932) and Stephenson (1953).
Terman's studies of highly intelligent children in the '20s, the research emphasis turned from genius to giftedness, reflected by vast numbers of studies on highly intelligent children. In the 1950's the research emphasis shifted once more--from giftedness as measured by the intelligence test, to creativity (Getzels, 1975).

There is no universally agreed upon definition of creativity and approaches to its study are very diverse. In general, the most widely applied conceptions are of three sorts, depending on the relative emphasis given to the product, the process, or the experience (Getzels & Madaus, 1969). Attempts to categorize the various approaches can be misleading, since a great deal of overlapping occurs, but Taylor (1975) has identified the following systems: psychoanalytic, humanistic, trait-factorial, holistic, and associationistic. Taylor (1975) has also categorized research on creativity into the following topics: (1) the creative personality; (2) creative problem formulation; (3) the creative process; (4) creative products; (5) creative climates; (6) creativity and mental health; and (7) creativity and intelligence.

An event which marked a paradigmatic change in the study of creativity and is viewed by many within the field as a landmark was Guilford's presidential address of 1950 to the American Psychological Association (Guilford, 1950). The previous research emphasis had been on giftedness, as measured by the intelligence test. Increasingly investigators had begun to doubt that the concept of intelligence was sufficient to explain all aspects of mental functioning. Getzels and Csikszentmihalyi (1975) observed that "Both before and after the invention of the IQ metric, the distinction between purely "rational" thinking and "creative" thinking
served as a counterforce to the dominant thesis of monolithic intelligence. Writing two centuries ago, for example, Gerard (1774) noted:

A person... may possess reason to perfection, and yet be totally destitute of invention, originality, and genius (p. 36)--a distinction which was preserved in the theoretical if not the empirical literature. Dewey (1917), Mead (1917), Knowlson (1920), Hirsch (1931), and Patrick (1946) ...(are a few of the authors who)... held that creativity entailed a cognitive process not completely synonymous with the one ordinarily encompassed in the concept of intelligence (p. 94, parentheses added).

Although the dominance of intelligence over the field of mental functioning was diminishing sufficiently by the late '40s so that other conceptions, including creativity, could emerge as legitimate fields of study, (Getzels & Csikszentmihalyi, 1975), there was still neither a clear conceptual distinction between intelligence and creativity, nor an operational approach specific to creativity. Getzels and Csikszentmihalyi noted that with his concept of "divergent thinking" Guilford (1950) "...provided a dialectical foil to the reigning notion of intelligence, and the tests that he and his associates had developed (many of which were originally developed by Thurstone and modified over the years by Guilford) provided a useable methodology within the altered conceptual framework" (p. 97, parentheses added). Thurstone (1950) also presented provocative material which stimulated others to examine possible creativity factors not included in the usual standard intelligence tests. Thurstone and one of his students, C. Taylor (1947), moved away from the "right or wrong answer"
approach and identified two fluency factors, fluency of ideas and verbal versatility. However, it was Guilford's "divergent thinking" concept that seemed to provide the greatest impetus to creativity researchers.

Building on the work of Guilford and others, Wallach and Kogan (1965) observed that to talk about "creativity and intelligence", as if the two terms refer to concepts at the same level of abstraction is to assert that something akin to Spearman's $G$ (Spearman, 1927) exists in the area of creativity. The concept of $G$ is based on the substantial inter-correlations among traditional indices of intelligence. Although recognizing "...that $G$ does not constitute the entire story in the intelligence domain... (and that) ... evidence for specific abilities exists also ...(Wallach and Kogan argued that) ...it is the fact that different intellectual abilities are appreciably intercorrelated which suggests the existence of a unified dimension of individual differences, and serves as a justification for assigning a single label such as 'intelligence' to this domain" (p. 2, parentheses added). Thus, Wallach and Kogan argued, to speak of "creativity and intelligence", is to assert that these two concepts define dimensions of individual difference that vary independently, or that are at most only minimally related. Yet several attempts to produce empirical evidence of a distinction between creativity and intelligence have failed. Getzels and Jackson (1962) obtained correlations between creativity and intelligence scores of about .3, approximately the same magnitude as the creativity part-score intercorrelations. Their results were obtained with measures based on Guilford's (1956) work using

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See Cattell (1971) for a much broader discussion of this issue.
his Structure-of-Intellect model. Guilford conceptualized creativity and intelligence as two different processes within the 'operations' dimension of his model, and labelled them respectively divergent and convergent thinking. But, Guilford has also reported (Guilford & Christensen, 1956) correlations between general intelligence scores and divergent thinking scores of about the same size ($r = .25$) as the intercorrelations among the divergent thinking tests themselves.

Wallach and Kogan argued that the kinds of procedures employed in the studies described above were too varied to define a cohesive dimension that is substantially independent of general intelligence. Based on this reasoning they developed new measures of creativity which were based on Mednick's (1962) definition of creative thinking as the forming of associative elements into new combinations which either meet specified requirements or are in some way useful. (They also used some measures from Guilford's battery). Wallach and Kogan reasoned that under conditions which would assure the appropriateness of associations, a more creative person would give more verbal associations, and more that are unique, to a stimulus than would a less creative individual.

Wallach and Kogan (1965) studied the relationship between creativity and intelligence in 151 Grade 5 children. Their creativity tasks included both verbal and figural stimuli. These measures were administered to children individually, in a relaxed, gamelike atmosphere, with no time

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The SI model is becoming increasingly recognized as weak. Horn and Knapp (1973) pointed out that an investigator can, using Procrustes procedures and data that have been accepted as showing support for SI theory, force solutions that provide what appears to be support for theories generated by a random process.
limits imposed. In contrast with the results obtained by Getzels and Jackson (1962), and by Guilford and Christensen (1956), Wallach and Kogan (1965) found non-significant correlations between creativity task and intelligence test scores (for 100 such correlations, the mean $r = .09$), and significant part-score correlations for each trait (for IQ, $n = 45$ correlations, mean $r = .51$; for creativity, $n = 45$ correlations, mean $r = .41$). Their interpretation was that they had succeeded in defining a dimension of individual difference which was independent of the traditional notion of general intelligence. Since publication of these results a number of partial replications of the creativity - intelligence distinction have appeared (e.g., Ward, 1968; Pankove & Kogan, 1968; Cropley & Maslany, 1969; Wallach & Wing, 1969; Williams & Fleming, 1969).

While not of central concern in the present study, an issue arising often in the recent creativity literature is the question of criterion validity for the various "creativity" tests available (including those of Wallach and Kogan), and by implication the issue of the appropriate application of the label "creativity". Work on the predictive validity of creativity tests is scant, and where work has been done it has been with high school or college students as subjects. In one such study, Wallach and Wing (1969) reported that ideational fluency scores of 500 college students predicted to a moderate but statistically significant degree talented accomplishments outside the classroom by these students during their high school years. Wallach (1971) when discussing this research comments: "... evidence has been provided suggesting that ideational fluency—as distinct from intelligence—does play a role
in creativity. This role, while present to a statistically significant degree—is nevertheless a small one. Presence or absence of creative attainments depends on many other considerations besides ideational fluency. And, on the other hand, ideational fluency can arise for many other reasons besides its possible role in facilitating creative attainments. . . In no sense therefore, is ideational fluency equivalent to such attainments. It is only an imperfect sign that they are more likely to be found. At best it helps us understand one factor among many that may be implied in the complex sequence of events eventuating in a meaningful real-world attainment" (p.17).

Most authors agree that prediction of creative performance is a multivariate issue (Cattell, 1971; Guilford, 1976) and that many social and psychological factors are important enough to make a difference in creative functioning (Andrews, 1975; Torrance, 1975). When the question is that of defining creativity in the criterion behaviour sense, it is difficult enough where adults are concerned, but when the question is that of creativity in children, the complexities increase still more. Ward (1974) pointed out that when creativity is defined too narrowly, there are too many experiences intervening between early childhood and maturity, and too many additional factors involved to expect much prediction to significant accomplishment in adulthood. Ward suggested that researchers give up using the word "creativity" in the name of any instrument used in research with young children, and refer instead to what specifically is being measured.

The more general issue of names for variables in psychological research was addressed by Cronbach (1968) who pointed out that neutral names
for variables do not invite the reader to make interpretations that have not been validated. The same issue can of course be raised (and has by many investigators) concerning the applicability of the label "intelligence" to the cognitive dimension tapped by traditional I.Q. measures.  

In no sense, therefore, are the tasks employed in the present study claimed to be measuring what we mean when we speak of "intelligence" and "creativity" in the global sense. In order to operationalize these terms for experimental purposes, their definitions have obviously had to be greatly narrowed. Nonetheless, the measures of intelligence and of ideational fluency employed can provide more information than we have had to date on how television, as a social-psychological phenomenon in the lives of young children can affect aspects of their cognitive functioning. Specifically, it is believed that they can provide evidence of the effect of television viewing on three clearly established primary abilities; verbal (v) and spatial (s), which are often included as part of intelligence tests; and ideational fluency (Fi), which is believed by many investigators to play a role in creativity.

Television first became a phenomenon in North American homes in the early nineteen-fifties, and its growth since then has been staggering. Lyle and Hoffman (1971) reported that the proportion of families in the U.S.A. owning television sets rose from almost none in 1950 to over 96 percent by 1970. The average home set is said to be turned on more than six hours per day. Bailyn (1959) found that the average viewing

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4 The split between test development and advances in conceptualizing human ability has been discussed by Cattell (1971).
time for children between the ages of six and sixteen was 22 hours per week in the United States. Thus the American child spends about as much time watching television as she or he spends in school, and more than in any other activity except sleep and play. By the time the average child is sixteen he or she has spent the equivalent of 15 to 20 solid months, 24 hours a day, before a television screen (Bronfenbrenner, 1970). It is not likely that the figures for Canadian children are substantially different.

Our understanding of the impact of this powerful medium has failed to keep pace with its enormous commercial success. One reason for this is of course the great difficulty of evaluating knowledge concerning the effects of television. Maccoby (1964) pointed out that it is tempting, if present day children are different in some ways from the children of previous generations, to attribute the changes to television and the other mass media. But it is obvious, she commented, that today's children are growing up in surroundings that differ from earlier patterns of life in ways other than the accelerated use of mass media. For example, in recent years, North American society has "...been recovering from the effects of a major war and living in the shadow of another one; population has grown rapidly, with crowding of houses and schools, and population has shifted from rural to urban to suburban areas, with accompanying changes in the demands that are placed upon children; more mothers are working; and income and living standards have been rapidly rising." (p. 327).

These are only some of the broadest changes in life patterns. Bronfenbrenner (1970) has pointed to a host of other changes in ecological circumstances which determine how children spend their time: for example,
the fragmentation of the extended family, the separation of residential and business areas, the disappearance of neighborhoods, age-segregation, the growth of single parent families, the abolition of the apprenticeship system, the delegation of child care to specialists and others outside the home. To sort out the effects of television from the context of all these other complex changes is a difficult task at best.

Research on the effects of television can be divided into two main categories: experimental, laboratory based studies of the effects of certain kinds of programming on behaviour (usually children's behaviour), and surveys of patterns of television use. Studies of the first type (e.g., Bandura, Ross & Ross, 1963; Berkowitz, 1964; Leifer & Roberts, 1971) have dealt primarily with the responses of children to violent or aggressive programming. These studies, although conducted because of concern for the long-range effects of viewing certain types of programming, have consisted mainly of the assessment of short-term effects. This is because most of the studies were conducted in laboratory settings in an attempt to control as many variables as possible. There have been more naturalistic studies (e.g., Stein & Friedrich, 1971; Friedrich & Stein, 1975), where children were exposed to diets of antisocial (e.g., aggressive) or prosocial versus neutral programming and were then either observed during the course of their normal interactions, or given a task designed to reflect learning of TV content, but again only relatively short-term effects (lasting several days or one or two weeks) have been investigated.

The second category of research (e.g., Greenberg & Dervin, 1970; Lyle & Hoffman, 1971; McIntyre & Teevan, 1971; Murray, 1971) has dealt
mainly with questions concerning various aspects of television use in areas where reception is available and TV viewing is fairly widespread. Usually, answers are sought to such questions as: What groups are the heaviest TV viewers? What type of programs do they watch?

A third category of research more directly comparable to the present study basically involves an expansion of the survey studies. Regular television viewers are compared with those people who do not have television available and are not, therefore, regularly exposed to it. The three major studies of this type (Himmelweit, Oppenheim & Vince, 1958; Schramm, Lyle, & Parker, 1961; Furu, 1962) were conducted about fifteen years ago, when regular exposure to television was not so widespread and television viewing did not impinge so much on general leisure time activities. All three of these studies relied heavily on questionnaires for data collection and few direct observations were made.

There are still many isolated communities in North America which do not have television reception. However, these communities are usually different in other important ways; because they are isolated, most of them haven't shared in the complex social changes of recent times. There remain few non-isolated North American communities which have shared in most recent social changes, but have not yet acquired television. When available, such areas can be contrasted with similar areas which have television, and thus the characteristics of children growing up with and without television can be compared. The opportunity to conduct this kind of investigation on the North American continent is swiftly vanishing, and represents a unique aspect of the present research. The research was
carried out in three Canadian communities selected for their comparability in obvious aspects at least other than the availability of television (see page 18). One of the towns ("Notel") did not have television reception at the time of phase one data collection. The second community ("Unitel") received only one channel (CBC). Residents in the third town ("Multitel") not on the cable got one U.S. channel (CBS), and those subscribing to the cable (most residents) got one Canadian (CBC) and three U.S. (ABC, CBS, and NBC) channels.

Another unusual aspect of the study is that the community without TV prior to the Time 1 testing then acquired TV reception. Thus, it was possible at Time 2 to assess the same children after two years of television exposure. Although this situation presents design problems because the Notel condition vanished at Time 2, it also presents unique opportunities in terms of findings. For example, since in Notel the same children could be studied before and after regular exposure to television, it was possible to assess performance on measures of ideational fluency and intelligence independently of television and then to assess change after exposure. This is particularly important in the case of variables (as in the present study) for which the effects of television viewing are unknown and may be either facilitative or inhibitory.

There is another important way in which the present study differs from existing research. Because this project is both longitudinal and cross-sectional in nature, (i.e., at Time 2 both the same subjects, and same-aged subjects were assessed), a type of data is provided which has not, up until now, been available. Thus the current work had the potential of yielding more definitive answers to questions concerning the
long-term effects of regular television viewing on certain aspects of cognitive development than were previously available.

In the present study data from a "natural" or "field" experiment were obtained for the general purpose of furthering television research, and with the specific aim of focusing on the relationship of television viewing to the performance on measures of ideational fluency and intelligence of young school-aged children.

Although there has been no previous research addressed specifically to the relationship between ideational fluency and television viewing, it is useful to consider the work of several researchers who have speculated on the relationship between "creativity" and television viewing. Most authors have concentrated on only two aspects of the possible relationship. The first line of reasoning concerns changes in the amount of time children with access to television spend in certain other forms of activity, and is represented by Maccoby's (1951) statement that while some television time involves a shift from other mass media to television, much of it is taken from playtime, from practising musical instruments, and from other forms of activity which might be called "creative" or "productive". Evidence concerning this hypothesis of the displacement effects of television is vague. Although a survey by Shizuoda (1962) in Japan and the Himmelweit et al. (1958) study with a British sample both reported no effects of TV-viewing on creative or expressive activities and interests, there is little comparability among methods used by the two studies and the measures of "creativity" employed were crude.

The second line of reasoning concerning the relationship between "creativity" and television viewing is represented by Furu (1971), who
regards "creativity" as a predisposition which controls television behaviour, rather than as a variable potentially affected by it. The first attempt to empirically test this hypothesis was made by Wade (1971), who argued that creative adolescents would make only limited use of the medium because they are committed to varied activities in their leisure hours, of which media are only a small part. Her findings, while supporting the hypothesized negative correlation between her measures of "creativity" and hours per week spent watching television (r = -.290, p < .001), do not rule out the alternative explanation of "creativity" (in the present study ideational fluency) as a variable which is itself affected by TV use. The present study represents the first attempt to test that hypothesis.

The relationship of TV-viewing to intelligence has usually been approached in terms of effects on school performance. The results of a pioneer, extensive study of television effects on children made by Himmelweit, Oppenheimer, and Vince (1958) in Great Britain, and a later, also comprehensive study by Schramm, Lyle, and Parker (1961) based on a large sample of North American children, agreed that television has little effect on general school performance. Schramm et al. (1961) did note, however, in their comparison of the two communities "Radiotown" and "Teletown", that children who had been growing up with television appear to come to school with about a one-year advantage in vocabulary. These authors commented that so far as vocabulary represents general knowledge, it can be said with some confidence that television appears to help children get off to a fast start. However, this advantage apparently is not
maintained. Children in the sixth and tenth grades in the two towns did not differ in vocabulary level. The present study was designed so that comparability of results with the Schramm, et al. (1961) findings could be assessed.

The Grade four and Grade seven age levels were chosen for the present investigation in order to enable a comparison of the results with the Wallach and Kogan (1965) findings, and to permit a comparison of the vocabulary results with those of Schramm et al. (1961).

Because the present study was a critical extension of an ongoing project, namely the longitudinal aspect (follow-up phase) of a project for which some cross-sectional data (first phase) were obtained and analyzed, the phase one hypotheses, method, and results will be presented at this time, followed by a brief discussion of these results.

First Phase: Hypotheses

The specific hypotheses of phase one of the study were as follows:

1. Ideational fluency is a variable which is itself affected by television exposure, and children who grow up without television will obtain higher mean ideational fluency scores than will children who grow up with television. There was no precedent in the literature concerning the relationship between ideational fluency and television exposure, and both of the following outcomes seemed plausible:

(a) that television exposure is itself a kind of experience which will stimulate (increase) ideational fluency, or

(b) that ideational fluency is increased by direct experience with the world (in the Piagetian sense) rather than by the indirect kind of
experience which television provides, hence exposure will decrease ideational fluency. As can be seen in Hypothesis 1 (above), the second possibility seemed more likely to this author.

2. If television can serve as a stimulus for intellectual development, it will be most likely to affect performance on verbal measures of intelligence which are related to informational experience. Thus, in general, children growing up in towns with television reception will score higher on a vocabulary test than will children in a town lacking television. However, if consistent with past findings, this effect will occur only for the younger children (Grade 4) and will not be maintained at the Grade 7 age level.

3. While television is likely to affect verbal intelligence test scores, it is unlikely to affect spatial ability intelligence test scores. To the extent that intelligence test performance is environmentally determined, direct experience with spatial tasks would be expected to influence block design test scores. Thus, differences on the WISC block design test among children varying in television experience will be minimal.

4. The findings of Wallach and Kogan (1965) will be replicated by the present study. Low correlations between the ideational fluency measures and the intelligence measures, and high intercorrelations within each set of measures will be obtained.

First Phase: Method

Towns

The study was conducted in three communities in British Columbia.
It was of central importance to the study that the towns selected be as similar as possible except with regard to television reception. Notel (1971 population = 658) was obviously the starting point. UniteI was chosen because it was about the same size (population 693 in 1971), purported (by Notel residents) to be roughly similar, and in the same general geographical area. In order to obtain a town with access to U.S. networks it was necessary to go to the Canada-U.S. border region. Multitel was selected because it was comparable in size (1971 population = 872) to Notel and Unitel and approximately equally distant from the closest urban centre. The most recent census data available for comparison of the three towns are from 1971. Because the data were available only in terms of proportion of town residents responding to each variable, not in terms of the responses of a given resident to a set of variables, it was not possible to do one analysis to determine if the vectors of data varied for the three towns. Accordingly, for eight variables, comparability was assessed by computing a chi square for differences among proportions, and if the result was significant, computing three chi squares to locate the pairwise source(s) of that overall difference. These chi squares were based on a minimum of 150 respondents in each town. The eight variables, and the relevant proportions of Notel, Unitel; and Multitel census respondents for those variables, were: female - 51%, 57%, 52%; family head with English as official language - 88%, 93%, 95%; mother tongue English - 74%, 81%, 83%; birthplace Canada - 77%, 90%, 77%; if born in Canada, those born in B.C. - 64%, 34%, 71%; experienced labour force in blue collar jobs - 62%, 72%, 77%; family head educated beyond
high school - 37%, 23%, 24%; single family dwellings - 85%, 73%, 90%. A total of 21 pairwise comparison chi squares were computed for these variables, of which 13 were statistically significant (the overall chi square for sex was the only nonsignificant three-way comparison). Of these 13 differences, 5 were between Notel and Multitel, 5 between Notel and Unitel, and 3 between Unitel and Multitel. Analyses of Variance followed by Tukey mean comparisons revealed that the mean income of the heads of Multitel ($8055) and Notel ($7377) families was higher than that for Unitel heads ($6854), and that on the average Multitel residents (proportion over 15 = 71%) were older than Notel (63%) and Unitel (65%) residents. When the results of all of these analyses are considered together, no consistent patterns emerge. For example, the mean income of Unitel family heads was lower than that for Multitel, but the same towns were comparable in two other indices of socioeconomic status, white collar/blue collar job status, and education of family head. Furthermore, although several of the differences between towns were statistically significant, with the exception of the variable concerning proportion of residents born in B.C., in absolute terms the proportions for the three towns for any one variable were quite similar (e.g., 88% or more of family heads had English as their official language). Thus while it is possible that the towns differed drastically on a relevant variable other than television exposure, in terms of the variables examined in the analyses and considered in selecting the towns (e.g., climate), the criterion of general comparability seems to have been met. (It is important to note that in the above discussion and analyses the three towns were assumed to be samples of towns with their television reception characteristics).
"Notel", did not have television reception at the time of data collection (although a few residents located on hills surrounding the town reported that they sometimes picked up weak signals). The second community, "Unitel", received only one channel (CBC) and reception was reported to be poor (snowy) in certain areas and/or at certain times during the winter months. The third town "Multitel", was not far from the United States border. Multitel residents not on the cable got one U.S. channel (CBS) and those subscribing to the cable (at least 85%) got one Canadian (CBC) and three U.S. (ABC, CBS, and NBC) channels. Reception in Multitel was reported to be consistently good. The three towns thus represented a continuum of television experience.

The community without television (Notel) was not "pure" in the sense of complete absence of access to television, since a few of the residents from surrounding hills reported that they sometimes received weak signals from one station. Also the fact that Notel is not isolated means that residents have an opportunity to watch television when they travel to other localities. In other words, Notel residents are normal people who watch television when it is available. Indeed it is important that they so behave, both for reasons of comparability among the towns and for the purposes of the follow-up data collection phase which was based on the assumption (for which there is now evidence) that the vast majority of Notel residents would begin to watch TV regularly as soon as reception was available. However, at the time of Phase One data collection, fewer than 14% of the Notel school children tested had access to television on an everyday basis. This provided a sharp contrast to the two TV towns (Unitel and Multitel), where 100% of the children tested had access to television on an everyday basis.
In terms of viewing hours per week, Table 1 provides comparisons between the three towns. While it can be seen from the table that Notel children reported a mean viewing time of 5.4 hours per week, it is important to note that the median was 0 hours viewed per week. Of the Notel children tested 79% reported that they viewed 6 hours or less per week, while in Unitel 92% of the children viewed 15 or more hours per week, and in Multitel 91% of the children viewed 21 or more hours per week.

Subjects

A total of 160 school children from the three towns served as subjects. Fifty-eight of these children, 29 from Grade Four (19 males and 10 females) and 29 from Grade Seven (14 males and 15 females), were residents of Notel. Fifty-three of the children, 24 from Grade Four (16 males and 8 females), and 29 from Grade Seven (12 males and 17 females), resided in Unitel. The remaining 49 children were residents of Multitel, 23 of these in Grade Four (10 males and 13 females), and 26 in Grade Seven (11 males and 15 females). (See Table 2).

In order to ensure that all subjects were representative of their town, only those children who had resided in their particular town for at least three years were included in the study. In addition, subjects from the two television towns (Unitel and Multitel) had to have had a television set in their homes for a minimum of three years. All school children meeting these criteria served as subjects in order to provide samples which would be as large as possible.

Dependent Variables

The measures of intelligence used were one verbal and one performance
Table 1

Reported Hours of Television Viewing at Time 1

<table>
<thead>
<tr>
<th>Hours/week</th>
<th>Notel (n=58)</th>
<th>Unitel (n=53)</th>
<th>Multitel (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>0</td>
<td>34 (58.6)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-6</td>
<td>12 (20.7)</td>
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<td>0</td>
</tr>
<tr>
<td>7-12</td>
<td>4 (6.9)</td>
<td>4 (7.6)</td>
<td>0</td>
</tr>
<tr>
<td>13-18</td>
<td>2 (3.5)</td>
<td>5 (9.4)</td>
<td>4 (8.2)</td>
</tr>
<tr>
<td>19-24</td>
<td>1 (1.7)</td>
<td>9 (17.0)</td>
<td>13 (26.5)</td>
</tr>
<tr>
<td>25-30</td>
<td>4 (6.9)</td>
<td>17 (32.0)</td>
<td>9 (18.4)</td>
</tr>
<tr>
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<td>9 (17.0)</td>
<td>8 (16.3)</td>
</tr>
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<td>1 (1.7)</td>
<td>7 (13.2)</td>
<td>6 (12.2)</td>
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<td>1 (1.9)</td>
<td>5 (10.2)</td>
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</tr>
<tr>
<td>55-60</td>
<td>0</td>
<td>0</td>
<td>1 (2.0)</td>
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</table>

Mean Number of Hours/week

<table>
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<tr>
<th></th>
<th>Notel</th>
<th>Unitel</th>
<th>Multitel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.4</td>
<td>23.9</td>
<td>26.9</td>
</tr>
</tbody>
</table>

Median Number of Hours/Week

<table>
<thead>
<tr>
<th></th>
<th>Notel</th>
<th>Unitel</th>
<th>Multitel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>28.5</td>
<td>29.0</td>
</tr>
<tr>
<td></td>
<td>Grade 4</td>
<td></td>
<td>Grade 7</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>Notel</td>
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<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Unitel</td>
<td>16</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Multitel</td>
<td>10</td>
<td>13</td>
<td>11</td>
</tr>
</tbody>
</table>
subtest from the Wechsler Intelligence Scale for Children (WISC). The verbal subtest was Vocabulary; the performance subtest was Block Design. Selection of the Vocabulary subtest was based on the fact that it possesses a very high correlation with the total verbal scale score ($r = .82$), and with the full scale score ($r = .83$), of the WISC. In addition, a vocabulary test was selected so as to provide a comparison with previous results concerning television and intelligence (Schramm et al., 1961). The Block Design subtest from the performance scale of the WISC was selected because of its high correlation with the total performance scale score ($r = .66$), and with the full scale score ($r = .64$), and because it is considered to be a good measure of spatial ability. Finally, these two subtests were used by Wallach and Kogan (1965) as part of their group of intelligence measures, and comparability of results could therefore be assessed.

The measures of ideational fluency were adapted from those used by Wallach and Kogan (1965). Five of the items, Alternate Uses, required the child to name uses for a common item, for example, a magazine. The 5 Pattern Meanings items were simple line drawings; each was drawn in black on a white 4 x 6 inch plastic card (see Figure 1, p. 25). (See pgs. 27-29 for a full description of the procedures for administering the ideational fluency tasks).

**Design**

The three between subject independent variables were Town (Notel, Unitel, and Multitel), Grade (4 and 7), and Sex, thus the experimental design included 12 independent groups of subjects. Due to differences in the number of subjects available in each town and grade, there were not equal

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5 All correlations cited are based on a standardization sample of 100 boys and 100 girls aged 10%. Where necessary $r$'s were corrected for spuriousness by the formula recommended by McNemar (WISC Manual, 1949).
Figure 1
Pattern Meanings Items

Example

1.

2.

3.

4.

5.
numbers of subjects in each group.

All subjects received each of the four dependent variable tasks, the two intelligence measures and the two ideational fluency measures. In all cases the order of presentation of the four dependent measures was the same, with the two ideational fluency measures preceding the two intelligence measures. Although it is customary research procedure to counterbalance the order of presentation of dependent measures, this was not done in the present study for two reasons. First, direct comparison in an absolute sense of performance on the two kinds of measures was not meaningful. The second reason for not counterbalancing was that the atmosphere experienced by the subject was considered by Wallach and Kogan (1965) to be a critical dimension of task context for the ideational fluency measures. The fact that an evaluative set is inherent in the presentation and nature of the two intelligence tasks led to a decision to place them last in the order of presentation. Of the two ideational fluency measures, the five Uses items were always presented first, and in the same order, followed by the five Pattern items, also always in the same order. Of the two intelligence measures, the presentation of the Vocabulary subtest always preceded the presentation of the Block Design subtest. As the Block Design subtest was the only one of the four dependent measures which was timed, the decision to place it last was based simply on the reasoning that it would be a more comfortable transition for the child from a non-evaluative to an evaluative atmosphere if the timed subtest came last.

Procedure

Each child was tested individually in a private room provided by the
school. The door to the experimental room was always kept closed, and there were no interruptions once the procedures had begun. Each session began with the experimenter introducing herself to the child and saying "Hi, I have some games here. I hope you will like them, but first, I need to know your name." At this point the child's name, age, and birthdate were taken. Following this the child was asked questions concerning his or her television viewing experience. (A list of these questions is provided in Appendix A, Table 1).

Following the recording of the child's reply to these questions, the presentation of the four dependent measures began.

The general instructions for the Alternate Uses task were:

Now, in this game, I am going to name an object--any kind of object, like a light bulb or the floor--and it will be your job to tell me lots of different ways that the object could be used. Any object can be used in a lot of different ways. For example, think about string. What are some of the ways you can think of that you might use string? (At this point the experimenter lets the child try). Yes, those are fine. I was thinking that you could also use string to attach a fish hook, to jump rope, to sew with, to hang clothes on, and to pull the blinds. (The experimenter varied her suggestions so as not to duplicate any the child had provided). There are lots more too, and yours were very good examples. I can see that you already understand how we play this game. So let's begin now. And remember, think of all the different ways you could use the object that I name. Here we go.

The experimenter's explanation of the example was provided in such a manner as to convey the feeling of suggestion rather than of finality.
The possible answers were given slowly and in a suggesting tone, so as to provide the impression that she was thinking of them at the time.

The five items in this procedure, in their order of administration were as follows:

1. "Tell me all the different ways you could use a magazine."
2. "Tell me all the different ways you could use a knife."
3. "Tell me all the different ways you could use a shoe."
4. "Tell me all the different ways you could use a button—the kind that is used on clothing."
5. "Tell me all the different ways you could use a key—the kind that is used in doors."

The procedure for the Pattern Meanings task was then introduced to the child as follows:

Here's a game where you can really feel free to use your imagination. In this game I am going to show you some drawings. After looking at each one, I want you to tell me all the things you think each complete drawing could be. Here is an example—you can turn it any way you'd like to. (The experimenter then gave the example card to the child). What could this be? (The child was encouraged to try some suggestions). Yes, those are fine. Some other kinds of things I was thinking of were the rising sun, a porcupine, eye lashes, a brush, a carnation, and probably there are lots of other things too. (The experimenter's particular suggestions were varied so as not to include any given by the child). I can see that you already know how we play this game. So let's begin now.

Once again the experimenter's suggestions for the example were presented slowly, in such a manner as to indicate that she was thinking of
them at the time. The "pattern meanings" procedure consisted of five items, in addition to the example. Each drawing appeared on a separate 4 x 6 inch card. (The figural items are illustrated in Figure 1, p.25). Each of the five test cards was presented to the child with the instruction: "Here is another drawing. Tell me all the things you think this could be."

In keeping with the rationale of a non-evaluative atmosphere for the fluency measures, the experimenter made a determined effort during their administration to avoid any expression of verbal or behavioural cues which would indicate to the child that he or she was under any pressure of time while responding to the individual items.

Following the completion of the Pattern Meanings task, the Vocabulary and Block Design subtests of the WISC were administered. In the Vocabulary subtest, the child must provide definitions for each of a number of words, arranged in a series of increasing difficulty. In the Block Design subtest, the child has to assemble blocks so as to duplicate a design displayed on a card. A number of different designs are employed. The administration of Vocabulary and Block Design subtests followed the general procedures set down in the WISC manual (Wechsler, 1949). The completion of the fourth dependent measure (Block Design subtest) signalled the end of the experimental session with the child.

**Scoring**

In accordance with the Wallach and Kogan (1965) method, two kinds of scores were obtained from both the Alternate Uses and Pattern Meanings measures. Items were scored for both Fluency (the total number of responses),
and for Uniqueness (responses occurring but once in the sample of 160 children). Responses which were repetitious or obscure (less than 1% of the total), were excluded from these scores. Thus, there were four scores for each child on the ideational fluency measures. Two of these were Fluency scores, including one for Alternate Uses and one for Pattern Meanings; and two were Uniqueness scores (Uses and Patterns). In all cases, inter-rater reliability was calculated by multiplying two times the number of agreements obtained by two independent scorers, and dividing the result by the total of scorer 1 plus the total of scorer 2. Two scorers working independently and using responses to all items by 20 subjects reached 100% agreement on Fluency scores. Using the responses of the total sample to the item "magazine", 95% agreement was reached on Uniqueness scores.

Scoring for the Vocabulary and Block Design subtests of the WISC followed the general procedures set down in the WISC manual. Following these rules, independent scorers eventually reached 94% agreement on Vocabulary scores (it is perhaps worth noting that several sessions were required to develop additional rules for scoring Vocabulary items to supplement those provided in the WISC manual). Raw Vocabulary and Block Design scores were then converted to scaled score equivalents in accordance with the WISC manual procedures.

First Phase: Results

There were four scores for each child for the ideational fluency measures, and two scores from the two intelligence measures, a Vocabulary scaled score, and a Block Design scaled score. Thus a total of six separate 3 x 2 x 2 between subject analyses of variance
was performed, with one analysis for each dependent measure. Since the number of cases varied slightly across the twelve subgroup cells, the method of unweighted means was used for these analyses. In addition, correlational analyses among the ideational fluency measures, among the intelligence measures, and between the ideational fluency and intelligence measures were carried out.

Results from the analyses of variance of the ideational fluency measures are presented first, followed by the results of the IQ analyses, and then by the correlational analyses.

Ideational Fluency Tasks

The alternate uses items were scored for both Fluency and Uniqueness as were the figural (pattern meanings) items. The results from the analyses of Uses fluency and Uses Uniqueness scores will be presented first, followed by the Figural Fluency and Figural Uniqueness analyses.

Alternate Uses Fluency

The mean numbers of uses fluency responses obtained for boys and girls at each grade level in each town are presented in Table 3. Results from the analysis of variance performed upon these data are presented in

---

6 The question of homogeneity of variances was not considered relevant in connection with the analyses of variance performed in the present investigation as it has been amply demonstrated (Boneau, 1960; Box, 1953; 1954a, 1954b; David and Johnson, 1951; Horsnell, 1953) that the F test of analysis of variance is inconsequentially affected by heterogeneity of variances and non-normality if the sample sizes in question are approximately equal and sufficiently large (as was the case in the present study).
Table 3
Mean Alternate Uses Ideational Fluency Scores

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th></th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>Note1</td>
<td>24.4</td>
<td>35.0</td>
<td>35.6</td>
</tr>
<tr>
<td>Unite1</td>
<td>18.8</td>
<td>26.1</td>
<td>25.4</td>
</tr>
<tr>
<td>Mutil1</td>
<td>20.9</td>
<td>22.3</td>
<td>26.6</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Note1</td>
<td>30.9</td>
</tr>
<tr>
<td>Unite1</td>
<td>21.9</td>
</tr>
<tr>
<td>Mutil1</td>
<td>23.4</td>
</tr>
</tbody>
</table>
Appendix B (Table 1).

Town emerged as a significant source of variation, $F(2,148) = 6.60$, $p < .01$. Subsequent multiple comparisons of the town means using the Tukey procedure (Appendix B, Table 2) revealed that children in Notel had higher mean Uses Fluency scores than did children in Unitel and Multitel (Notel > Unitel, $p < .01$; Notel > Multitel, $p < .05$). The scores of children in Unitel and Multitel did not differ significantly (i.e., Notel > Unitel = Multitel).

A second significant source of variation emerging from the analysis of the Uses Fluency scores was a Grade x Sex interaction, $F(1, 148) = 4.86$, $p < .05$). A breakdown of this interaction by analysis of simple main effects (Appendix B, Table 3) revealed a significant difference for males only, with Grade 7 males performing better than those in Grade 4 ($p < .05$).

**Alternate-Uses Uniqueness**

The mean numbers of unique responses produced for uses items by boys and girls at each grade level in each town are presented in Table 4. Results from the analysis of variance performed on these data are presented in Appendix B (Table 4).

Town again emerged as a significant source of variation, $F(2,148) = 4.95$, $p < .01$. Subsequent analysis by the Tukey procedure (Appendix B, Table 5) showed that Notel children gave more alternate uses that were unique in the sample than children in both Unitel (Notel > Unitel, $p < .05$) and Multitel (Notel > Multitel, $p < .05$). The performance of Unitel and Multitel children did not significantly differ (i.e., Notel > Unitel = Multitel).
Table 4
Mean Alternate Uses Uniqueness Scores

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Notel</td>
<td>2.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Unitel</td>
<td>1.6</td>
<td>2.1</td>
</tr>
<tr>
<td>Multitel</td>
<td>3.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Notel</td>
<td>3.9</td>
</tr>
<tr>
<td>Unitel</td>
<td>2.1</td>
</tr>
<tr>
<td>Multitel</td>
<td>2.2</td>
</tr>
</tbody>
</table>
To summarize the results from the analyses of Alternate Uses items, children from the town without television (Notel) had significantly higher Uses Fluency and Uniqueness scores than did the children from either of the towns with television, and these latter two groups did not significantly differ. The main effect of Town was not qualified by any interactions, but a significant Grade x Sex interaction did emerge in the Uses Fluency scores. Grade 7 boys performed better than Grade 4 boys, whereas no Grade difference was found among the performance of the girls.

**Figural Fluency**

The mean Figural Fluency scores for boys and girls at each grade level in each town are presented in Table 5. Results from the analysis of variance performed on these data are presented in Appendix B, Table 6.

The only significant source of variation to emerge from this analysis was Grade, $F(1,148) = 4.55, p < .05$. Older (Grade 7) subjects produced significantly greater numbers of associates to the pattern meanings items (i.e., had higher mean Figural Fluency scores) than did younger (Grade 4) children.

**Figural Uniqueness**

The mean Figural Uniqueness scores for boys and girls at each grade level in each town are presented in Table 6. Results from the analysis of variance performed on these data are presented in Appendix B, Table 7.

Grade emerged as a significant source of variation $F(1,148) = 6.03, p < .01$. However, this main effect of Grade was qualified by a significant Grade x Town interaction, $F(2,148) = 3.82, p < .05$). A breakdown of this
Table 5
Mean Pattern Meanings Fluency Scores

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th></th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>Notel</td>
<td>15.7</td>
<td>18.2</td>
<td>20.9</td>
</tr>
<tr>
<td>Unitel</td>
<td>16.0</td>
<td>19.8</td>
<td>16.9</td>
</tr>
<tr>
<td>Multitel</td>
<td>18.0</td>
<td>18.6</td>
<td>27.2</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Notel</td>
<td>19.8</td>
</tr>
<tr>
<td>Unitel</td>
<td>16.4</td>
</tr>
<tr>
<td>Multitel</td>
<td>20.9</td>
</tr>
</tbody>
</table>
Table 6
Mean Pattern Meanings Uniqueness Scores

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th></th>
<th>Grade 7</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Notel</td>
<td>3.1</td>
<td>3.3</td>
<td>5.0</td>
<td>5.9</td>
</tr>
<tr>
<td>Unitel</td>
<td>3.2</td>
<td>5.1</td>
<td>3.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Multitel</td>
<td>2.5</td>
<td>3.5</td>
<td>9.1</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

Notel  | 4.4
Unitel | 3.4
Multitel | 5.0
interaction by analysis of simple main effects and subsequent Tukey pro-
cedure (See Appendix B, Table 8) revealed the following pattern of results.
From the point of view of a comparison between grades in each town, the
performance of children in Grades 4 and 7 differed only in Multitel (Grade
7 > Grade 4, p < .01). For both the Notel and Unitel towns, the Figural
Uniqueness scores for Grades 4 and 7 did not differ significantly. Analy-
sis of the same Grade x Town interaction from the point of view of a com-
parison among towns at each grade level revealed no significant differences
among towns for the Grade 4 children. However, at the Grade 7 age level,
children from Multitel gave more figural responses that were unique than
Unitel children (p < .01). There were no other significant pairwise com-
parisons.

To summarize, the results for the Figural (pattern meanings) measure
were somewhat more complex than the results from the alternate
uses measure. For the Figural Fluency scores the only significant source
of variation was a grade effect such that Grade 7 subjects gave more re-
sponses to figural items than Grade 4 subjects. For Figural Uniqueness,
Grade 7's performed better than Grade 4's only in Multitel. Furthermore,
no significant difference in Figural Uniqueness was obtained across towns
for the Grade 4 children. However, for the Grade 7 students, Unitel chil-
dren performed more poorly than Multitel children, and the performance of
children from Multitel and Notel did not significantly differ.

Intelligence Measures

Scoring for the Vocabulary and Block Design subtests of the WISC
followed the general procedures set down in the WISC manual. Raw Vocabu-
lary and Block Design scores were then converted to scaled score equivalents in accordance with the WISC manual procedures.

**Vocabulary**

The mean Vocabulary scaled scores for girls and boys in each grade in each town are presented in Table 7. Results from the analysis of variance performed upon these data are presented in Appendix B (Table 9).

Town emerged as a significant source of variation, $F(2,148) = 3.65$, $p < .03$. Subsequent analysis by the Tukey procedure (Appendix B, Table 10), revealed that children from Multitel performed significantly better on the Vocabulary subtest than children from Notel (Multitel > Notel, $p < .05$). As can be seen in Table 7, the performance of Unitel children fell roughly in the middle of the performance of children in Notel and Multitel.

Grade also emerged as a significant source of variation $F(1,148) = 6.77$, $p < .01$. Older (Grade 7) students had significantly lower mean Vocabulary scaled scores than did younger (Grade 4) students. This result is contrary to expectation. It should be noted that the raw scores of the older children were higher than the raw scores of the younger children. However, once the scores were scaled according to age, as is customary with the WISC subtests, this unexpected age difference in performance obtained.

**Block Design**

The mean Block Design scaled scores for boys and girls at each grade level in each town are presented in Table 8. Results from the analysis of variance performed upon these scores are presented in Appendix B (Table 11).
Table 7
Mean Vocabulary Scaled Scores

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th></th>
<th>Grade 7</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Notel</td>
<td>10.2</td>
<td>11.5</td>
<td>9.9</td>
<td>10.4</td>
</tr>
<tr>
<td>Unitel</td>
<td>11.7</td>
<td>11.8</td>
<td>10.9</td>
<td>8.2</td>
</tr>
<tr>
<td>Multitel</td>
<td>12.8</td>
<td>11.8</td>
<td>11.9</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Notel</td>
<td>10.4</td>
</tr>
<tr>
<td>Unitel</td>
<td>10.9</td>
</tr>
<tr>
<td>Multitel</td>
<td>11.8</td>
</tr>
</tbody>
</table>
Table 8

Mean Block Design Scaled Scores

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th></th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>Notel</td>
<td>11.4</td>
<td>10.5</td>
<td>11.8</td>
</tr>
<tr>
<td>Unitel</td>
<td>11.4</td>
<td>9.3</td>
<td>12.0</td>
</tr>
<tr>
<td>Multitel</td>
<td>12.5</td>
<td>10.3</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Notel</td>
<td>11.4</td>
</tr>
<tr>
<td>Unitel</td>
<td>10.9</td>
</tr>
<tr>
<td>Multitel</td>
<td>10.8</td>
</tr>
</tbody>
</table>
Sex emerged as the only significant source of variation, $F(1, 148) = 8.26, p < .01$. Male children had higher scores than female children on the Block Design subtest. This finding is consistent with past research in which boys do better than girls on certain tasks believed to have a spatial component (Maccoby, 1966). In their more recent review Maccoby and Jacklin (1974) report finding few recent studies employing the Block Design subtest, however, where new studies exist the findings are inconsistent, reporting either no sex difference or differences favouring males.

Correlational Analyses

In order to present tables showing the (Pearson product-moment) correlations among the ideational fluency measures, among the intelligence measures, and between the fluency and intelligence measures for the Grade 4 and 7 children (i.e., across the three towns), a pooled within groups covariance matrix was first obtained, from which a pooled within groups correlation matrix was computed for use in the tables. However, the Bartlett-Box homogeneity of dispersion test indicated heterogeneity of variance/covariance. For this reason median correlations were used. The median correlations among the ideational fluency measures for each grade are shown in Table 9. The correlations for the individual subgroups ranged widely, but all of the median correlations arising from those subgroups were positive ($r = .30$ to $.84$).

In Table 10, the correlations between children's alternate uses and pattern meanings fluency scores, and between their uses and pattern meanings uniqueness scores, are shown for each town x grade x sex subgroup. Of the 24 correlations, 14 were significant at the .01 level and
Table 9

Median Correlations Among the Ideational Fluency Measures

Grade 4

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fluency - Uses</td>
<td>.84</td>
<td>.70</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>Range*</td>
<td>(.50 to .93)</td>
<td>(.21 to .88)</td>
</tr>
<tr>
<td>2. Uniqueness - Uses</td>
<td>.76</td>
<td>.64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(.26 to .87)</td>
<td>(.60 to .80)</td>
</tr>
<tr>
<td>3. Fluency - Patterns</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(.50 to .86)</td>
<td></td>
</tr>
<tr>
<td>4. Uniqueness - Patterns</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade 7

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fluency - Uses</td>
<td>.78</td>
<td>.77</td>
<td>.61</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(-.03 to .86)</td>
<td>(.09 to .87)</td>
</tr>
<tr>
<td>2. Uniqueness - Uses</td>
<td>.50</td>
<td>.33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(-.05 to .75)</td>
<td>(-.02 to .91)</td>
</tr>
<tr>
<td>3. Fluency - Patterns</td>
<td>.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(.60 to .99)</td>
<td></td>
</tr>
<tr>
<td>4. Uniqueness - Patterns</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The range in this and all following tables comes from the 6 subgroups Town x Sex (3 x 2).
an additional 3 reached the .05 level of significance. Only 7 correlations failed to reach significance. For the total sample, the median fluency correlation was .75, and the median uniqueness correlation, .67. These results are similar to those of Wallach and Kogan (1965).

The median correlations between the two intelligence measures were positive for children in both Grade 4 and Grade 7 ($r = .30$). These findings for the intelligence measures are not surprising and simply reflect the already well-established fact that traditional measures of intelligence generally tap, in addition to more specific abilities, a cohesive dimension of individual variation.

The median correlations between the ideational fluency and intelligence measures for the two grades are presented in Table 11. The median correlations between these two kinds of measures for the Grade 7 children were generally low, ranging from .01 to .27. For the Grade 4 children, seven of the eight median correlations were relatively low (.01 to .24), but the median correlation between Block Design and Alternate Uses Fluency scores was surprisingly high ($r = .42$).

Discussion of First Phase Results

The first phase findings of low median correlations between the ideational fluency and intelligence measures, and higher median correlations within each set of measures for the Grade 7 children, were very similar to those obtained by Wallach and Kogan (1965) with fifth graders. Thus support was provided that the measures employed tapped dimensions of individual variation that were substantially independent at this age level. For the children in Grade four, median correlations within each type of
Table 10
Correlations Between Alternate Uses and Pattern Meanings Scores

<table>
<thead>
<tr>
<th></th>
<th>Fluency</th>
<th>Uniqueness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>.88**</td>
<td>.66**</td>
</tr>
<tr>
<td>Girls</td>
<td>.73*</td>
<td>.66*</td>
</tr>
<tr>
<td>Grade 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>.72**</td>
<td>.51*</td>
</tr>
<tr>
<td>Girls</td>
<td>.86**</td>
<td>.79**</td>
</tr>
<tr>
<td><strong>Unitel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>.66**</td>
<td>.60**</td>
</tr>
<tr>
<td>Girls</td>
<td>.21</td>
<td>.60</td>
</tr>
<tr>
<td>Grade 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>.08</td>
<td>.25</td>
</tr>
<tr>
<td>Girls</td>
<td>.64**</td>
<td>.24</td>
</tr>
<tr>
<td><strong>Multitel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>.75**</td>
<td>.75**</td>
</tr>
<tr>
<td>Girls</td>
<td>.65**</td>
<td>.39</td>
</tr>
<tr>
<td>Grade 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>.70**</td>
<td>.01</td>
</tr>
<tr>
<td>Girls</td>
<td>.87**</td>
<td>.91**</td>
</tr>
</tbody>
</table>

**p < .01  
* p < .05
Table 11
Median Correlations Between the Ideational Fluency and Intelligence Measures

Grade 4

<table>
<thead>
<tr>
<th></th>
<th>WISC Vocabulary</th>
<th>WISC Block Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fluency - Uses Range</td>
<td>0.12 (−0.36 to 0.79)</td>
<td>0.42 (0.03 to 0.49)</td>
</tr>
<tr>
<td>2. Uniqueness - Uses Range</td>
<td>0.22 (−0.23 to 0.43)</td>
<td>0.11 (−0.23 to 0.71)</td>
</tr>
<tr>
<td>3. Fluency - Patterns Range</td>
<td>0.20 (0.03 to 0.69)</td>
<td>0.24 (−0.26 to 0.84)</td>
</tr>
<tr>
<td>4. Uniqueness - Patterns Range</td>
<td>0.21 (−0.24 to 0.60)</td>
<td>0.13 (−0.30 to 0.74)</td>
</tr>
</tbody>
</table>

Grade 7

<table>
<thead>
<tr>
<th></th>
<th>WISC Vocabulary</th>
<th>WISC Block Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fluency - Uses Range</td>
<td>0.27 (−0.11 to 0.41)</td>
<td>0.08 (−0.05 to 0.22)</td>
</tr>
<tr>
<td>2. Uniqueness - Uses Range</td>
<td>0.01 (−0.14 to 0.26)</td>
<td>0.11 (−0.28 to 0.44)</td>
</tr>
<tr>
<td>3. Fluency - Patterns Range</td>
<td>0.20 (−0.08 to 0.36)</td>
<td>0.07 (−0.14 to 0.53)</td>
</tr>
<tr>
<td>4. Uniqueness - Patterns Range</td>
<td>0.20 (−0.17 to 0.51)</td>
<td>0.17 (−0.08 to 0.28)</td>
</tr>
</tbody>
</table>
measure also were positive, as expected. One of the median correlations
between the two sets of measures, however, was somewhat higher than ex-
pected. Subsequent to the 1965 Wallach and Kogan work, several cross-
sectional studies have been conducted providing evidence of the relative
independence of the Wallach-Kogan measures from traditional IQ measures
at various age levels (e.g., Pankove & Kogan, 1968; Ward, 1968; Cropley &
Maslany, 1969; Wallach & Wing, 1969; Williams & Fleming, 1969). The cur-
rent findings were the first providing evidence on this issue for chil-
dren at the Grade 4 and Grade 7 age levels, hence it was not possible to
make direct comparisons with past studies. Data collected from the Phase
Two cross-sectional sample, however, should provide such an opportunity.

The sex difference in performance on the Block Design subtest (i.e.,
boys obtained higher mean scaled scores than girls), was consistent with
past studies (Maccoby, 1966; Maccoby and Jacklin, 1974), as were the sub-
stantial median intercorrelations within the intelligence measures and within
the Wallach-Kogan measures. One question that arises is the representa-

ness of the towns in the present study vis-a-vis North American towns in
general. To the degree that widely held findings are replicated, new ones
gain credibility. Thus, these replications of results from previous stu-
dies lend credibility to those aspects of the present study which provide
new information, namely the results from both the ideational fluency and
the intelligence measures as they relate to television exposure.

Considering intelligence first, the pattern of results concerning the
relationship between exposure to television and performance on the two
measures of intelligence was as expected. In general, children growing up
in the towns with television had higher vocabulary scores than the children
in the town without television. There were, however, no significant dif-
ferences among the mean Block Design scores obtained by the children in the three towns. These findings are consistent with the reasoning that to the extent that intelligence is environmentally determined, television serves as a stimulus for aspects of verbal intellectual development related to information accumulation, but does not necessarily affect other aspects of intellectual development.

The vocabulary findings from Time 1 were similar to those of Schramm, Lyle, and Parker (1961) in one respect. They found that children growing up with television appear to come to school with about a one-year advantage in vocabulary over children growing up without television. The vocabulary advantage of the television children in the present study was also about one year. The Time 1 findings differ from those of Schramm et al., in another respect. When assessing older children in the sixth and tenth grades, Schramm et al., found that the children in the two towns "Radiotown" and "Teletown" did not differ in vocabulary level. In other words, the television-related vocabulary advantage held only for children entering school. In the present study the one-year vocabulary advantage seen in the Grade 4 children from the two television towns was also shown by the Grade 7 children. It is difficult to speculate on this discrepancy in findings with only two studies as a basis for comparison, but Time 2 data should provide further information on the question concerning age-related differences in the relationship between television and vocabulary scores.

The Alternate Uses ideational fluency results provided strong support for the hypothesis that fluency and uniqueness in generating alternate uses is affected by television exposure. The children growing up in the town without television had significantly higher Alternate Uses fluency and Uniqueness scores than did the children from either of the two towns
with television. This finding is especially interesting in light of the results reported above for the WISC Vocabulary scores. Although the children from the two television towns scored highest on the verbal measure of intelligence, they did not also earn higher Uses fluency and uniqueness scores. On the contrary, it was the children who did least well on the Vocabulary subtest (Notel subjects) who did best on the fluency and uniqueness of uses measure. It can thus be concluded that although both of the procedures designed for studying ideational fluency and uniqueness require the exercise of verbal skill, the child's ability to display ideational fluency and uniqueness has little to do with whether or not the child exhibits the behaviour that will earn him or her a high score on a vocabulary test. This finding that the relationship between television and Uses ideational fluency was diametrically opposite to the relationship between television and WISC vocabulary scores provides a further demonstration of the relative independence of ideational fluency from verbal intelligence as measured in a vocabulary test.

The pattern of results for the figural measure of ideational fluency (pattern meanings procedure) were unexpected, and in sharp contrast to those for the alternate uses procedure. The only consistent pattern to emerge was an age difference in performance such that Grade 7 children in all three towns obtained higher Figural Fluency scores than Grade 4 children. In the case of Figural Uniqueness, this age difference occurred in Multitel only, while among the Grade 7 students those in Unitel produced fewer unique responses than students in Notel, and significantly fewer than those in Multitel.

The diversity in results between the Uses and Patterns measures was the more perplexing since, as reported earlier, for the sample as a whole
the two indices (fluency and uniqueness) derived from the alternate uses procedure were substantially correlated with the two indices (fluency and uniqueness) derived from the pattern meanings procedure (see Table 10). Thus the pattern of relationships within each town was the same.

Phase One of the present study was conducted in the hope of clarifying the relationship of television exposure to cognitive development in young children. The Time 1 results suggest that television exposure has differential effects on performance on the two types of measures (ideational fluency and intelligence) employed. In terms of intelligence, the Time 1 findings are not inconsistent with the hypotheses of a positive relationship between television viewing and WISC Vocabulary scores, and no relationship between television and WISC Block Design scores. The relationship between television and ideational fluency was complicated by the type of stimulus material employed. In the case of the Alternate Uses task, children growing up without television obtained significantly higher mean ideational fluency and uniqueness scores than children growing up with television. In the case of the Pattern Meanings task, no clear relationship between television exposure and ideational fluency emerged. Data collected during Phase Two provide an excellent opportunity to clarify Time 1 findings.

Second Phase

Two years and four months after the collection of Phase One data, the three towns were studied again. At the time of Phase Two data collection television had existed in Notel for over two years. Thus it is possible to compare Time 1 scores obtained by Notel children on mea-

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8When the smallest subgroups are considered, 7 of the possible 24 correlations do not reach the .05 level of significance (see Table 10). This finding undoubtedly reflects the lability of correlations for small samples.
sures of both ideational fluency and intelligence, with those obtained by these same children after they had been viewing television for two years. Similar longitudinal data were also obtained in Unitel and Multitel. In addition, data were collected from a second cross-sectional sample of children in each of the three towns. Based on Time 1 findings, Second Phase hypotheses were generated. However, given the pioneering nature of the present study, less consideration was given prior to Phase Two data collection to formulating highly specific hypotheses, than to a consideration of possible patterns of effects that would be interpretable. These are discussed below.

Second Phase: Hypotheses

The question of whether there would be changes in the ideational fluency scores of Notel children after a period of two years was a difficult one. To date, hardly any work has been done on the developmental history of ideational fluency. Wallach and Kogan speculated in their 1965 volume that the associative mode constitutes a basic underpinning which emerges quite early in the child's life. They considered whether there might be "critical periods" in the ontogeny of the associative mode of thinking. These speculations are in keeping with the implication in the general creativity literature that "creativity" is a fairly constant trait (e.g., the research emphasis on delineating the early experience of adults judged to be highly creative).

One attempt to examine the long-term stability of ideational fluency, when assessed with the Wallach-Kogan tasks, was made by Kogan and Pankove

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9 In their study Kogan and Pankove referred to the Wallach-Kogan tasks as measures of "creativity", as is commonly the case in the creativity literature.
(1972) when a subsample of the fifth-grade children studied by Pankove and Kogan (1968) was re-examined five years later in the tenth grade. Subjects for the study were drawn from two school systems; in one, individual testing was carried out, while in the other males and females were examined separately in groups. In both school systems male and female examiners were used for male and female subjects respectively. The results were complex and less than definitive. Reporting that they found no consistent increase or decrease in fluency and/or uniqueness over the 5-year period, Kogan and Pankove concluded that the testing context had differential effects on males and females. Their conclusion was based on the finding that males demonstrated greatest stability in the group testing context, while for females those tested individually showed greatest stability. In fact the overall fluency level of male tenth-graders in the individual administration by a male examiner condition declined to a near-significant extent from the prior fifth-grade level. Concerning this result Kogan and Pankove stated, "A performance decline of the kind obtained is unusual across the age span studied for a cognitive dimension, and ... points to the presence of some inhibitory interpersonal influence for the individual testing context where adolescent males are concerned" (p. 431). Although Kogan and Pankove speculated considerably about their findings, they also acknowledged that generalizations concerning long-term stability of an associative creativity dimension must await further longitudinal work.

It is interesting in light of the Kogan and Pankove findings to consider the work of Torrance, who has long been interested in the role of
socialization training in creative functioning and development. Torrance (1975) commented: "Early in my research it came to my attention that there are disturbing drops in creative functioning at about ages 5, 9, and 13—at times when there are customarily increased socialization pressures in the dominant, affluent culture of the United States... When I began studying this development in other cultures (1967), it seemed fairly clear that drops in creative functioning occurred in almost all cultures whenever and wherever there are increased socialization pressures and sharp discontinuities. No drops occurred, however, in a black segregated school in middle Georgia and in schools in Western Samoa." (p. 290).

Although the longitudinal work of Kogan and Pankove (1972) and Torrance (1967; 1975) is instructive, it is less than conclusive and specific hypotheses for Phase Two of the present study remained difficult to make. In terms of change in the three towns, Notel had now had television for over two years, quality of reception had been improved in Unitel, and in Multitel, quality of reception and number of channels received remained unchanged. One of the difficulties to be considered is that developmental effects can be confounded with the effects of television on the dependent variables. That is, if we do not know the developmental history of performance on a dependent variable (as is the case for the ideational fluency measures in the present study), it is difficult to know whether observed changes are due to developmental change, to the effects of television, or to a complex interaction between these factors. But, because the present study was both longitudinal and cross-sectional, it was possible to sort out some of these effects, by comparisons for example of the performance of same-aged subjects at Time 1, Time 2, and across time, with the
performance of longitudinal subjects. In light of this problem, it was important to consider the Time 1 age (Grade) differences in performance relative to the amount of television viewed (Town). The performance of Multitel children could be instructive in this regard since of the three towns, it had undergone the least change from Time 1 to Time 2, and therefore served as the best approximate control.

Cross-Sectional Comparisons Between Towns (Time 2) and Within Towns (Time 1 with Time 2)

Measures of Ideational Fluency

Alternate Uses

Multitel and Unitel

Since Multitel had had no change in the television variable (i.e., quality of reception or number of channels received), the scores of the Time 2 cross-sectional sample were not expected to differ significantly from those of the same-aged children at Time 1. Television reception in Unitel was improved subsequent to the collection of Time 1 data. However, as there were no significant differences in the performance of Unitel and Multitel children at Time 1, none were anticipated at Time 2. The only age difference in performance on the Alternate Uses task occurred in the fluency scores of males; in all towns, Grade 7 males obtained higher fluency scores than did Grade 4 boys. However, there was no age difference among females on Alternate Uses fluency scores and no age difference for either sex on Uses uniqueness scores. Thus, it was difficult to speculate whether age differences in Alternate Uses scores would occur for Time 2 boys or not.
Notel children had now been viewing television for over two years. In terms of the cross-sectional sample this meant that the Grade 4 subjects began viewing television in Grade 2, and the Grade 7 subjects were fifth-graders when television became available. The question was whether after two years of television viewing, the Alternate Uses fluency scores of these children would remain significantly higher than those of the children in Multitel and Unitel, or whether they would show decreases relative to their same-aged Time 1 counterparts. The answer to this question depended partly on whether the impact of television viewing on ideational fluency exerts effects rapidly (in two years or less), or whether the effects occur more slowly. The effects of viewing on ideational fluency seemed more likely to be displacement effects rather than content effects. That is, they seemed more likely to occur as a result of time taken from other activities in order to view TV than as a result of what specifically was viewed. If the effects of displacement are rapid, the scores of these children would show decreases relative to their Time 1 counterparts. However, if displacement effects occur more slowly, relatively little change would be shown (i.e., their scores would remain significantly higher than those of Multitel and Unitel children). In addition to the effects of displacement, developmental differences also had to be considered. For example, displacement effects might occur much more rapidly for very young children. An age difference in performance by Notel cross-sectional subjects at Time 2, such that decreases would be shown by the Grade 4 children (who were in Grade 2 when TV arrived), but
not by the Grade 7 children (who were in Grade 5 when TV arrived) would be consistent with such an interpretation.

**Longitudinal Comparisons (Time 1 with Time 2)**

At Time 2 longitudinal subjects were in Grades 6 and 9.

**Multitel and Unitel**

There seemed no reason to expect either consistent increases or decreases in Uses fluency scores for longitudinal subjects in Multitel or Unitel who were now in Grade 6. The Grade 9 students, however, might have shown changes, since as pointed out previously, testing context, socialization training or other factors might affect performance.

Furthermore, if the age difference in Time 1 fluency scores for males is considered, it might be expected that this difference would be reflected in the fluency scores of Grade 6 subjects, such that there would be an age difference in the fluency scores of males (i.e., when Time 2 cross-sectional subjects in Grade 4 and 7 were compared to Time 2 longitudinal Grade 6 subjects within towns, the differences might order themselves by age). Based on Time 1 findings, this age difference would not be expected for females, since at Time 1 the younger subjects performed as well as the older subjects.

**Notel**

Notel longitudinal subjects had been viewing television since Grades 4 and 7. Since, at Time 1, there were no age differences for females in Uses fluency scores, one might expect the fluency scores of Grade 6 females to remain as high as those of Time 1 Notel children. For males, fluency scores obtained by the Grade 6's might be higher than at Time 1 (when these subjects were in Grade 4), if the age difference observed was main-
tained. On the other hand, if there were changes (decreases) in scores relative to the Time 1 performance of these Grade 6 children, it would be of interest to compare such changes to the Time 2 cross-sectional Notel subjects. Such a comparison could serve to illuminate television effects, particularly if there were changes in the scores of both these groups of Notel children. Concerning the Grade 9 Notel subjects, decreases in fluency scores might appear because of situational factors (e.g., testing context, socialization pressures, or other factors).

Pattern Meanings Task

Since at Time 1 no effect of television (no town differences) was found for figural items (the only difference was a grade difference), there was no reason to expect that there would be town differences at Time 2 on figural measures, for either cross-sectional or longitudinal subjects.

Intelligence Measures

Vocabulary

Cross-Sectional and Longitudinal Comparisons

Multitel and Unitel

No consistent increases or decreases were expected in the vocabulary scores of Multitel children. Since television reception in Unitel had been improved, it was possible that these children would show gains in vocabulary scores at Time 2.

Notel

The effects on vocabulary scores of viewing television seemed likely to be content effects (i.e., related to information accumulation), rather
than displacement effects. If these kinds of effects occur rapidly (i.e., within 2 years or less), general increases might be shown in the scores of Notel children. No change in the scores of Notel children would suggest that the effects are slower. Another point to consider when looking at the pattern of results is the finding of Schramm et al. (1961) that the gain shown by TV children is relatively short-lived (i.e., the gain shown by their Grade 1 Teletown children was not maintained by children in Grades 6 and 10). Although the Time 1 vocabulary results of the present study did not confirm such a finding (there were no town x age differences in vocabulary scores), the age span of Time 2 subjects was wider and thus there was further opportunity to make comparisons with the Schramm et al. (1961) findings.

Block Design

The block design scores of children in the three towns were not expected to differ from Time 1 to Time 2, since they didn't differ at Time 1.

Relationship Among Ideational Fluency Measures, Among Intelligence Measures, and Between Fluency and Intelligence Measures

It was expected that the findings of Wallach and Kogan (1965) and of Phase One of the present study, in which low correlations between the ideational fluency and intelligence measures and high correlations within each set of measures were obtained, would be replicated.

Second Phase: Method

Towns

Phase Two of the study was conducted in the same three British
Columbia communities as Phase One. In all three towns the time lag was 2 years and four months from Time 1 to Time 2. Television reception (CBC) was acquired by Notel during the Fall of 1973, very soon after the collection of Phase One data. Virtually all residents of Notel had acquired television sets within a month of the arrival of reception. Tables 12, 13, and 14 provide the information for the three towns at Time 2 regarding viewing hours per week. The Time 1 viewing hours are also included in the tables to facilitate comparisons across time. While the mean viewing time reported for Notel children at Time 1 was 5.4 hours per week (median = 0), at Time 2 the reported mean viewing time per week was 24.5 (median = 23.5).

Subjects

Two samples of subjects were used in all three towns. Children in Grades 4 and 7 provided a cross-sectional comparison with data collected in those grades during the first phase of the project. In addition the same children tested in the first phase (now in Grades 6 and 9) were tested again to provide a longitudinal sample.

A total of 283 children from the three towns served as subjects. Fifty-one of these children, 24 from Grade Four (14 males and 10 females) and 27 from Grade Seven (12 males and 15 females), constituted the cross-sectional sample from Notel. Of the 49 Notel longitudinal subjects, 24 (15 males and 9 females) were in Grade 6, and 25 (12 males and 13 females) were in Grade 9. Only 9 of the original 58 Notel subjects (15%) were lost from the sample.

In Unitel 89 children served as subjects. Forty-four of the children, 20 from Grade Four (11 males and 9 females) and 24 from Grade Seven (9
Table 12

Reported Hours of Television Viewing for Notel

<table>
<thead>
<tr>
<th>Hours/week</th>
<th>Proportion of Subjects</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1 (n=58)</td>
<td>Time 2 (n=91)</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>0</td>
<td>34 (58.6)</td>
<td>0</td>
</tr>
<tr>
<td>1-6</td>
<td>12 (20.7)</td>
<td>2  (2.2)</td>
</tr>
<tr>
<td>7-12</td>
<td>4 (6.9)</td>
<td>5  (5.5)</td>
</tr>
<tr>
<td>13-18</td>
<td>2 (3.5)</td>
<td>14 (15.4)</td>
</tr>
<tr>
<td>19-24</td>
<td>1 (1.7)</td>
<td>24 (26.4)</td>
</tr>
<tr>
<td>25-30</td>
<td>4 (6.9)</td>
<td>16 (17.6)</td>
</tr>
<tr>
<td>31-36</td>
<td>0</td>
<td>18 (19.8)</td>
</tr>
<tr>
<td>37-42</td>
<td>1 (1.7)</td>
<td>5  (5.5)</td>
</tr>
<tr>
<td>43-48</td>
<td>0</td>
<td>4  (4.4)</td>
</tr>
<tr>
<td>49-54</td>
<td>0</td>
<td>3  (3.3)</td>
</tr>
<tr>
<td>Mean</td>
<td>5.4 hours/week</td>
<td>24.5 hours/week</td>
</tr>
<tr>
<td>Median</td>
<td>0</td>
<td>23,5</td>
</tr>
<tr>
<td>Hours/week</td>
<td>Proportion of Subjects</td>
<td>Time 1 (n=53)</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
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</tr>
<tr>
<td>1-6</td>
<td>0</td>
<td>1 (1.3)</td>
</tr>
<tr>
<td>7-12</td>
<td>4 (7.6)</td>
<td>7 (8.9)</td>
</tr>
<tr>
<td>13-18</td>
<td>5 (9.4)</td>
<td>9 (11.4)</td>
</tr>
<tr>
<td>19-24</td>
<td>9 (17.0)</td>
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<td>17 (32.0)</td>
<td>18 (22.8)</td>
</tr>
<tr>
<td>31-36</td>
<td>9 (17.0)</td>
<td>13 (16.5)</td>
</tr>
<tr>
<td>37-42</td>
<td>7 (13.2)</td>
<td>7 (8.9)</td>
</tr>
<tr>
<td>43-48</td>
<td>1 (1.9)</td>
<td>3 (3.8)</td>
</tr>
<tr>
<td>49-54</td>
<td>1 (1.9)</td>
<td>2 (2.5)</td>
</tr>
<tr>
<td>Mean</td>
<td>23.9 hours/week</td>
<td>26.2 hours/week</td>
</tr>
<tr>
<td>Median</td>
<td>28.5</td>
<td>24.5</td>
</tr>
</tbody>
</table>
### Table 14

Reported Hours of Television Viewing for Multitel

<table>
<thead>
<tr>
<th>Hours/week</th>
<th>Proportion of Subjects</th>
<th>Time 1 (n=49)</th>
<th>Time 2 (n=80)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-6</td>
<td>0</td>
<td>3 (3.8)</td>
<td></td>
</tr>
<tr>
<td>7-12</td>
<td>0</td>
<td>1 (1.3)</td>
<td></td>
</tr>
<tr>
<td>13-18</td>
<td>4 (8.2)</td>
<td>2 (2.5)</td>
<td></td>
</tr>
<tr>
<td>19-24</td>
<td>13 (26.5)</td>
<td>16 (20.0)</td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>9 (18.4)</td>
<td>18 (22.5)</td>
<td></td>
</tr>
<tr>
<td>31-36</td>
<td>8 (16.3)</td>
<td>16 (20.0)</td>
<td></td>
</tr>
<tr>
<td>37-42</td>
<td>6 (12.2)</td>
<td>11 (13.8)</td>
<td></td>
</tr>
<tr>
<td>43-48</td>
<td>5 (10.2)</td>
<td>8 (10.0)</td>
<td></td>
</tr>
<tr>
<td>49-54</td>
<td>3 (6.1)</td>
<td>2 (2.5)</td>
<td></td>
</tr>
<tr>
<td>53-60</td>
<td>1 (2.0)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>61-66</td>
<td>0</td>
<td>2 (2.5)</td>
<td></td>
</tr>
<tr>
<td>67-72</td>
<td>0</td>
<td>1 (1.3)</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>26.9 hours/week</td>
<td>31.0 hours/week</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>29.0</td>
<td>30.5</td>
<td></td>
</tr>
</tbody>
</table>
males and 15 females), constituted the cross-sectional sample. Of the Unitel longitudinal subjects, 22 (15 males and 7 females) were in Grade 6 and 24 (9 males and 15 females) were in Grade 9. Only 7 of the original 53 Unitel subjects (13%) were lost from the sample.

The remaining 93 children were Multitel residents. Of these children, 26 in Grade Four (15 males and 11 females), and 25 in Grade Seven (12 males and 13 females), constituted the cross-sectional sample. The longitudinal sample consisted of 44 students, 18 of these in Grade Six (9 males and 9 females) and 24 in Grade Nine (10 males and 14 females). Only 7 subjects (14%) were lost from the original (Time 1) Multitel sample (see Table 15).

As was the case for Phase One subjects, only those children who had resided in their particular town for at least three years were included in the study.

Each child was interviewed extensively concerning his or her television viewing habits (See Appendix A, Table 2).

**Dependent Variables**

The measures of intelligence used were again the Vocabulary and Block Design subtests of the WISC.

The ideational fluency measures for subjects in the cross-sectional sample were again the five Alternate Uses and five Pattern Meanings items adapted from Wallach and Kogan (1965) (See Figure 1, p. 25).

Due to limitations of time, and given the high reliability of the Wallach and Kogan tasks, only four items of the Alternate Uses and four of the Pattern Meanings procedures were given to the longitudinal
Table 15
Number of Subjects in each Cross-Sectional and Longitudinal Subgroup at Time 2

<table>
<thead>
<tr>
<th>Cross-Sectional Sample (n = 146)</th>
<th>Grade 4</th>
<th></th>
<th>Grade 7</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Note1</td>
<td>14</td>
<td>10</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Unitel</td>
<td>11</td>
<td>9</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Multitel</td>
<td>15</td>
<td>11</td>
<td>12</td>
<td>13</td>
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</table>

<table>
<thead>
<tr>
<th>Longitudinal Sample (n = 137)</th>
<th>Grade 6</th>
<th></th>
<th>Grade 9</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Note1</td>
<td>15</td>
<td>9</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Unitel</td>
<td>15</td>
<td>7</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Multitel</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>
subjects. In order to avoid total confounding of time/television/developmental change with the effects of testing, of these four items, as two were the same/items administered at Time 1 (shoe and button) and two were new items (chair and car tire). Longitudinal subjects were also given an additional verbal (similarities) (See ps.68-69) and figural (Lines) task (see Figure 2). Given the high reliability of the tasks, and due to time limitations, only two items were administered from each of the Similarities and Lines tasks. Since only one verbal and one figural procedure--uses and patterns, respectively--had been administered to these subjects previously, it was possible to examine stability over the 2-year period for tasks taken previously and tasks encountered for the first time.

Procedure

Due to the large number of subjects to be tested, and given the amount of time (30 to 60 minutes) necessarily spent with each subject, in conjunction with the expense of lodging in the three communities, two additional experimenters (one male and one female) were trained for Phase Two data collection. However, due to the suggestion in the Kogan and Pankove (1972) study that the performance of male subjects in the individual testing-male examiner context may have been influenced unduly, only female examiners were used for the Grade 9 subjects.

The procedure for the cross-sectional sample (Grade 4 and Grade 7 subjects) was the same as the procedure for Time 1 subjects (see pgs.26-29). A slight change was made in the introductory remarks to the longitudinal subjects. There was no mention made to these subjects of the tasks being "games" as it was assumed that particularly the Grade 9 students
Figure 2

Line Meanings Items Used at Time 2

1.

2.
would be highly skeptical of such a statement. Longitudinal subjects were informed that the present work was a continuation of the study in which they had participated 2 years previously. The examiner's purpose, as communicated to these subjects, concerned stability and change in thinking processes over time.

The order of presentation of dependent variables for all Time 2 subjects was exactly the same as that for Time 1 subjects, (see p.26). The additional verbal ideational fluency task (Similarities) given to longitudinal subjects was administered immediately following the Alternate Uses task. The additional figural ideational fluency task (Lines) given to these subjects was administered following the Pattern Meanings task.

The general instructions for the new Similarities task given to longitudinal subjects were:

This time I am going to name two objects, and I will want you to think of all the ways that these two objects are alike. I might name any two objects -- like door and chair. But whatever I say, it will be your job to think of all the ways that the two objects are alike. For example, tell me all the ways that an apple and an orange are alike. (The subject then responded). That's very good. You've already said a lot of things I was thinking of. I guess you could also say that they are both round, and they are both sweet, they both have seeds, they both are fruits, they both have skins, they both grow on trees -- things like that. Yours were fine, too. (The experimenter's suggestions were varied so as not to include any which the child had given). Do you see how this one goes? (If clear understanding of the procedure was demonstrated
by the subject, the last sentence was replaced by, I can see that you already understand this one). Well, let's begin now. And remember each time I name two objects, you name as many ways as you can that these two objects are alike.

The experimenter's responses to the example were once again given in such a manner as to convey a tone of suggestion rather than finality.

The two items in this procedure, in their order of administration were as follows:

1. "Tell me all the ways in which milk and meat are alike."
2. "Tell me all the ways in which a curtain and a rug are alike."

The procedure for the additional figural ideational fluency task (Lines) was introduced to the longitudinal subjects as follows:

This one is about lines. I am going to show you some lines and after you have looked at each one, I want you to tell me all the things it makes you think of. Now take your time, and be sure that when you look at the line you tell me what the whole line makes you think of, and not just a part of it. O.K.? Here is the first line. You can turn it any way you want to. Tell me all the things you can about it. What does it make you think of?

After the student indicated that s/he had completed his or her suggestions for the first line, the experimenter introduced the next stimulus card, again reminding the child that s/he could turn it any way s/he wished. Each line was presented on a separate 4 in. x 6 in. card. (see Figure 2).
Scoring

Scoring for Time 2 data followed the same general procedure outlined for Phase One data (see P. 29-30), with the exception that uniqueness scores were not calculated for Time 2 ideational fluency tasks. Previous research with the Wallach and Kogan measures (Wallach & Kogan, 1965; Pankove & Kogan, 1968; Kogan & Pankove, 1972) has demonstrated that fluency (number of responses) and uniqueness (number of unique responses) are such highly correlated variables that little additional information is gained from calculating both scores. Inter-rater reliability was calculated in the same manner as at Time 1 (see P. 30). As was the case for Time 1 data, two scorers working independently and using responses to all items by 30 subjects reached 100% agreement on fluency scores. Agreement on Time 2 Vocabulary scores was 97.5%. As was the case at Time 1, raw Vocabulary and Block Design scores were converted to scaled score equivalents in accordance with the WISC manual procedures.

Second Phase: Results

Presentation of the Time 2 results begins with those from the ideational fluency measures, followed by those from the intelligence measures. For each dependent variable, within each of these sections, results from the analyses of the cross-sectional data are presented first, followed by those from the longitudinal analyses. This organization was chosen in order to facilitate a comparison of the results for each dependent variable between the cross-sectional and longitudinal findings.

Since there was one score for each child from each of the two types of ideational fluency measures (Alternate Uses and Pattern Meanings), and one score from each of the two intelligence measures (a Vocabulary scaled
score - and a Block Design scaled score), four separate $3 \times 2 \times 2 \times 2$ between subject analyses of variance using the unweighted means solution were performed on the cross-sectional data.

Similarly, separate $3 \times 2 \times 2 \times 2$ repeated measures analyses of variance using the unweighted means solution were performed on the longitudinal data with Time as a within subject factor.

In addition, correlative analyses among the ideational fluency and intelligence measures, and between these two sets of measures were carried out. Results from the correlative analyses are presented in the final portion of the results section.

Ideational Fluency Measures

Alternate Uses Task

Cross-Sectional Sample

The mean numbers of Alternate Uses fluency responses by boys and girls at each grade level, in each town, at each time, are presented in Table 16. Results from the analysis of variance performed with these data are presented in Appendix C, Table 1.

Four significant sources of variation emerged from this analysis. The first was the effect of Town $F(2,282) = 3.68, p < .03$, and the second was the effect of Time $F(1,282) = 4.93, p < .03$. These main effects were qualified, however, by a significant Town x Time interaction, $F(2,282) = 3.90, p < .02$, which was of course of critical interest. A graphical presentation of this result is presented in Figure 3.

$^{10}$Although presentation of the Time 1 portion of the across-time cross-sectional analyses is redundant (since they have already been presented earlier in the paper); they will be briefly reconsidered here wherever appropriate, in order to facilitate comparison with the Time 2 findings.
Table 16

Mean Alternate Uses Fluency Scores for the Cross-Sectional Sample

<table>
<thead>
<tr>
<th>Grade</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$T_1$</td>
<td>$T_2$</td>
</tr>
<tr>
<td>Grade 4</td>
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<td></td>
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<tr>
<td>Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note1</td>
<td>24.5</td>
<td>25.9</td>
</tr>
<tr>
<td>Unite1</td>
<td>18.8</td>
<td>27.1</td>
</tr>
<tr>
<td>Multite1</td>
<td>20.9</td>
<td>18.2</td>
</tr>
<tr>
<td>Grade 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
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<td></td>
</tr>
<tr>
<td>Note1</td>
<td>35.6</td>
<td>25.1</td>
</tr>
<tr>
<td>Unite1</td>
<td>25.4</td>
<td>22.8</td>
</tr>
<tr>
<td>Multite1</td>
<td>26.6</td>
<td>20.3</td>
</tr>
</tbody>
</table>
Figure 3

Town by Time Interaction for Alternate Uses Scores

Mean Alternate Uses Fluency Scores

Unitel
Notel
Multitel

Time 1
Time 2
A breakdown of the Town x Time interaction by simple main effects analysis (Appendix C, Table 2), and subsequent Tukey procedure (Appendix C, Table 3), revealed a significant effect of time for Notel only, $F(1,282) = 12.24$, $p < .01$. Thus, the Alternate Uses fluency scores of Time 2 Multitel and Unitel children did not differ significantly from those of their same-aged Time 1 counterparts, but Time 2 Notel children had significantly lower mean Alternate Uses fluency scores than their same-aged counterparts at Time 1. This same interaction examined from the point of view of a comparison among the towns at each time showed no significant difference among the towns at Time 2, $F(2,282) = 1.17$, $p > .10$. This result contrasts with the significant difference found among towns at Time 1, when Notel children had higher mean Alternate Uses fluency scores than did children in Unitel and Multitel, and the scores of children in these latter two towns did not differ significantly.

The main effect of Time was further qualified by its significant interaction with Grade and Sex, $F(1,282) = 5.93$, $p < .02$. A breakdown of this interaction by analysis of simple (simple) main effects (Appendix C, Table 4) from the point of view of a comparison across time for each level of Grade and Sex, showed a significant difference across time both for females in Grade 4, $F(1,282) = 5.94$, $p < .02$; and for males in Grade 7, $F(1,282) = 4.22$, $p < .05$. In both these groups the scores of Time 2 children were significantly lower than those of their Time 1 counterparts. It is, however, important to note that in Notel (the only town for which the change over time was significant) it was only in the case of Grade 4 boys that Time 1 performance did not surpass that at Time 2.
Longitudinal Sample

As described in the Time 2 method section of the present paper, there was a slight change in the format of the ideational fluency tasks given to the longitudinal sample of children at Time 2. These children had been administered five items from the Alternate Uses task, and five from the Pattern Meanings task at Time 1, but at Time 2, due to time considerations and given the high reliability of the tasks, only four items from each task were administered. Since it seemed possible that practice effects might occur with tasks of this nature, two of the items given at Time 2 were the same as those given at Time 1, and two were different.

Results from the repeated measures analysis of variance using scores from the two items which were the same at Time 1 and Time 2 are presented in Appendix C, Table 5. Two significant sources of variation emerged from this analysis. The first was the effect of Time, $F(1,125) = 4.01$, $p < .05$. Time 1 performance (mean = 8.8) significantly surpassed performance at Time 2 (mean = 7.8). The main effect of time was qualified by an interaction with Grade, $F(1,125) = 5.47$, $p < .03$. A breakdown of this interaction by analysis of simple main effects (Appendix C, Table 6) revealed a significant effect of Time for the older group of students only.

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11 As described earlier, the longitudinal sample was comprised of the children in the Time 1 sample (Grades 4 and 7) who were still available two years later (Grades 6 and 9). Eighty-six percent (137 of the original 160 children) were available for retesting.

12 The concern with possible practice effects was not substantiated by the remarks made by the children during the Phase Two testing sessions. Most of them seemed to remember only vaguely having been tested during Phase One.
\[ F(1,125) = 9.92, \ p < .01, \] such that their Time 2 scores (Grade 9) were significantly lower than their Time 1 scores (Grade 7). When this interaction was examined from the point of view of a comparison among the Groups at each time, there was no significant difference between the younger and older groups of children at Time 1 (Grades 4 and 7), \( F(1,125) = 2.82, \ p > .10 \); or at Time 2 (Grades 6 and 9), \( F(1,125) = 1.92, \ p > .10 \). Most notable regarding this analysis was the lack of a significant Town x Time interaction (see Table 17, for the means for each town at each time) paralleling that which appeared in the cross-sectional analysis.

Pattern Meanings Task

Cross-Sectional Sample

The mean numbers of Pattern Meanings fluency responses by boys and girls at each grade level in each town at each time are presented in Table 18. Results from the analysis of variance performed upon these data are presented in Appendix C, Table 7.

Two significant sources of variation emerged from this analysis. The first was a main effect of Grade, \( F(1,282) = 3.92, \ p < .05 \). As was the case at Time 1, older (Grade 7) children had higher mean Pattern Meanings scores than did younger (Grade 4) children.

A second significant source of variation emerging from the cross-sectional analysis of the Pattern Meanings scores was a Town x Time interaction, \( F(2,282) = 3.26, \ p < .04 \). A breakdown of this interaction by analysis of simple main effects (Appendix C, Table 8) revealed a significant change over time for Unitel only, \( F(2,282) = 5.56, \ p < .05 \), with Time 2 Unitel children obtaining higher Pattern Meanings scores than their
<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Time 2</th>
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<tr>
<td>Note1</td>
<td>9.9</td>
<td>7.7</td>
</tr>
<tr>
<td>Unitel</td>
<td>7.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Multitel</td>
<td>8.5</td>
<td>8.1</td>
</tr>
</tbody>
</table>

n = 137
Table 18

Mean Pattern Meanings Fluency Scores for the Cross-Sectional Sample

<table>
<thead>
<tr>
<th></th>
<th>Grade 4 Boys</th>
<th>Grade 4 Girls</th>
<th>Grade 7 Boys</th>
<th>Grade 7 Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( T_1 )</td>
<td>( T_2 )</td>
<td>( T_1 )</td>
<td>( T_2 )</td>
</tr>
<tr>
<td>Notel</td>
<td>15.8</td>
<td>20.21</td>
<td>18.2</td>
<td>20.7</td>
</tr>
<tr>
<td>Unitel</td>
<td>16.0</td>
<td>28.36</td>
<td>19.9</td>
<td>16.8</td>
</tr>
<tr>
<td>Multitel</td>
<td>18.0</td>
<td>16.07</td>
<td>18.7</td>
<td>17.7</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notel</td>
<td>19.9</td>
<td>22.4</td>
</tr>
<tr>
<td>Unitel</td>
<td>16.9</td>
<td>22.1</td>
</tr>
<tr>
<td>Multitel</td>
<td>20.9</td>
<td>18.4</td>
</tr>
</tbody>
</table>
Time 1 counterparts. A comparison across Towns at Time 2 showed no significant difference among towns. This finding is consistent with the absence of a significant difference among the towns at Time 1 on this measure.

Longitudinal Sample

Results from the repeated measures analysis of variance using scores from the two Pattern items which were the same at Time 1 and Time 2 are presented in Appendix C, Table 9.

As there were no town differences in Pattern Meanings scores at Time 1, no Town x Time interaction was expected from the repeated measures analysis of these scores—and none emerged. The only significant source of variation was a Town x Sex interaction, $F(2,125) = 4.77$, $p < .01$. A breakdown of this interaction by analysis of simple main effects (Appendix C, Table 10) and subsequent Tukey analysis (Appendix C, Table 11), from the point of view of a comparison between boys and girls in each town, revealed a significant sex difference in Multitel only $F(1,125) = 7.10$, $p < .01$, such that boys had significantly higher Pattern Meanings scores than did girls. This same interaction examined from the point of view of a comparison between the towns for each sex, revealed a significant difference between towns for boys only, $F(2,125) = 5.10$, $p < .01$. Boys in Multitel had significantly higher Pattern Meanings scores than did boys in Unitel ($p < .01$) and Notel ($p < .05$). The latter two groups did not differ.

In summary, the general pattern of results for the measures of ideational fluency were as follows. Considering the Patterns task first, since no effects of television (i.e., no town differences) were found at Time 1, none were expected at Time 2, for either cross-sectional or longitudinal
subjects. Although a significant Town x Time interaction did occur in the cross-sectional analysis, closer examination revealed that significant change occurred in Unitel only. While it is true that the quality of reception improved in Unitel subsequent to Time 1 data collection, a far greater change on this dimension (i.e., the arrival of television) occurred in Notel, but for Notel there was no significant change in performance on this measure, hence the change in Unitel seems unlikely to be related to television exposure. In the longitudinal analysis there was, as reported, a significant interaction of Town with Sex, such that Multitel boys were superior to both Unitel and Notel boys. One interpretation of this result could be that television viewing leads to improved fluency with Pattern Meanings and that two years of viewing is not enough to allow Notel boys to "catch up". The cross-sectional findings, however, do not support such an interpretation, nor does there seem to be any reason for the effect to be limited to boys. Therefore, a more parsimonious interpretation would be that this effect was not related to television. The only consistent finding to emerge at Time 1 for Pattern Meanings was a grade difference in performance such that Grade 7 children in all three towns obtained higher fluency scores than Grade 4 children. This result was repeated in the Time 2 cross-sectional findings.

Based on Time 1 findings, the results of critical interest were, of course, those from the Alternate Uses fluency task. The significant Town x Time interaction in the cross-sectional analysis revealed that the superiority shown by Time 1 Notel children on this measure was not shown by their Time 2 counterparts. And, only in Notel did performance drop significantly from Time 1 to Time 2. This result was consistent with the
hypothesis that television viewing would lead to a decrease in ideational fluency in young children. It was not, however, confirmed by the results of the longitudinal analysis. That is, in the latter case, the drop in performance shown by Notel children was not statistically significant. One possible explanation for this apparent discrepancy might be that the longitudinal analysis was based on only two items, and hence was less sensitive than the cross-sectional analysis, which was based on five items. A further finding of interest in the longitudinal analysis was the (anticipated) decrease in performance shown by the Grade 9 students in all three towns.

Intelligence Measures

Vocabulary

Cross-Sectional Sample

The mean Vocabulary scaled scores for girls and boys, in each grade and town at each time, are presented in Table 19. Results from the analysis of variance procedure using these scores are presented in Appendix C, Table 12.

Three significant sources of variation emerged from this analysis. The first was a main effect of Grade, $F(1,282) = 22.57, p < .01$. Consistent with the findings at Time 1, younger (Grade 4) children earned higher mean vocabulary scaled scores than did older (Grade 7) children.

A second significant source of variation was a main effect of Time, $F(1,282) = 7.06, p < .01$. This main effect of Time was qualified by a significant interaction with Town, $F(2,282) = 3.48, p < .03$. A breakdown of this interaction by simple main effects analysis (Appendix C, Table 13) and subsequent Tukey procedure (Appendix C, Table 14) revealed no significant
Table 19

Mean Vocabulary Scaled Scores for the Cross-Sectional Sample

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th></th>
<th>Grade 7</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
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<tr>
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<td>$T_1$</td>
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<td>$T_1$</td>
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<tr>
<td>Notel</td>
<td>10.2</td>
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<td>12.1</td>
</tr>
<tr>
<td></td>
<td>9.9</td>
<td>10.4</td>
<td>10.4</td>
<td>9.2</td>
</tr>
<tr>
<td>Unitel</td>
<td>11.7</td>
<td>10.7</td>
<td>11.8</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>8.6</td>
<td>9.2</td>
<td>9.8</td>
</tr>
<tr>
<td>Multitel</td>
<td>12.8</td>
<td>10.8</td>
<td>11.8</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td>11.9</td>
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<td>10.5</td>
<td>8.9</td>
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</table>

Averaged Over Grade and Sex

<table>
<thead>
<tr>
<th></th>
<th>$T_1$</th>
<th>$T_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notel</td>
<td>10.5</td>
<td>10.7</td>
</tr>
<tr>
<td>Unitel</td>
<td>10.9</td>
<td>10.0</td>
</tr>
<tr>
<td>Multitel</td>
<td>11.8</td>
<td>10.2</td>
</tr>
</tbody>
</table>
difference among towns at Time 2, $F(2,282) = 1.11, p > .10$. As would be expected from the Time 1 results, Town at Time 1 was a significant simple main effect, $F(2,282) = 3.81, p < .01$; with Multitel children earning significantly higher mean scaled Vocabulary scores than Notel children ($p < .05$), and the scores of Unitel children falling between those of Multitel and Notel. This same interaction, examined from the point of view of a comparison across time for each town, revealed a significant effect of Time for Multitel only, $F(1,282) = 10.78, p < .01$. While the Vocabulary scaled scores of Time 2 Notel and Unitel children did not differ significantly from those of their same-aged counterparts at Time 1, in Multitel the Time 2 children scored significantly lower than the Time 1 children. This Time 2 result does not support the hypothesis concerning the Vocabulary scores. Not only was there no significant improvement in the performance of Notel children after two years of television viewing, but the scores of Time 2 Multitel children were significantly lower than those of their Time 1 counterparts. This finding makes questionable the attribution of the superior performance of Time 1 Multitel children to the effects of television.

**Longitudinal Sample**

The mean Vocabulary scaled scores earned by girls and boys, in each grade and town at Time 1 and Time 2, are presented in Table 20. Results from the repeated measures analysis of variance procedure on the Vocabulary scaled scores are presented in Appendix C, Table 15.

Two significant sources of variation emerged from the analysis. The first was a main effect of Time, $F(1,125) = 74.66, p < .01$. The means for Time 1 and Time 2 were 10.7 and 9.4 respectively. Thus, the Time 2 Vocabulary scaled scores of these children were significantly lower than their
Table 20
Mean Vocabulary Scaled Scores for the Longitudinal Sample

<table>
<thead>
<tr>
<th>Grade 4 (to 6)</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>$T_1$</td>
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<tr>
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<td>9.7</td>
<td>8.8</td>
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<tr>
<td>Unitel</td>
<td>11.5</td>
<td>9.4</td>
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<tr>
<td>Multitel</td>
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<td>10.8</td>
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</table>

<table>
<thead>
<tr>
<th>Grade 7 (to 9)</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$T_1$</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>Multitel</td>
<td>11.7</td>
<td>10.7</td>
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</table>

Averaged Over Grade and Sex

<table>
<thead>
<tr>
<th></th>
<th>$T_1$</th>
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<tbody>
<tr>
<td>Note1</td>
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<td>Unitel</td>
<td>10.6</td>
<td>9.1</td>
</tr>
<tr>
<td>Multitel</td>
<td>11.3</td>
<td>9.8</td>
</tr>
</tbody>
</table>
own Time 1 scores. This finding differs from that reported above for the cross-sectional sample where the main effect of Time was qualified by an interaction with Town, such that only in Multitel were the scores of Time 2 children significantly lower than those of their Time 1 counterparts. However, since the Time 2 children in the longitudinal analysis were, obviously, older than at Time 1, the drop in their scores is consistent with the significant Grade effect (4 > 7) obtained in the cross-sectional analysis. The WISC scaling procedure for vocabulary apparently favoured the younger children.

A second significant source of variation in the analysis was a Town x Sex interaction, $F(2,125) = 5.12, p < .01$. A breakdown of this interaction by analysis of simple main effects (Appendix C, Table 16) from the point of view of a comparison between boys and girls in each town showed that, in Notel, girls earned significantly higher mean vocabulary scaled scores than boys, $F(1,125) = 3.94, p < .05$; while in Multitel, boys earned significantly higher scores than girls, $F(1,125) = 6.03, p < .05$. The scores of girls and boys in Unitel did not differ significantly. This same interaction examined from the point of view of a comparison among towns for each sex revealed a significant difference among towns for males only, $F(2,125) = 7.30, p < .01$. A breakdown of this effect using the Tukey procedure (Appendix C, Table 17) revealed that boys in Multitel had significantly higher vocabulary scaled scores than did boys in Notel ($p < .01$). The scores of boys in Unitel fell roughly in the middle of those of boys in Multitel and Notel, and did not differ significantly from either. This effect, like the Town x Sex interaction occurring in the figural fluency scores, does not seem likely to be related to television viewing.
Intelligence Measures: Block Design

Cross-Sectional Comparisons

The mean Block Design scaled scores for boys and girls, in each town, and each grade at each time, are presented in Table 21. Results from the analysis of variance procedure with these scores are presented in Appendix C, Table 18.

Sex emerged as the only significant source of variation, $F_{(1,282)} = 13.41, p < .01$. Male children had higher scores than female children on the Block Design subtest. This finding is consistent with the Time 1 result, and also with past research employing the Block Design subtest (Maccoby, 1966; Maccoby & Jacklin, 1974).

Longitudinal Sample

The mean Block Design scaled scores for boys and girls, in each town, at each time are presented in Table 22. Results from the repeated measures analysis of variance performed with these data are presented in Appendix C, Table 19.

Two significant sources of variation appeared in this analysis. The first was a main effect of Sex, $F_{(1,125)} = 18.54, p < .01$; which was qualified by an interaction with Grade, $F_{(1,125)} = 4.50, p < .04$. A breakdown of this interaction by simple main effects analysis (Appendix C, Table 20) from the point of view of a comparison between boys and girls in each group, showed a significant sex difference in performance (boys > girls) in the younger group (Grades 4 and 6) only, $F_{(1,125)} = 15.19, p < .01$. The scores of boys in the older group (Grades 7 and 9) were not significantly different from the scores of girls, $F_{(1,125)} = 2.02, p > .10$. When this same interaction was examined from the point of view of a comparison between groups
Table 21

Mean Block Design Scaled Scores for the Cross-Sectional Sample

<table>
<thead>
<tr>
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<th></th>
<th>Grade 7</th>
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<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
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<td>T₂</td>
<td>T₁</td>
<td>T₂</td>
</tr>
<tr>
<td>Notel</td>
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<td>10.5</td>
<td>10.5</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>11.9</td>
<td>11.9</td>
<td>11.7</td>
<td>9.9</td>
</tr>
<tr>
<td>Unitel</td>
<td>11.4</td>
<td>10.8</td>
<td>9.4</td>
<td>10.2</td>
</tr>
<tr>
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<td>12.0</td>
<td>11.6</td>
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<td>10.0</td>
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<td>10.3</td>
<td>9.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T₁</td>
<td>T₂</td>
</tr>
<tr>
<td></td>
<td>11.3</td>
<td>10.1</td>
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<td>9.2</td>
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</table>

Averaged over Grade and Sex

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<tr>
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<th>T₁</th>
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</thead>
<tbody>
<tr>
<td>Notel</td>
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<td>10.7</td>
</tr>
<tr>
<td>Unitel</td>
<td>10.8</td>
<td>10.6</td>
</tr>
<tr>
<td>Multitel</td>
<td>11.0</td>
<td>10.1</td>
</tr>
</tbody>
</table>
Table 22

Mean Block Design Scaled Scores for the Longitudinal Sample

<table>
<thead>
<tr>
<th>Grade 4 (to 7)</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T₁</td>
<td>T₂</td>
</tr>
<tr>
<td>Notel</td>
<td>11.6</td>
<td>11.7</td>
</tr>
<tr>
<td>Unitel</td>
<td>11.5</td>
<td>10.8</td>
</tr>
<tr>
<td>Multitel</td>
<td>13.7</td>
<td>13.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 7 (to 9)</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T₁</td>
<td>T₂</td>
</tr>
<tr>
<td>Notel</td>
<td>11.7</td>
<td>12.3</td>
</tr>
<tr>
<td>Unitel</td>
<td>12.3</td>
<td>10.9</td>
</tr>
<tr>
<td>Multitel</td>
<td>11.6</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Averaged Over Grade and Sex

<table>
<thead>
<tr>
<th></th>
<th>T₁</th>
<th>T₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notel</td>
<td>11.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Unitel</td>
<td>11.0</td>
<td>10.4</td>
</tr>
<tr>
<td>Multitel</td>
<td>10.8</td>
<td>11.3</td>
</tr>
</tbody>
</table>
for each sex, a significant difference was found for females only, $F(1,125) = 5.64, p < .05$. Among the females, those in the older group (tested in Grade 7 and 9) earned significantly higher scaled scores on the Block Design subtest than those in the younger group (tested in Grades 4 and 6).

To summarize the results from the cross-sectional and longitudinal analyses of the intelligence measures, important similarities emerged in the two sets of findings for each measure. Considering the results from the Block Design subtest first, the failure of significant town differences to occur at either time cross-sectionally and in the longitudinal analysis was consistent with the hypotheses of the current study concerning this measure. The only consistent pattern to emerge at Time 1 with Block Design scores was a sex difference in performance such that boys had higher scaled scores than girls in all three towns. This pattern was repeated in the Time 2 cross-sectional sample. In the longitudinal sample, this sex difference in performance remained for the younger group of children (those tested in Grades 4 and 6); but disappeared in the older group of children (those tested in Grades 7 and 9). These findings are consistent with past research employing the Block Design subtest (Maccoby, 1966; Maccoby & Jacklin, 1974).

The results from the cross-sectional and longitudinal analyses of the Vocabulary subtest also showed important consistencies. Most notable was that in Notel, no significant change over time was shown in the Vocabulary scaled scores of children in either the cross-sectional or longitudinal samples. While a significant Town x Time interaction did occur in the cross-sectional analysis, closer examination revealed that significant change occurred only in the control town of Multitel. This result is contrary to
hypotheses concerning the Vocabulary scores. That is, the Time 1 finding that Multitel children were superior to Notel children on the Vocabulary subtest suggested that performance differences might well be attributed to television viewing, but the Time 2 results suggest that this conclusion was premature. Instead, it appears that the presence or absence of television had no differential effect on children's vocabulary scores, and that the Time 1 superiority of Multitel children can not be attributed to television.

Correlational Analyses

Although of secondary interest to the results presented above, the correlational findings were of interest vis-a-vis past studies employing the Wallach-Kogan measures. The aims of the correlational analyses were: (1) to examine the relationships within the ideational fluency and intelligence measures; (2) to examine the relationship between these two sets of measures; and (3) for the children in the longitudinal sample, to examine the stability of performance over the two year period on the measures of ideational fluency.

Cross-Sectional Sample

The median (Pearson product - moment) correlations among and between the ideational fluency and intelligence measures for the Time 2 cross-sectional sample are presented in Table 23. As can be seen from the table, the two fluency measures (Uses and Patterns) were positively correlated for Grade 4 (median \( r = .78 \)) and for Grade 7 (median \( r = .47 \)).

---

13 The rationale for presenting median correlations rather than a pooled within-groups correlation matrix is the same as described earlier for the Time 1 sample. See p. 42.
### Table 23

**Medial Correlations Among and Between the Ideational Fluency and Intelligence Measures for the Time 2 Cross-Sectional Sample**

#### Grade 4

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fluency - Uses</td>
<td>.78</td>
<td>.24</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>(.15 to .89)</td>
<td>(-.62 to .66)</td>
<td>(-.11 to .62)</td>
</tr>
<tr>
<td>2. Fluency - Patterns</td>
<td>.28</td>
<td>.29</td>
<td>.53</td>
</tr>
<tr>
<td></td>
<td>(-.16 to .38)</td>
<td>(-.10 to .50)</td>
<td>(-.34 to .81)</td>
</tr>
<tr>
<td>3. Vocabulary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Block Design</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

#### Grade 7

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fluency - Uses</td>
<td>.47</td>
<td>.23</td>
<td>-.04</td>
</tr>
<tr>
<td></td>
<td>(.36 to .93)</td>
<td>(-.36 to .52)</td>
<td>(-.33 to .37)</td>
</tr>
<tr>
<td>2. Fluency - Patterns</td>
<td>.01</td>
<td>.12</td>
<td>.30</td>
</tr>
<tr>
<td></td>
<td>(-.18 to .55)</td>
<td>(-.32 to .17)</td>
<td>(-.01 to .77)</td>
</tr>
<tr>
<td>3. Vocabulary</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>4. Block Design</td>
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</tr>
</tbody>
</table>
The two intelligence measures were also positively correlated (median $r$'s = .53, and .30 for Grades 4 and 7 respectively). With respect to the correlations between the two kinds of measures at each grade level, the pattern was similar to that obtained at Time 1. For the Grade 7 children, the median correlations were quite low, ranging from $r = -.04$ to $r = .23$. For the Grade 4 children, the median correlations were slightly higher than for the Grade 7 children, ranging from $r = .23$ to $r = .29$. As was the case at Time 1, the moderate magnitude of these correlations for the Grade 4 children was higher than expected based on several previous cross-sectional studies employing the Wallach-Kogan measures (see Kogan, 1971; Kogan, 1973).

Longitudinal Sample

The median correlations among the ideational fluency measures for the younger group of children (Grades 4 and 6) are presented in Table 24. As can be seen from the table, all 28 of the correlations were positive, with a range of $r = .27$ to $r = .89$. It also was possible to examine for both groups of children in the longitudinal sample, the consistency of performance across the two year period on these measures. For children in the younger group, median correlations for fluency of .57 and .62 were obtained for uses and patterns, respectively. It was interesting that positive correlations were not confined to pairings of the same task. Median correlations for fluency between fourth-grade uses and patterns, on the one hand, and sixth-grade similarities and lines, on the other, ranged from .50 to .58.

The median correlations among the ideational fluency measures for the older group of children (Grades 7 and 9) are presented in Table 25. Since
Table 24
Median Correlations Among the Ideational Fluency Measures for the Longitudinal Sample in Grades 4 and 6

<table>
<thead>
<tr>
<th>Variables</th>
<th>Grade 4</th>
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<td>2</td>
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<tr>
<td>1. Fluency - Uses</td>
<td></td>
<td>.70</td>
<td>.86</td>
<td>.61</td>
<td>.57</td>
<td>.52</td>
<td>.50</td>
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<tr>
<td>Range</td>
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<td>(.19 to .90)</td>
<td>(.44 to .93)</td>
<td>(.53 to .81)</td>
<td>(-.06 to .93)</td>
<td>(-.27 to .83)</td>
<td>(-.17 to .61)</td>
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<td>2. Fluency - Patterns</td>
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<td>.54</td>
<td>.67</td>
<td>.71</td>
<td>.62</td>
<td>.54</td>
<td>.56</td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>(.12 to .88)</td>
<td>(.50 to .93)</td>
<td>(.20 to .90)</td>
<td>(.42 to .78)</td>
<td>(.41 to .63)</td>
<td>(.32 to .81)</td>
</tr>
<tr>
<td>3. Uniqueness - Uses</td>
<td></td>
<td>.62</td>
<td>.52</td>
<td>.35</td>
<td>.32</td>
<td>.27</td>
<td></td>
</tr>
<tr>
<td>Range</td>
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<td>(.48 to .74)</td>
<td>(.11 to .88)</td>
<td>(-.28 to .94)</td>
<td>(-.08 to .70)</td>
<td>(-.28 to .71)</td>
<td></td>
</tr>
<tr>
<td>4. Uniqueness - Patterns</td>
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<td>.52</td>
<td>.46</td>
<td>.42</td>
<td>.43</td>
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<td></td>
</tr>
<tr>
<td>Range</td>
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<td>(.35 to .83)</td>
<td>(.13 to .70)</td>
<td>(.24 to .80)</td>
<td>(.21 to .57)</td>
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<table>
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</tr>
<tr>
<td>5. Fluency - Uses</td>
<td></td>
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<td></td>
<td></td>
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<td>.73</td>
</tr>
<tr>
<td>Range</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(.22 to .86)</td>
</tr>
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<td>6. Fluency - Patterns</td>
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<td>.89</td>
</tr>
<tr>
<td>Range</td>
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<td></td>
<td>(.29 to .89)</td>
<td>(.69 to .97)</td>
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<td>7. Fluency - Similarities</td>
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<td>Range</td>
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<td>8. Fluency - Lines</td>
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Table 25
Median Correlations Among the Ideational Fluency Measures for Boys and Girls in the Longitudinal Sample in Grades 7 and 9

<table>
<thead>
<tr>
<th>Variables</th>
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<td>1. Fluency - Uses</td>
<td>.72</td>
<td>.77</td>
<td>.66</td>
<td>.54</td>
<td>.31</td>
<td>.63</td>
<td>.27</td>
<td></td>
</tr>
<tr>
<td>2. Fluency - Patterns</td>
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<td>.51</td>
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<td>.15</td>
<td>.33</td>
<td>.46</td>
<td></td>
</tr>
<tr>
<td>3. Uniqueness - Uses</td>
<td>.83</td>
<td>.80</td>
<td>.55</td>
<td>.34</td>
<td>.59</td>
<td>.14</td>
<td>.47</td>
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<tr>
<td>4. Uniqueness - Patterns</td>
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<td>.79</td>
<td>.85</td>
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<td>.31</td>
<td>.22</td>
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</tr>
<tr>
<td>5. Fluency - Uses</td>
<td>-.22</td>
<td>-.08</td>
<td>-.18</td>
<td>-.15</td>
<td>.79</td>
<td>.89</td>
<td>.78</td>
<td></td>
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<td>6. Fluency - Patterns</td>
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<td>.03</td>
<td>-.25</td>
<td>-.05</td>
<td>.73</td>
<td>.64</td>
<td>.94</td>
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<tr>
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<td>-.09</td>
<td>-.06</td>
<td>-.01</td>
<td>.58</td>
<td>.56</td>
<td>.55</td>
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<tr>
<td>8. Fluency - Lines</td>
<td>.01</td>
<td>.08</td>
<td>.02</td>
<td>.13</td>
<td>.60</td>
<td>.71</td>
<td>.32</td>
<td></td>
</tr>
</tbody>
</table>

The median correlations for boys (n = 31) are presented above the diagonal and for girls (n = 42), below the diagonal.
at this age level the pattern of correlations differed somewhat for the two sexes, they are presented separately. The correlations for boys are presented above the diagonal, and those for girls are presented below it.

Considering the between-task median correlations for fluency and uniqueness at the Grade 7 level first, all were substantial for both boys and girls (ranging from $r = .51$ to $r = .88$). The between-task correlations for fluency at the Grade 9 level also were mostly substantial for both sexes, both for tasks taken previously (patterns and uses), and for tasks taken for the first time (similarities and lines) (one median $r = .32$, others ranged from $r = .55$ to $r = .94$).

The median correlation coefficients across seventh and ninth grade measures were, however, somewhat different for boys and girls. For the boys, the 16 medians were all positive and ranged from $r = .14$ to $r = .63$. Fluency for the seventh-grade Uses task was positively correlated with fluency for the Uses and Similarities administered in the ninth-grade (median $r = .54$ and $.63$). In addition, seventh-grade fluency for the Patterns task was positively correlated with ninth-grade fluency for the Lines task (median $r = .46$). Grade 7 uniqueness for the Uses task correlated positively with ninth-grade fluency for both Patterns and Lines (median $r = .59$ and $.47$). Unlike the results for the younger children, performance by boys in this age group was not consistent for all measures across the two year period. Strong stability was observed, however, for fluency in the case of Uses and Similarities.

For the girls in this age group, on the other hand, most of the between-grade correlations for fluency and uniqueness were low and/or negative. Each of the five median $r$'s discussed.
above, which were positive across the two year period for boys, was higher than that obtained for girls.

The median correlations among the intelligence measures are presented next. Tables 26 and 27 present these correlations for the younger and older groups of children respectively. As expected, all of the correlations were positive for both groups of children (ranging from \( r = .30 \) to \( r = .77 \)).

Turning finally to the relationship between the measures of ideational fluency and intelligence, the median correlations for the younger group of children are presented in Table 28. As can be seen from the table, nearly all of the median correlations were moderately positive (the range was from \( r = -.12 \) to \( r = .45 \)). The correlations between the fluency and intelligence measures were somewhat higher than expected, based on previous work with the Wallach-Kogan tasks (see Kogan 1971; Kogan, 1973), but were consistent with the cross-sectional findings of the present study for the Grade 4 children.

The median correlations between the ideational fluency and intelligence measures for the older group of children are presented in Table 29. The correlations are presented separately for boys and girls, since, once again, the patterns for the two sexes differed in several respects.

Considering the pattern for the girls first, the correlations between the two kinds of measures were generally low (some were negative); the range was from \( r = -.10 \) to \( r = .52 \). None of the median correlations between seventh-grade fluency or uniqueness and seventh-grade intelligence measures
Table 26

Median Correlations Among the Intelligence Measures for the Longitudinal Sample in Grades 4 and 6

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
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<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. WISC - Vocabulary Range</td>
<td>.45</td>
<td>.77</td>
<td>.44</td>
<td>(-.02 to .85) (.57 to .89) (-.11 to .80)</td>
</tr>
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<td>2. WISC - Block Design Range</td>
<td>.58</td>
<td>.65</td>
<td>(.11 to .72) (.49 to .88)</td>
<td></td>
</tr>
<tr>
<td>Grade 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. WISC - Vocabulary Range</td>
<td>.47</td>
<td>.65</td>
<td>(.17 to .67)</td>
<td></td>
</tr>
<tr>
<td>4. WISC - Block Design</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>
Table 27
Median Correlations Among the Intelligence Measures
for the Longitudinal Sample in Grades 7 and 9

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>Grade 7</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. WISC - Vocabulary Range</td>
<td>.35</td>
<td>.61</td>
<td>.42</td>
<td></td>
</tr>
<tr>
<td>2. WISC - Block Design Range</td>
<td>.30</td>
<td>.37</td>
<td></td>
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<tr>
<td>Grade 9</td>
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</tr>
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<td>4. WISC - Block Design</td>
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Table 28
Median Correlations Between the Ideational Fluency and Intelligence Measures for the Longitudinal Sample in Grades 4 and 6

<table>
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<tr>
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<td>2. Fluency - Patterns</td>
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<tr>
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<td>.25</td>
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### Table 29

Median Correlations Between the Ideational Fluency and Intelligence Measures for the Longitudinal Sample in Grades 7 and 9

<table>
<thead>
<tr>
<th>Test Measure</th>
<th>WISC Vocabulary</th>
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<th>WISC Vocabulary</th>
<th>WISC Block Design</th>
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<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
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<td></td>
<td></td>
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</tr>
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<td>.10</td>
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<tr>
<td>4. Uniqueness - Patterns</td>
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<td>.06</td>
<td>-.08</td>
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<td>.32</td>
<td>.31</td>
<td>.12</td>
<td>.30</td>
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<td>8. Fluency - Lines</td>
<td>.16</td>
<td>.26</td>
<td>.01</td>
<td>.13</td>
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</table>
was above .21 for girls.

For boys, more of the 32 median $r$'s were positive than was the case for girls (range = -.14 to .50, ten were above $r = .30$ by comparison with two for the girls). The median correlations between boys' seventh-grade fluency or uniqueness and seventh-grade intelligence scores were low, with the exception of the correlations between WISC Vocabulary and Alternate Uses fluency and uniqueness scores ($r$'s = .50 and .49). Median correlations between boys' Grade 7 fluency or uniqueness and Grade 9 intelligence scores, and between Grade 9 fluency and Grade 7 intelligence scores were also low. Five of the eight $r$'s between ninth-grade measures of fluency and intelligence, however, were positive for boys. Four were between ninth-grade vocabulary and ninth-grade fluency measures. Of these four correlations between ninth-grade vocabulary and ninth-grade fluency, all were higher than the analogous median correlations for girls.

In summary, the results from the correlational analyses were as follows. As expected, the median correlations among the intelligence measures all were moderately positive for both the cross-sectional and longitudinal samples. Median correlations among the ideational fluency measures also were all positive for both groups of children. In terms of the correlations between the ideational fluency and intelligence measures, the results were mixed. For children in the cross-sectional sample, the hypothesis of the present study that the correlations between the two sets of measures would be low held true in the case of children in Grade 7, but not for Grade 4 children. For the children in the longitudinal sample
who were tested in Grades 4 and 6 the median correlations between ideational fluency and intelligence also were higher than anticipated, but were consistent with the findings for Grade 4 children in the cross-sectional sample. For the older group of children in the longitudinal sample (tested in Grades 7 and 9), the pattern of results differed for boys and girls. For the girls, the median correlations between the fluency and intelligence measures were quite low. For the boys, while seventh-grade vocabulary correlated positively with seventh-grade fluency and uniqueness on the uses task, none of the other correlations between seventh-grade fluency and seventh-grade intelligence were substantial. In Grade 9, however, all four of the correlations between ninth-grade vocabulary and ninth-grade fluency were positive. This different pattern in the relationship between the fluency and intelligence measures for the older students (Grade 9) was similar to that observed by Kogan and Pankove (1972) with tenth-grade students.

For the children in the longitudinal sample, the consistency of performance on the ideational fluency measures also was examined. For the younger group of children, ideational fluency scores were found to be highly correlated across the two year period. For the older children, a sex difference was observed in the consistency of performance across the two years. For boys, high consistency was demonstrated in the case of verbal ideational fluency tasks. For girls, the median correlations across the two year period were very low.
Second Phase: Discussion

The findings of primary interest in the current study are, of course, those concerning the impact of television exposure on children's performance on measures of ideational fluency and intelligence. Or, phrased another way, the major findings are those relating to the effects of television viewing by young school children on three primary abilities; namely, verbal (v), spatial (s), and ideational fluency (Fi). Before proceeding to a discussion of the findings relating to these major issues, the findings from the correlational analyses are discussed.

The correlational analyses produced several findings of interest vis-a-vis past studies employing the Wallach-Kogan measures. The low median correlations between the latter and the intelligence measures and high median correlations within each set of measures, obtained for both Time 1 and Time 2 seventh-grade children, were similar to the findings of Wallach and Kogan (1965) with fifth-graders. There have been other cross-sectional studies conducted subsequent to the 1965 work of Wallach and Kogan which also have provided evidence of the relative independence of the Wallach-Kogan measures from traditional IQ measures. To date studies providing such evidence have included: children of nursery school age (Williams & Fleming, 1969); children of kindergarten age (Ward, 1968); first- and second-grade children (Ward, 1968); fifth-grade children (Pankove & Kogan, 1968); high school seniors (Wallach & Wing, 1969); and college students (Cropley & Maslany, 1969). Contrasting with the findings reported in these studies (and with those for seventh graders in the present study) were the results for the Grade
4 children in the current investigation. Median correlations between the two sets of measures were generally moderately positive for both the Time 1 and Time 2 samples. Further, when the Time 1 fourth-graders were retested two years later in Grade Six, the pattern remained. Thus, while the results for Grade 7 children in the current study were consistent with those of other cross-sectional studies employing the Wallach-Kogan measures, the results for Grade 4 children were not. This discrepancy in results for Grade 4 children is not readily interpretable.

When the Time 1 Grade 7 children were retested in ninth-grade, the pattern of correlations between the intelligence and ideational fluency measures differed for boys and girls. As described above, median correlations between the two types of measures were mostly low for both sexes at the seventh-grade level. For girls two years later they remained low. For boys on the other hand, of the eight correlations between ninth-grade measures of intelligence and ninth-grade measures of ideational fluency, five were moderately positive. This contrasting pattern for boys and girls was especially interesting in light of Kogan & Pankove's (1972) finding that correlations between performance on the Wallach-Kogan measures and measures of intelligence, which were nonsignificant for both sexes at the Grade 5 level, remained unrelated for girls five years later. For boys, however, they found that the correlations for tenth graders were positive and significant.

Kogan and Pankove (1972) did not report, however, whether the correlations for males and females were compared statistically. In any
case, the outcomes of the present study and of the Kogan and Pankove (1972) study are suggestive of a possible sex difference in the relationship between ideational fluency and intelligence in children at this age level (ninth and tenth grades). There were, however, several procedural differences in the two studies and caution must be observed in interpreting the outcomes as mutually supportive. For example, in the Kogan and Pankove (1972) work no intelligence measures were administered to the children. Instead, information on intelligence levels was taken from school records, which were based on the California Test of Mental Maturity and the Differential Aptitude Test, respectively. This, and other differences, make comparisons between the two studies difficult, other than in the broadest terms. At most, it could be said that future investigators should be alert to the possibility of a sex difference in the relationship between ideational fluency and intelligence in children at this age level (Grades 9 and 10).

Another issue arising in the literature with regard to the Wallach-Kogan measures has been the question of long-term stability of performance. In the current study an attempt was made to shed further light on this issue by examining the consistency of performance shown by the two longitudinal groups of children across a two year period. For the younger group of children (those tested in Grades 4 and 6) performance on the Wallach-Kogan measures was found to be highly consistent across the two year period, both for tasks taken perviously, and tasks encountered for the first time. As no previous longitudinal work concerning this issue has been done with children at this age level, this finding was new.
For the older group of children (those tested in Grades 7 and 9) performance over the two years was found to be far less consistent. Moreover, the pattern differed somewhat for boys and girls. For boys, while performance was not as highly consistent as it was for the younger children across all the various measures, considerable stability was demonstrated in the case of verbal tasks. Seventh-grade fluency for the Alternate Uses task was positively correlated with fluency for the Alternate Uses and Similarities tasks administered in the ninth grade. For the girls in this age group, however, all of the correlations across the two year period were very low (most were negative).

These results contrast somewhat with those of Kogan and Pankove (1972) who considered the question of long-term stability of performance on the Wallach-Kogan measures with fifth-grade children (originally tested by Pankove and Kogan in 1968) who were retested five years later in the tenth grade. Based on the complex and rather ambiguous results of their study, Kogan and Pankove (1972) concluded that stability appeared to be moderated by an interaction between the sex of the subject and the tenth-grade testing context. More specifically, they concluded that "Boys showed higher consistency when the assessment at adolescence took place in an impersonal mass testing; girls manifested more consistency when the assessment at adolescence was carried out by a nonevaluative female examiner." (p. 431). The Pankove and Kogan (1972) study was carried out in two separate school systems—in one, the children were tested in groups; while in the other, tasks were administered individually by same-sex examiners. Their conclusion regarding the interaction of the sex
of the subject with the testing context was based on the finding that the performance of the boys in the school system where the tasks had been group administered was highly consistent across the 5-year period, whereas very little consistency was shown by the boys in the school where the tasks had been administered individually by a male examiner. For girls, on the other hand, some stability was observed for the group of girls who had been individually tested by a female examiner, but none was shown by the girls in the school system where group testing had occurred. In the current study tasks were administered individually by female examiners to both boys and girls in Grade 9. It is assumed that the female examiners qualified as "nonevaluative", since, as previously described, considerable effort was directed toward keeping the testing situation as gamelike as possible. In spite of these conditions (i.e., individual testing, non-evaluative female examiner) none of the between-grade correlations for fluency (or uniqueness) was very high for ninth-grade girls. For boys, on the other hand, five of the sixteen between-grade correlations were moderately positive (as previously reported, these five median correlations were for verbal tasks, and all were also higher than those reported for girls). In other words, ninth-grade girls in the current study showed less consistency in performance on measures of ideational fluency (and uniqueness) over a two year period than did ninth-grade boys. And, if one ignores testing context, it appears that the performance of tenth-grade girls in the Kogan and Pankove study was less stable over a five year period than the performance of tenth-grade boys. This last statement cannot be made with confidence since Kogan and Pankove (1972) did
not report whether they statistically compared the correlations obtained by boys with those obtained by girls. Also, as discussed earlier, there were many differences in the two studies, most notably the ages of the children. Considered in conjunction, however, the results of the Kogan and Pankove (1972) study and those of the current study suggest that there may be a significant difference in the consistency of performance demonstrated by boys and girls at this age level (ninth- and tenth grades) on the Wallach-Kogan measures. Furthermore, if future studies with children at this age level do find sex differences in the stability of performance on these measures, it seems safe to conclude that such differences cannot be confidently attributed solely to an interaction between the testing context and the sex variable.

The findings of major interest in the present study are of course those from both the ideational fluency and intelligence measures as they relate to television exposure.

Considering intelligence first, the results were consistent with the hypothesis that children's scores on the WISC Block Design test would not be affected by television experience. There were no differences either cross-sectionally or longitudinally among the mean Block Design scaled scores obtained by the children in the three towns. Indeed, the only significant effect to emerge in the cross-sectional analysis was a sex difference (favouring boys). In the longitudinal analysis a sex difference in performance (favouring boys) occurred in the younger group of children, but not in the older group. As mentioned earlier, previous researchers employing the block design subtest have also reported either no sex differences, or differences favouring boys (Maccoby, 1966; Maccoby & Jacklin, 1974).
The results pertaining to the Vocabulary subtest of the WISC were less clear-cut. The hypothesis concerning this measure was based on the supposition that if television could serve as a stimulus for intellectual development, it would be most likely to affect verbal measures of intelligence which are somewhat related to informational experience. Therefore it was possible that children growing up in towns with television reception would score higher on a vocabulary test than would children in a town lacking television. The outcome at Time 1 appeared to support this hypothesis (i.e., Multitel children earned higher Vocabulary scaled scores than Notel children). Thus, it was expected that the scores of Notel children might increase from Time 1 to Time 2. However, in neither the cross-sectional nor the longitudinal analysis was there significant change in the Vocabulary scaled scores earned by Notel children.

It may be that the effects of television viewing on vocabulary occur slowly and that two years of viewing is not sufficient to effect significant change. The significant interaction of Town with Sex in the longitudinal analysis, such that boys in Multitel scored higher on the Vocabulary subtest than boys in Notel could be seen as providing some support for such an interpretation. That is, the superiority of Multitel boys in the longitudinal analysis could be interpreted as suggesting that the longer period of television exposure experienced by boys in Multitel led to their superior performance relative to boys in Notel, and that two years of viewing by the latter was not long enough to allow them to "catch up". Several points, however, mitigate against this "not enough catch up time" interpretation. First, it requires the assumption that a "longer
period of viewing would lead to an improvement in the vocabulary scores of Notel boys. Second, there seems no reason for the effect, if it is television-related, to be limited to one sex. In addition, the cross-sectional findings fail to support such an interpretation. In Multitel (the town which had undergone the least change on the television variable) Time 2 children performed significantly more poorly on the Vocabulary subtest than their same-aged Time 1 counterparts. Whatever the reason for the poorer performance of Time 2 Multitel children, it seems clear that it was not related to television exposure, since both groups of Multitel children had been viewing television since an early age. In other words, the across-time cross-sectional findings simply were not readily interpretable in terms of the television variable. On the basis of the current data, therefore, it would seem most reasonable to conclude that the presence or absence of television had no differential effect on the WISC Vocabulary scores of children at the age levels tested.

A possible reason for this outcome could be that the vocabulary of children at the ages tested in the present study was already too advanced to be influenced by television viewing. Some support for this notion is provided by the Schramm, Lyle, and Parker (1961) finding that children growing up with television appeared to come to school with a vocabulary advantage of about one year relative to children in a town without television, but that older children (sixth and tenth graders) did not maintain the advantage. The age levels in the present study were selected partly so that comparability with the Schramm et al., findings could be assessed. The present results are consistent with those of Schramm et al., in that
the presence or absence of television appeared to have no differential effect on the vocabulary scores of children in Grades 4, 6, 7 and 9. That the result held true for Grade 4 children extends downward the age range for this finding.

The discussion now turns to a consideration of the relationship between television exposure and children's performance on measures of ideational fluency. Considering the results from the Alternate Uses task first, fairly strong support was provided for the hypothesis that fluency in generating alternate uses for common items is affected by television exposure. At Time 1, the children growing up in the town without television had significantly higher Alternate Uses fluency scores than did children in either of the two towns with television. The results of the (across-time) cross-sectional analysis showed that two years after the arrival of television in Notel, there was no longer a significant difference in the Alternate Uses fluency scores earned by children in the three towns. Moreover, within each of the three towns, only in Notel were the scores of Time 2 children significantly different (lower) than those of their Time 1 counterparts.

The cross-sectional findings for Uses fluency were not completely mirrored in the results of the longitudinal analysis. Although the means in the longitudinal analysis formed a pattern similar to that of the means in the cross-sectional analysis (i.e., The Notel mean was highest of the three towns at Time 1 and showed the most drop at Time 2), none of the differences was significant. It is important to note in this regard that the longitudinal analysis was based on fewer items than was the
cross-sectional analysis (i.e., two versus five, as previously described).

Although conjectural, it is interesting to consider what links might be proposed to account for the relationship between television exposure and Alternate Uses fluency found in the present study. The reasoning on which the hypothesis regarding this relationship was based, was that Uses fluency would be more likely to be increased by direct experience with the world (in the Piagetian sense) than by the indirect kind of experience which television provides. In other words, if television has any effect on ideational fluency, the effect would be more likely to be due to displacement of other activities than to the content of the television viewed. Wallach and Kogan (1965) also attempted to conceptualize this issue. Although these authors were not concerned with the effects of television viewing per se, they pointed out that in terms of assessing a person's capacity to generate cognitive elements, one factor influencing that person's performance as a ceiling or upper bound is the extent of his or her experience. Also of interest in this regard is the frequency of interaction hypothesis postulated by Crockett (1965)—that cognitive complexity varies with the degree to which an individual interacts frequently and intimately with environmental objects in a particular domain. Consonant with these notions, it seems possible that the superior performance of Time 1 Notel children on the Alternate Uses fluency measure may have resulted from a wider behavioural repertoire prior to the arrival of television. Continuing with this line of reasoning, the poorer performance of Time 2 Notel children could be interpreted as resulting from a reduction in the variety of children's interactions with
their environment, that is, to a displacement effect of television. However, until more is known about the primary ability referred to as ideational fluency (Fi), the links proposed to account for its apparent relationship to television viewing remain speculative.

In contrast to the results for the Alternate Uses measure of ideational fluency, the results for the Pattern Meanings procedure did not appear to be related to television exposure. This result was not surprising given the lack of town differences to appear for this measure at Time 1. Although a significant Town x Time interaction did appear in the across-time cross-sectional analysis, significant differences were, as previously described, limited to Unitel and were not readily interpretable in terms of the television variable.

Other investigators have also reported various discrepancies in cross-sectional data for verbal and figural stimulus materials. For example, the mean fluency score difference between the Wallach and Kogan (1965) middle-class fifth-graders and the Wallach and Wing (1969) college freshmen favoured the latter sample (i.e., the older subjects had higher fluency scores), but the discrepancy was considerably larger for verbal than for figural items. The finding (Ward, Kogan, & Pankove, 1972) that black disadvantaged fifth-graders were less productive than their middle-class counterparts on verbal items, but somewhat more productive on figural items is also of interest. These authors suggested that perhaps a task such as Alternate Uses favours subjects with richer experiential repertoires, whereas figural tasks may have more to do with the organization and accessibility of repertoires.
As illustrated by the results of these studies and those of the present study, there apparently are very distinct differences between some verbal and nonverbal tasks of ideational fluency.

In sum, the results of this cross-sectional and longitudinal study based on a natural experiment involving three towns varying in television reception, indicate that television exposure is not related to performance on measures of the primary abilities spatial (s) or verbal (v), or to performance on figural measures of ideational fluency. The results did indicate, however, that television exposure may have a negative effect on performance on one verbal measure of the primary ability ideational fluency (Fi).
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APPENDIX A
TABLE 1
List of Questions Concerning Television Viewing at Time One

1. Do you have a television set at home which is working?
   If yes: How many hours do you usually watch on
   a) weekdays? (including before school, at lunch time, and after school).
   b) weekends? (on Saturday? on Sunday?)
   If no:
   a) Do you ever watch television at anyone else's house?
      If so
   b) How often do you watch there? (on weekdays? on weekends?)

---

15 The nature of the questions and the exact order in which they were asked was based upon the individual child's response. It was not possible to follow an exact format as there was so much variation in the television viewing histories of the children.
TABLE 2

List of Questions Concerning Television Viewing
at Time Two

1. Do you have a television set at home which is working?
   If yes: How many hours do you usually watch on
   a) weekdays before school?
   b) weekdays after school?
   c) weekdays after supper?
   d) Saturday?
   e) Sunday?
   If no:
   a) Do you watch TV elsewhere? If so
   b) How often do you watch TV? (Probe to ascertain frequency, duration, and location).

16This list contains only that portion of the Time 2 media interview which was used in the current study. The complete interview was more extensive (containing questions concerning specific programs viewed, etc.) and is available on request.
APPENDIX B
Table 1

Source Table for the Analysis of Variance of the Alternate Uses Fluency Scores - Town x Grade x Sex

<table>
<thead>
<tr>
<th>Source</th>
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<th>MS</th>
<th>F</th>
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</tr>
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<td>&lt;.01</td>
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<td>1.53</td>
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</tr>
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<td>Town x Grade</td>
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<td>148</td>
<td>205.34</td>
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Table 2:

Tukey Test of the Town Effect in the Alternate Uses Fluency Scores

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<th>MS</th>
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<td>Town</td>
<td>2711.59</td>
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<td>1355.80</td>
<td>6.60</td>
<td>&lt;.01</td>
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</table>

Order

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<th>Multitel</th>
<th>Notel</th>
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<tr>
<td>T</td>
<td>21.98</td>
<td>23.41</td>
<td>30.97</td>
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</tbody>
</table>

Truncated Range

| S x q .95 | 6.59 |
| S x q .99 | 8.24 |

Unitel   Multitel   Notel

<table>
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<th>Multitel</th>
<th>Notel</th>
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<td>Unitel</td>
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<td>1.43</td>
<td>8.98  p &lt;.01</td>
</tr>
<tr>
<td>Multitel</td>
<td>---</td>
<td>---</td>
<td>7.56  p &lt;.05</td>
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<tr>
<td>Notel</td>
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### TABLE 3

**Simple Main Effects Analysis of the Grade x Sex Interaction in the "Alternate Uses" Fluency Scores**

<table>
<thead>
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<th>Mean Scores</th>
<th>Grade 4</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
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<td>21.52 (n=44)</td>
<td>29.65 (n=37)</td>
</tr>
<tr>
<td>Females</td>
<td>27.42 (n=31)</td>
<td>25.29 (n=48)</td>
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</tbody>
</table>

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<th>P</th>
</tr>
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<tbody>
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<td>Sex for Grade 4</td>
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<td>632.33</td>
<td>2.08</td>
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<td>396.62</td>
<td>1.93</td>
<td>---</td>
</tr>
<tr>
<td>Grade for Males</td>
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<td>1327.11</td>
<td>6.46</td>
<td>p &lt; .05</td>
</tr>
<tr>
<td>Grade for Females</td>
<td>85.26</td>
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<td>85.26</td>
<td>0.42</td>
<td>---</td>
</tr>
<tr>
<td>Error</td>
<td>148</td>
<td>205.33</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 4

Source Table for the Analysis of Variance of the Alternate Uses Uniqueness Scores - Town x Grade x Sex

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<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
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<td>Town</td>
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<td>2</td>
<td>57.28</td>
<td>4.95</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Grade</td>
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<td>1</td>
<td>9.94</td>
<td>0.86</td>
<td>---</td>
</tr>
<tr>
<td>Sex</td>
<td>3.11</td>
<td>1</td>
<td>3.11</td>
<td>0.27</td>
<td>---</td>
</tr>
<tr>
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<td>2</td>
<td>11.25</td>
<td>0.97</td>
<td>---</td>
</tr>
<tr>
<td>Town x Sex</td>
<td>18.78</td>
<td>2</td>
<td>9.39</td>
<td>0.81</td>
<td>---</td>
</tr>
<tr>
<td>Grade x Sex</td>
<td>22.11</td>
<td>1</td>
<td>22.11</td>
<td>1.91</td>
<td>---</td>
</tr>
<tr>
<td>Town x Grade x Sex</td>
<td>30.98</td>
<td>2</td>
<td>15.49</td>
<td>1.34</td>
<td>---</td>
</tr>
<tr>
<td>Error</td>
<td>1711.89</td>
<td>148</td>
<td>11.57</td>
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TABLE 5

Tukey Test of the Town Effect in the Alternate Uses Uniqueness Scores

<table>
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<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
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<td>2</td>
<td>57.28</td>
<td>4.95</td>
<td>&lt;.01</td>
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</tbody>
</table>

Order

<table>
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<tr>
<th>Treatments in Order</th>
<th>Unitel</th>
<th>Multitel</th>
<th>Notel</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>2.18</td>
<td>2.20</td>
<td>3.95</td>
</tr>
</tbody>
</table>

Truncated Range

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>$S \bar{x} q$</td>
<td>1.96</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Unitel</th>
<th>Multitel</th>
<th>Notel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unitel</td>
<td>---</td>
<td>0.02</td>
<td>1.77 p &lt;.05</td>
</tr>
<tr>
<td>Multitel</td>
<td>---</td>
<td>1.75 p &lt;.05</td>
<td></td>
</tr>
<tr>
<td>Notel</td>
<td>---</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 6

Source Table for the Analysis of Variance of the Pattern Meanings Fluency Scores - Town x Grade x Sex

<table>
<thead>
<tr>
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<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
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<td>2</td>
<td>214.46</td>
<td>2.64</td>
<td>---</td>
</tr>
<tr>
<td>Grade</td>
<td>369.13</td>
<td>1</td>
<td>369.13</td>
<td>4.55</td>
<td>&lt;.04</td>
</tr>
<tr>
<td>Sex</td>
<td>4.53</td>
<td>1</td>
<td>4.54</td>
<td>0.06</td>
<td>---</td>
</tr>
<tr>
<td>Town x Grade</td>
<td>436.83</td>
<td>2</td>
<td>218.42</td>
<td>2.69</td>
<td>---</td>
</tr>
<tr>
<td>Town x Sex</td>
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<td>2</td>
<td>137.65</td>
<td>1.70</td>
<td>---</td>
</tr>
<tr>
<td>Grade x Sex</td>
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<td>1</td>
<td>164.53</td>
<td>2.03</td>
<td>---</td>
</tr>
<tr>
<td>Town x Grade x Sex</td>
<td>159.57</td>
<td>2</td>
<td>79.78</td>
<td>0.98</td>
<td>---</td>
</tr>
<tr>
<td>Error</td>
<td>11998.57</td>
<td>148</td>
<td>81.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 7

Source Table for the Analysis of Variance of the Pattern Meanings Uniqueness Scores - Town x Grade x Sex

<table>
<thead>
<tr>
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<th>MS</th>
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<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
<td>46.71</td>
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<td>23.35</td>
<td>1.15</td>
<td>---</td>
</tr>
<tr>
<td>Grade</td>
<td>122.50</td>
<td>1</td>
<td>122.50</td>
<td>6.04</td>
<td>&lt; .02</td>
</tr>
<tr>
<td>Sex</td>
<td>2.13</td>
<td>1</td>
<td>2.13</td>
<td>0.10</td>
<td>---</td>
</tr>
<tr>
<td>Town x Grade</td>
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<td>2</td>
<td>77.64</td>
<td>3.83</td>
<td>&lt; .03</td>
</tr>
<tr>
<td>Town x Sex</td>
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<td>0.81</td>
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<td>63.16</td>
<td>3.11</td>
<td>---</td>
</tr>
<tr>
<td>Town x Grade x Sex</td>
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<td>2</td>
<td>29.77</td>
<td>1.47</td>
<td>---</td>
</tr>
<tr>
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<td>20.29</td>
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TABLE 8

Simple Main Effects and Subsequent Tukey Analysis of the Town x Grade Interaction for Pattern Meanings Uniqueness Scores

<table>
<thead>
<tr>
<th>Mean Scores</th>
<th>Notel</th>
<th>Unitel</th>
<th>Multitel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 4</td>
<td>3.21 (n=29)</td>
<td>3.83 (n=23)</td>
<td>3.09 (n=23)</td>
</tr>
<tr>
<td>Grade 7</td>
<td>5.52 (n=29)</td>
<td>3.07 (n=30)</td>
<td>6.77 (n=26)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
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<th>MS</th>
<th>F</th>
<th>P</th>
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<tbody>
<tr>
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<td>77.41</td>
<td>3.81</td>
<td>---</td>
</tr>
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<td>7.51</td>
<td>0.37</td>
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</tr>
<tr>
<td>Grade for Multitel</td>
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<td>165.47</td>
<td>8.15</td>
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<td>3.69</td>
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</tr>
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<td>100.58</td>
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Tukey Test of the Significant Effect of Town for Grade 7

<table>
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<th>MS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Town for Grade 7</td>
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<td>2</td>
<td>100.58</td>
<td>4.96</td>
<td>p &lt; .05</td>
</tr>
<tr>
<td>Order</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment in Order of Position</td>
<td>Unitel</td>
<td>Notel</td>
<td>Multitel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
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<td>5.52</td>
<td>6.67</td>
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</table>

Truncated Range

S x q   | .95 | 2.74 |
S x q   | .99 | 3.43 |

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<tr>
<td>Notel</td>
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TABLE 9

Source Table for the Analysis of Variance of the Vocabulary Scaled Scores - Town x Grade x Sex

<table>
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</thead>
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<td>&lt;.03</td>
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<tr>
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<td>47.60</td>
<td>8.40</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Sex</td>
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<td>1</td>
<td>5.12</td>
<td>0.90</td>
<td>---</td>
</tr>
<tr>
<td>Town x Grade</td>
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<td>2</td>
<td>3.04</td>
<td>0.54</td>
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</tr>
<tr>
<td>Town x Sex</td>
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<td>15.82</td>
<td>2.79</td>
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<td>9.17</td>
<td>1.62</td>
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</tr>
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<td>1.57</td>
<td>0.28</td>
<td>---</td>
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<td>148</td>
<td>5.67</td>
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TABLE 10

Tukey Test of the Town Effect in the Vocabulary Scores

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<th>P</th>
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</thead>
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<td>&lt;.03</td>
</tr>
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<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment in Order of Positions</td>
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<td>Unitel</td>
<td>Multitel</td>
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<td>11.75</td>
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</table>

Pairwise Comparisons

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<td>0.85</td>
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<tr>
<td>Multitel</td>
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<td>----</td>
</tr>
<tr>
<td>Source</td>
<td>SS</td>
<td>df</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------</td>
<td>----</td>
</tr>
<tr>
<td>Town</td>
<td>7.28</td>
<td>2</td>
</tr>
<tr>
<td>Grade</td>
<td>1.90</td>
<td>1</td>
</tr>
<tr>
<td>Sex</td>
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</tr>
<tr>
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<td>35.77</td>
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</tr>
<tr>
<td>Town x Sex</td>
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</tr>
<tr>
<td>Grade x Sex</td>
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</tr>
<tr>
<td>Town x Grade x Sex</td>
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<td>2</td>
</tr>
<tr>
<td>Error</td>
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<td>148</td>
</tr>
</tbody>
</table>
APPENDIX C
**TABLE 1**

Source Table for the Analysis of Variance of the Alternate Uses Fluency Scores - Town x Grade x Sex x Time

Cross-Sectional Sample:

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
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<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
<td>1444.30</td>
<td>2</td>
<td>722.15</td>
<td>3.68</td>
<td>&lt;.03</td>
</tr>
<tr>
<td>Grade</td>
<td>387.34</td>
<td>1</td>
<td>387.34</td>
<td>1.97</td>
<td>--</td>
</tr>
<tr>
<td>Town x Grade</td>
<td>179.94</td>
<td>2</td>
<td>89.97</td>
<td>0.46</td>
<td>--</td>
</tr>
<tr>
<td>Sex</td>
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<td>1</td>
<td>3.68</td>
<td>0.02</td>
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</tr>
<tr>
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<td>22.20</td>
<td>0.11</td>
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</tr>
<tr>
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<td>1</td>
<td>93.31</td>
<td>0.48</td>
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</tr>
<tr>
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<td>43.16</td>
<td>0.22</td>
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</tr>
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<td>967.15</td>
<td>4.93</td>
<td>&lt;.03</td>
</tr>
<tr>
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<td>765.25</td>
<td>3.90</td>
<td>&lt;.02</td>
</tr>
<tr>
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<td>1</td>
<td>12.89</td>
<td>0.07</td>
<td>--</td>
</tr>
<tr>
<td>Town x Grade x Time</td>
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<td>2</td>
<td>25.86</td>
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</tr>
<tr>
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<td>1</td>
<td>175.60</td>
<td>0.89</td>
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<tr>
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<td>228.11</td>
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<td>--</td>
</tr>
<tr>
<td>Grade x Sex x Time</td>
<td>1163.46</td>
<td>1</td>
<td>1163.48</td>
<td>5.93</td>
<td>&lt;.02</td>
</tr>
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<td>Town x Grade x Sex x Time</td>
<td>103.79</td>
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<td>51.89</td>
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<td>282</td>
<td>196.31</td>
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</table>
### TABLE 2

Simple Main Effects Test of the Town x Time Interaction in the Cross-Sectional Uses Fluency Scores

<table>
<thead>
<tr>
<th>Mean Scores</th>
<th>NOTEL</th>
<th>UNITEL</th>
<th>MULTITEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>31.81 (n=58)</td>
<td>22.74 (n=53)</td>
<td>23.38 (n=49)</td>
</tr>
<tr>
<td>Time 2</td>
<td>22.40 (n=51)</td>
<td>24.51 (n=44)</td>
<td>20.11 (n=51)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
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<td>1424.72</td>
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TABLE 3
Tukey Test of the Significant Town Effect Among the Alternate Uses Fluency Scores at Time 1

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<td></td>
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<tr>
<td>Multitel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Notel</td>
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<td></td>
<td></td>
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Truncated Range

| S x q .95 | 6.94 |
| S x q .99 | 8.69 |

<table>
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<tr>
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<th>Multitel</th>
<th>Notel</th>
</tr>
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<tbody>
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<td>Multitel</td>
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<tr>
<td>Notel</td>
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</table>
Simple Main Effects Test of the Grade x Sex x Time Interaction in the Cross-Sectional Alternate Uses Fluency Scores

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<thead>
<tr>
<th>Mean Scores</th>
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<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Grade 4</td>
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<td></td>
</tr>
<tr>
<td>Males</td>
<td>21.48  (n=45)</td>
<td>23.72 (n=40)</td>
</tr>
<tr>
<td>Females</td>
<td>27.84  (n=31)</td>
<td>19.09 (n=30)</td>
</tr>
<tr>
<td>Grade 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>29.23  (n=37)</td>
<td>22.74 (n=42)</td>
</tr>
<tr>
<td>Females</td>
<td>25.44  (n=47)</td>
<td>23.82 (n=34)</td>
</tr>
</tbody>
</table>

<table>
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<tr>
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<th>p</th>
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<td>1167.26</td>
<td>5.94</td>
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<td>51.77</td>
<td>0.26</td>
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</tr>
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TABLE 5
Source Table for the Repeated Measures Analysis of Variance of the Alternate Uses Fluency Scores
Town x Grade x Sex x Time

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<td>1.86</td>
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<td>52.75</td>
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<td>0.81</td>
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<td>36.82</td>
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<td>36.86</td>
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<td>91.97</td>
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<td>2.29</td>
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<tr>
<td>Town x Sex x Time</td>
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<td>125</td>
<td>16.79</td>
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TABLE 6

Simple Main Effects Test of the Group x Time Interaction in the Longitudinal Alternate Uses Fluency Scores

<table>
<thead>
<tr>
<th>Mean Scores</th>
<th>GROUP 1 (Grade 4 to 6)</th>
<th>GROUP 2 (Grade 7 to 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>8.06 (n=64)</td>
<td>9.44 (n=73)</td>
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<table>
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<th>MS</th>
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<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group at Time 1</td>
<td>64.57</td>
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<td>64.57</td>
<td>282</td>
<td>--</td>
</tr>
<tr>
<td>Group at Time 2</td>
<td>44.00</td>
<td>1</td>
<td>44.00</td>
<td>1.92</td>
<td>--</td>
</tr>
<tr>
<td>Error</td>
<td>125</td>
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<td>22.88</td>
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<tr>
<td>Time for Group 1 (Grade 4 to 6)</td>
<td>4.50</td>
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<td>4.50</td>
<td>0.26</td>
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</tr>
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<td>Time for Group 2 (Grade 7 to 9)</td>
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<td>166.68</td>
<td>9.92</td>
<td>&lt;.01</td>
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<tr>
<td>Error</td>
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<td></td>
<td>16.79</td>
<td></td>
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### TABLE 7
Source Table for the Analysis of Variance of the Pattern Meanings Fluency Scores - Town x Grade x Sex x Time Cross-Sectional Sample.

<table>
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<tbody>
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<td>Town</td>
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</tr>
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<td>0.02</td>
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<td>58.21</td>
<td>0.50</td>
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<td>211.68</td>
<td>1.81</td>
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<td>381.72</td>
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<td>19.39</td>
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<td>282</td>
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</table>
**TABLE 8**

Simple Main Effects Test of the Town x Time Interaction in the Cross-Sectional Pattern Meanings Fluency Scores

<table>
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<tr>
<th>Mean Scores</th>
<th>Notel</th>
<th>Unitel</th>
<th>Multitel</th>
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</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>19.91 (n=58)</td>
<td>16.92 (n=53)</td>
<td>20.98 (n=49)</td>
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<tr>
<td>Time 2</td>
<td>22.41 (n=51)</td>
<td>22.12 (n=44)</td>
<td>18.38 (n=51)</td>
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</tbody>
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<table>
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<th>p</th>
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<td>650.07</td>
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<td>168.93</td>
<td>1.44</td>
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</tr>
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<td>229.82</td>
<td>1.96</td>
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</tr>
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<td>252.80</td>
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### TABLE 9

Source Table for the Repeated Measures Analysis of Variance of the Pattern Meanings Fluency Scores 
Town x Grade x Sex x Time

<table>
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<tr>
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<td>0.71</td>
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<td>62.81</td>
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<tr>
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<td>7.26</td>
<td>0.29</td>
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<td>12.19</td>
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<td>2</td>
<td>3.19</td>
<td>0.22</td>
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<td>10.33</td>
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<td>0.88</td>
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<td>6.40</td>
<td>0.45</td>
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</tr>
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<td>0.23</td>
<td>0.17</td>
<td>--</td>
</tr>
<tr>
<td>Error</td>
<td>1774.23</td>
<td>125</td>
<td>14.19</td>
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</table>
TABLE 10

Simple Main Effects Test of the Town x Sex Interaction in the Pattern Meanings Fluency Scores - Longitudinal Sample

<table>
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<th>Notel</th>
<th>Unitel</th>
<th>Multitel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>7.48 (n=54)</td>
<td>6.96 (n=48)</td>
<td>10.18 (n=38)</td>
</tr>
<tr>
<td>Females</td>
<td>9.23 (n=44)</td>
<td>6.77 (n=44)</td>
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<table>
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<th>p</th>
</tr>
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<td>3.04</td>
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<td>1</td>
<td>0.78</td>
<td>0.03</td>
<td>--</td>
</tr>
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<td>172.56</td>
<td>7.10</td>
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</tr>
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<td>123.85</td>
<td>5.10</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Town for Females</td>
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<td>2</td>
<td>73.56</td>
<td>3.03</td>
<td>--</td>
</tr>
<tr>
<td>Error</td>
<td>125</td>
<td></td>
<td>24.30</td>
<td></td>
<td></td>
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</tbody>
</table>
TABLE 11

Tukey Test for the Significant Town Effect for Males for the Pattern Meanings: Fluency Scores -- Longitudinal Sample

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
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<td>Town for Males</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>Order</td>
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<td></td>
</tr>
<tr>
<td>Unitel</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Notel</td>
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<td></td>
<td></td>
<td>2.70</td>
<td>p &lt; .05</td>
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<td>0.53</td>
<td>3.23</td>
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Truncated Range

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<th>Multitel</th>
</tr>
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<td></td>
</tr>
<tr>
<td>S \bar{x} q .99</td>
<td>3.07</td>
<td></td>
</tr>
<tr>
<td>Source</td>
<td>SS</td>
<td>df</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
<td>----</td>
</tr>
<tr>
<td>Town</td>
<td>13.55</td>
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<tr>
<td>Grade</td>
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<tr>
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<tr>
<td>Sex</td>
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<td>1</td>
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<tr>
<td>Town x Grade x Sex</td>
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<td>2</td>
</tr>
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<tr>
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<td>2</td>
</tr>
<tr>
<td>Grade x Time</td>
<td>2.74</td>
<td>1</td>
</tr>
<tr>
<td>Town x Grade x Time</td>
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<td>Sex x Time</td>
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<td>Town x Sex x Time</td>
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</tr>
<tr>
<td>Grade x Sex x Time</td>
<td>.01</td>
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</tr>
<tr>
<td>Town x Grade x Sex x Time</td>
<td>14.76</td>
<td>2</td>
</tr>
<tr>
<td>Error</td>
<td>1586.67</td>
<td>282</td>
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TABLE 13

Simple Main Effects Test of the Town x Time Interaction
in the Cross-Sectional Vocabulary Scaled Scores

<table>
<thead>
<tr>
<th>Mean Scores</th>
<th>Notel</th>
<th>Unitel</th>
<th>Multitel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>10.50 (n=58)</td>
<td>10.90 (n=53)</td>
<td>11.75 (n=49)</td>
</tr>
<tr>
<td>Time 2</td>
<td>10.72 (n=51)</td>
<td>10.03 (n=44)</td>
<td>10.19 (n=51)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
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<td>Time for Notel</td>
<td>1.28</td>
<td>1</td>
<td>1.28</td>
<td>0.22</td>
<td>--</td>
</tr>
<tr>
<td>Time for Unitel</td>
<td>18.14</td>
<td>1</td>
<td>18.14</td>
<td>3.22</td>
<td>--</td>
</tr>
<tr>
<td>Time for Multitel</td>
<td>60.72</td>
<td>1</td>
<td>60.72</td>
<td>10.78</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Town at Time 1</td>
<td>42.97</td>
<td>2</td>
<td>21.48</td>
<td>3.81</td>
<td>* .05</td>
</tr>
<tr>
<td>Town at Time 2</td>
<td>12.50</td>
<td>2</td>
<td>6.25</td>
<td>1.11</td>
<td>--</td>
</tr>
<tr>
<td>Error</td>
<td>282</td>
<td>5.63</td>
<td></td>
<td></td>
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Tukey Test of the Significant Town Effect Among the Vocabulary Scaled Scores at Time 1 -- Cross-Sectional Sample

<table>
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<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town for Time 1</td>
<td>42.97</td>
<td>2</td>
<td>21.48</td>
<td>3.81</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tr>
<td>Note1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unitel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multitel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean

| Note1   | 10.50 |  |   |
| Unitel  | 10.90 |  |   |
| Multitel| 11.75 | |   |

Truncated Range

\[ S \bar{x} q .95 \] 1.07
\[ S \bar{x} q .99 \] 1.34

\[ S \bar{x} q .95 \] 1.07
\[ S \bar{x} q .99 \] 1.34

<table>
<thead>
<tr>
<th>Note1</th>
<th>Unitel</th>
<th>Multitel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note1</td>
<td>0.40</td>
<td>1.25 ( p &lt; .05 )</td>
</tr>
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<td>Unitel</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>Multitel</td>
<td></td>
<td></td>
</tr>
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<td>Source of Variation</td>
<td>SS</td>
<td>df</td>
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<tr>
<td>--------------------</td>
<td>------</td>
<td>----</td>
</tr>
<tr>
<td>Town</td>
<td>39.84</td>
<td>2</td>
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<tr>
<td>Grade</td>
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<td>Town x Grade</td>
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</tr>
<tr>
<td>Grade x Sex</td>
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<td>1</td>
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<tr>
<td>Town x Grade x Sex</td>
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<td>2</td>
</tr>
<tr>
<td>Error</td>
<td>1044.47</td>
<td>125</td>
</tr>
<tr>
<td>Time</td>
<td>113.24</td>
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<td>Town x Time</td>
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<td>2</td>
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<tr>
<td>Grade x Time</td>
<td>3.37</td>
<td>1</td>
</tr>
<tr>
<td>Town x Grade x Time</td>
<td>1.64</td>
<td>2</td>
</tr>
<tr>
<td>Sex x Time</td>
<td>1.03</td>
<td>1</td>
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<tr>
<td>Town x Sex x Time</td>
<td>3.03</td>
<td>2</td>
</tr>
<tr>
<td>Grade x Sex x Time</td>
<td>0.18</td>
<td>1</td>
</tr>
<tr>
<td>Town x Grade x Sex x Time</td>
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<td>2</td>
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<tr>
<td>Error</td>
<td>189.59</td>
<td>125</td>
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</table>
TABLE 16

Simple Main Effects Test of the Town x Sex Interaction in the Longitudinal Vocabulary Scores

<table>
<thead>
<tr>
<th>Mean Scores</th>
<th>Notel</th>
<th>Unitel</th>
<th>Multitel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>9.13 (n=54)</td>
<td>10.35 (n=48)</td>
<td>11.45 (n=38)</td>
</tr>
<tr>
<td>Females</td>
<td>10.30 (n=44)</td>
<td>9.39 (n=44)</td>
<td>9.89 (n=46)</td>
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</table>

<table>
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<tr>
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<th>MS</th>
<th>F</th>
<th>p</th>
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<tr>
<td>Sex for Notel</td>
<td>32.90</td>
<td>1</td>
<td>32.90</td>
<td>3.94 &lt; .05</td>
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</tr>
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<td>Sex for Unitel</td>
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<td>1</td>
<td>21.50</td>
<td>2.57  --</td>
<td></td>
</tr>
<tr>
<td>Sex for Multitel</td>
<td>50.38</td>
<td>1</td>
<td>50.38</td>
<td>6.03 &lt; .05</td>
<td></td>
</tr>
<tr>
<td>Town for Males</td>
<td>121.96</td>
<td>2</td>
<td>60.98</td>
<td>7.30 &lt; .01</td>
<td></td>
</tr>
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<td>Town for Females</td>
<td>18.24</td>
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<td>9.12</td>
<td>1.09</td>
<td></td>
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<td>Error</td>
<td>125</td>
<td>8.35</td>
<td></td>
<td></td>
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<td>Source</td>
<td>SS</td>
<td>df</td>
<td>MS</td>
<td>F</td>
<td>p</td>
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<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
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<td>Town for Males</td>
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<td>Order</td>
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<td>3</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Unitel</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multitel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>11.45</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$S \bar{x} .99$</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Notel           | 1.22 |    |    | 2.32 p < .01 |    |
| Unitel          | 1.22 |    |    | 2.32 p < .01 |    |
| Multitel        | 1.10 |    |    | 1.10 |    |
TABLE 18

Source Table for the Analysis of Variance of the
Block Design Scaled Scores - Town x Grade x Sex x Time

Cross-Sectional Sample

<table>
<thead>
<tr>
<th>Source</th>
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<th>F</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>Town</td>
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<td>6.42</td>
<td>0.72</td>
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<td>1</td>
<td>0.01</td>
<td>0.00</td>
<td>--</td>
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<td>21.03</td>
<td>2.37</td>
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</tr>
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<td>1</td>
<td>118.98</td>
<td>13.41</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Town x Sex</td>
<td>12.19</td>
<td>2</td>
<td>6.10</td>
<td>0.69</td>
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</tr>
<tr>
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<td>1</td>
<td>0.14</td>
<td>0.02</td>
<td>--</td>
</tr>
<tr>
<td>Town x Grade x Sex</td>
<td>7.57</td>
<td>2</td>
<td>3.79</td>
<td>0.43</td>
<td>--</td>
</tr>
<tr>
<td>Time</td>
<td>23.19</td>
<td>1</td>
<td>23.19</td>
<td>2.61</td>
<td>--</td>
</tr>
<tr>
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<td>6.84</td>
<td>2</td>
<td>3.42</td>
<td>0.38</td>
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</tr>
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<td>1.75</td>
<td>1</td>
<td>1.75</td>
<td>0.20</td>
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</tr>
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<td>2.47</td>
<td>2</td>
<td>1.23</td>
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</tr>
<tr>
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<td>3.23</td>
<td>0.36</td>
<td>--</td>
</tr>
<tr>
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<td>5.18</td>
<td>2</td>
<td>2.59</td>
<td>0.29</td>
<td>--</td>
</tr>
<tr>
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<td>12.76</td>
<td>0.44</td>
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</tr>
<tr>
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<td>2.88</td>
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</tr>
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<td>2502.60</td>
<td>282</td>
<td>8.87</td>
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</table>
### TABLE 19

Source Table for the Repeated Measures

Analysis of Variance of the Block Design Scaled Scores

Town x Grade x Sex x Time

<table>
<thead>
<tr>
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<th>p</th>
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</thead>
<tbody>
<tr>
<td>Town</td>
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<td>29.00</td>
<td>2.29</td>
<td>--</td>
</tr>
<tr>
<td>Grade</td>
<td>34.87</td>
<td>1</td>
<td>34.87</td>
<td>2.76</td>
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</tr>
<tr>
<td>Town x Grade</td>
<td>24.21</td>
<td>2</td>
<td>12.10</td>
<td>0.95</td>
<td>--</td>
</tr>
<tr>
<td>Sex</td>
<td>234.26</td>
<td>1</td>
<td>234.26</td>
<td>18.54</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Town x Sex</td>
<td>74.14</td>
<td>2</td>
<td>37.07</td>
<td>2.93</td>
<td>--</td>
</tr>
<tr>
<td>Grade x Sex</td>
<td>56.88</td>
<td>1</td>
<td>56.88</td>
<td>4.50</td>
<td>&lt;.04</td>
</tr>
<tr>
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<td>7.80</td>
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<td>3.90</td>
<td>0.30</td>
<td>--</td>
</tr>
<tr>
<td>Error</td>
<td>1579.16</td>
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<td>12.63</td>
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<td></td>
</tr>
<tr>
<td>Time</td>
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<td>1</td>
<td>0.92</td>
<td>0.19</td>
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</tr>
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<td>8.49</td>
<td>1.81</td>
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</tr>
<tr>
<td>Grade x Time</td>
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<td>1</td>
<td>4.22</td>
<td>0.90</td>
<td>--</td>
</tr>
<tr>
<td>Town x Grade x Time</td>
<td>4.63</td>
<td>2</td>
<td>2.31</td>
<td>0.49</td>
<td>--</td>
</tr>
<tr>
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<td>1</td>
<td>5.08</td>
<td>1.08</td>
<td>--</td>
</tr>
<tr>
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<td>0.67</td>
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<tr>
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<td>1</td>
<td>0.33</td>
<td>0.07</td>
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</tr>
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</tr>
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<td>125</td>
<td>4.67</td>
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</tr>
</tbody>
</table>
TABLE 20

Simple Main Effects Test of the Grade x Sex Interaction in the Longitudinal Block Design Scaled Scores

<table>
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<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
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<tbody>
<tr>
<td>Sex for Group 1 (Grade 4 to 6)</td>
<td>191.88</td>
<td>1</td>
<td>15.19</td>
<td>&lt;.01</td>
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</tr>
<tr>
<td>Sex for Group 2 (Grade 7 to 9)</td>
<td>38.16</td>
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<td>3.02</td>
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<td>Group for Males</td>
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<td>0.00</td>
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<td></td>
</tr>
<tr>
<td>Group for Females</td>
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Mean Scores

<table>
<thead>
<tr>
<th>Group 1 (Grade 4 to 6)</th>
<th>Group 2 (Grade 7 to 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>11.90 (n=78)</td>
<td>11.91 (n=64)</td>
</tr>
<tr>
<td>9.35 (n=48)</td>
<td>10.88 (n=84)</td>
</tr>
</tbody>
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