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ABSTRACT

Using a longitudinal data set obtained from 169 pre-adolescent children between the ages of 8 and 13 years, this study statistically divided locus of control into two independent components. The first component was noted as "age-dependent" (AD) and was determined by predicted values generated by regressing children's ages onto their locus of control scores. The second component was called "age-independent" (AI) and was determined by the residual scores from the regression analysis. The components were then used to identify clusters of items associated with AD and AI from the original 40-item pool of the research instrument. Both components showed a strong positive relationship with the general measure. Both defined similar score ranges and encompassed the full internal-external range. One variable, Self Esteem, obtained a linear correlation of r=-.54 with AI and r=.00 with AD. Further analyses, utilizing multiple log-linear chi-square analyses with regard to Internal/External response patterns, demonstrated that the relationship between age and locus of control, while quite robust, is not necessarily linear. Earlier analyses of this scale may have obtained statistical artifacts associated with the binary structure of the scale. A six-point Likert scaling system is recommended for future use. It is speculated that similarities and differences between the locus of control components across cultures may clarify the distinction between the components. (RH)

AGE-DEPENDENT AND AGE-INDEPENDENT MEASURES OF LOCUS OF CONTROL : A PAPER PRESENTATION TO THE THIRD EUROPEAN CONFERENCE ON PERSONALITY AND MEASUREMENT.

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ABSTRACT. Using an existing longitudinal data set of 169 pre-adolescent children between the ages of 8 and 13, locus of control was statistically divided into two independent locus of control components by regressing children's ages onto their locus of control scores. The first component was noted as "age-dependent" (AD) and was determined by predicted values generated by the regression analysis, while the second component was called "age-independent" (AI) and was determined by the residual scores from the same regression analysis. These two components were then used to identify clusters of items from the original 40 item pool of the instrument which were associated with AD and AI. Both components of locus of control (AD and AI) showed a strong positive relationship with the general measure of locus of control. Both AD and AI defined similar score ranges and encompassed the full internal-external range. One variable, Self Esteem, obtained a linear correlation of r=-.54 with AI and r=.00 with AD. Further analyses, utilizing multiple log-linear chi-square analyses with regard to Internal/External response patterns, demonstrated that the relationship between age and locus of control, while quite robust, is not necessarily linear. Earlier analyses of this scale may have obtained statistical artifacts associated with the binary structure of the scale. A six-point Likert scaling system is recommended for future use. It is speculated that similarities and differences between the locus of control components across cultures may clarify the distinction between the components. Studying these distinctions across cultures and across age levels (both cross-sectionally and longitudinally) with an instrument which utilized a six-point Likert scale would allow for a more sophisticated factor-analytic treatment and would also help clarify the role of environmental influences (ie., culture) on the development of locus of control. This strategy should also help identify those aspects of locus of control that are robust across cultures.

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AGE-DEPENDENT AND AGE-INDEPENDENT MEASURES OF LOCUS OF CONTROL

INTRODUCTION

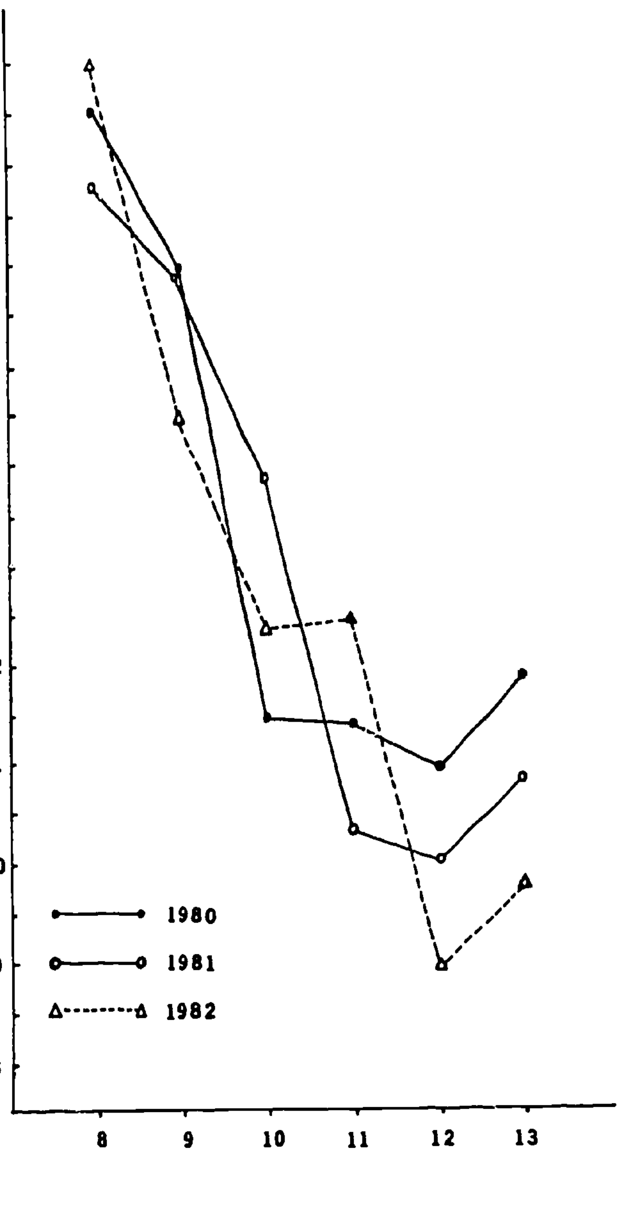
BACKGROUND. Locus of control enjoys wide spread popularity as a personality measure. As a generalized expectancy measure the construct has been theorized to exist on a relative continuum ranging from Externality to Internality (Nowicki & Strickland, 1973; Rotter, 1975). Theoretical speculation regarding individual differences (sample variability) have focused on whether or not this measure reflects a stable personality characteristic or one which is subject to either the influences of experience or maturation (Lefcourt, 1976). Waterman (1984) believes that locus of control is one of four important facets making up the optimally psychological functioning personality. He theorizes that this personality develops across time and achieves stability in adults. An earlier analysis of pre-adolescent children's locus of control perceptions (Sherman, 1984) suggested a strong linear trend being associated with growing up (See Figures 1 & 2). This study tends to confirm Waterman's (1984) developmental predictions. Younger children were found to be relatively more External than their older peers and older children were relatively more Internal than their younger peers. These analyses were based on the generalized expectancy full scale locus of control scores as measured by the Children's Nowicki-Strickland Internal-External Control Scale (CN-SIECS). Brim (1974) has described this scale as an "agree-disagree" or binary scale. The two primary objectives of the present study were to attempt an item by item analysis of the children's response patterns to the locus of control instrument (See Appendix I) with respect to developmental changes and to confirm a hypothesis predicting a statistically significant relationship between Locus of Control and Self-Esteem - another of the four facets of personality which Waterman (1984)describes.

At the beginning of these analyses we thought that we were quite knowlegable about the locus of control construct. However, after many analyses and several trips back to the library and attempts at interpreting our results, we feel that, at this point in time, we know much less than we would like, and, consequently feel far more confused. Because of this, in all honesty we would like to apologize for any confusion which may be caused by the following presentation. Our study has been one of exploratory data analyses and we believe we have raised more questions than we have answered. Therefore, we are reporting how we arrived at what we found, our findings, some preliminary speculations, and offering some suggestions with regard to future research in the area.

METHOD

SCHOOL SETTING AND SAMPLE.

The laboratory school from which the data were collected was administered by a midwestern university school of education. The laboratory school was used as a research facility as well as a field



Mean locus of control scores by chronological age groups and sex
ears.

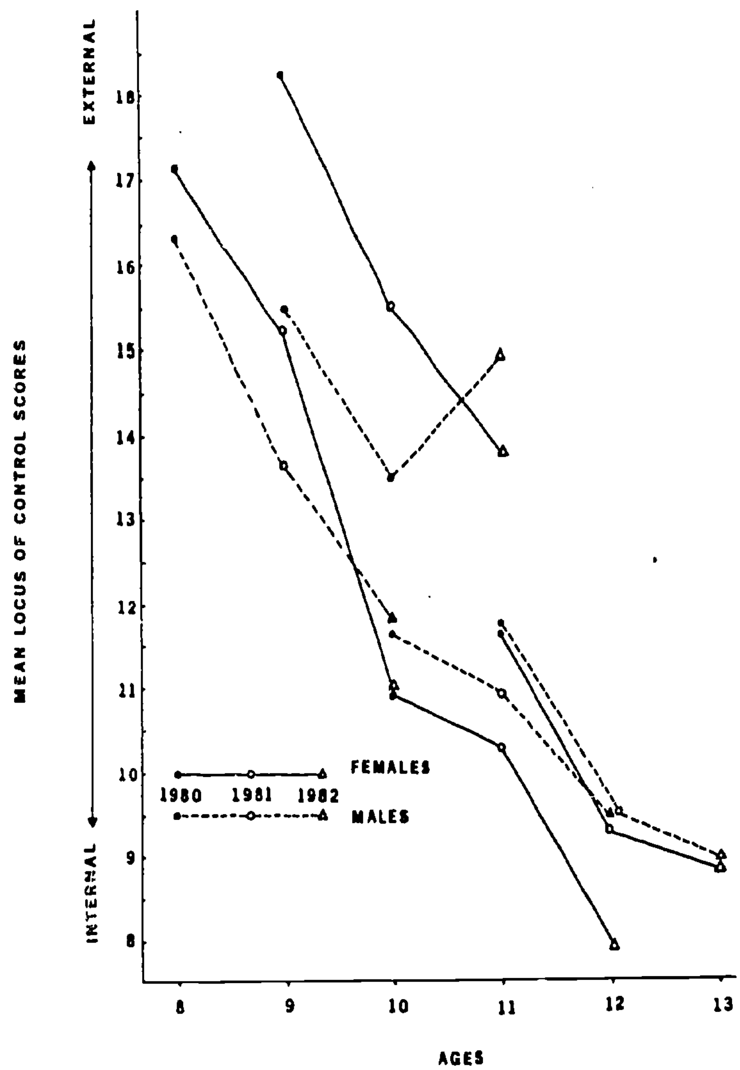


Figure 2. Mean locus of control scores of both sexes across three years for four different age-cohorts.

cite for both undergraduate pre-service and graduate student training. Many experimental programs were actively being pursued in this facility. The school annually included approximately 243 children ranging in age from five through thirteen. Approximately 70 to 80 percent of the children's parents were affiliated with the university. Structurally there were three levels: the Primary Unit, including five, six, and seven-year-olds; Intermediate Unit, including eight, nine, and ten-year-olds; the Advanced Unit was organized into three traditionally age-homogeneous sixth, seventh and eighth grade classrooms consisting of eleven, twelve, and thirteen-year-olds respectively. Six separate classrooms each containing approximately 27 children of mixed ages were utilized in the Primary and Intermediate Units. An equal number of both sexes as well as the three age groups were placed in each of the three Primary and three Intermediate classrooms (e.g., in the three Intermediate classrooms there would be approximately nine eight-year-olds, nine nine-year-olds, and nine ten-year-olds equally distributed between both sexes). Further descriptions of this population are contained in Sherman (1984a; 1984b). The present study examined children between the ages of eight and thirteen in both the Intermediate and Advanced classrooms during the last year of a three year longitudinal study (n=169).

INSTRUMENTS.

LOCUS OF CONTROL. Locus of control was measured by the Children's Nowicki-Strickland Internal-External Control Scale (CN-SIECS) (Nowicki & Strickland, 1973). The scale has 40 declarative statements which require a "yes" or "no" response: 24 of the items are stated such that an affirmative response would be scored as "external" whereas the remaining 16 items are phrased such that a "no" response would be scored as "external." Brim (1974) would describe this as an "agree-disagree scale." Theoretically scores could range from 0 to 40, with highest scores reflecting an external orientation and lowest scores reflecting an internal orientation. Children were read the questions aloud in a standardized fashion while they read from their own copies upon which they recorded their answers. KR-20 reliability statistics were computed for the children's responses each year and were found to be acceptable. The KR-20 coefficients were .72, .73 and .77. While the KR-20's suggest statistical homogeneity among the 40 items, we feel that this does not accurately reflect the content of the items as we will detail in our results section.

SELF ESTEEM. The children were annually administered an abbreviated form of the Coopersmith Self-Esteem Inventory (Robinson & Shaver, 1973). This instrument consists of 25 binary (yes/no responses) declarative items. The items were phrased in both negative and positive forms and were scored one point each for responses which reflect "positive" self-esteem. High scores (25) reflect strong positive self-esteems whereas low scores (0) reflect weak or negative self-esteems.

DESIGN AND ANALYSIS.

In general, the strategy of analysis was one of identifying relationships, not necessarily linear, between age and Locus of Control. Initially a regression analysis attempted to predict children's locus of control scores from their ages. This allowed us to obtain predicted and residual locus of control scores. The predicted scores were conceptualized as "Age-Dependent" (AD) while the residual scores were thought of as "Age-Independent" (AI) scores. The original 40 item CN-SIECSSIECS were then used in two separate multiple regression analyses in which the best combination of items which predicted either the AD or AI locus of control scores from the previous analysis was sought. To confirm the hypothesis (Waterman, 1984) predicting a significant relationship between childrens' Self-Esteem scores and their locus of control scores, these two measures were correlated with each other. In addition, the AD and AI scores from the initial analysis were used as predictors of self-esteem scores. Separate two way log-linear analyses (Everitt, 1977) of each of the 40 items by the six age groups determined statistically significant cell residuals contributing to the overall statistically significant chi-squares. This chi-square analysis helped determine differences within age groups with respect to External/Internal responses.

Thus, we looked at the data using two techniques: multiple regression and chi-square. Our results were particularly informative and with one exception misleading with regard to our research question regarding the relationship between locus of control items and development. We feel that a brief measurement discussion within the context of the two statistical techniques might be beneficial.

MULTIPLE REGRESSION AND CORRELATION. Our initial analysis was one of predicting locus of control scores from age. This analysis defined two scores, the predicted scores which we referred to as age-dependent locus of control (AD) and the residuals of the locus of control scores which we referred to as age-independent locus of control (AI). Using multiple regression we then attempted to predict AD from the 40 locus of control items. Five items were identified as statistically significant predictors of AD. We wondered whether we might not obtain a different set of items if we were to use just age rather than AD as our dependent variable. This second multiple regression analysis identified the same five items as significant predictors of age. When we looked at the content of these five items we were totally baffled as to why they, as a group, were related to age while a variety of other items were not related to age, even though their content suggested that they too should be age related.

The multiple regression analyses utilized point biserial correlations. The items that were identified as age related items were identified as such because of distributional similarities that allowed them to be maximally correlated with the criterion variables. The problem with this analysis is that there are other locus of control items whose relationship with age has been attenuated by their variances. These other items may be influenced more by age than the five age related items that we identified through the regression analysis.

CHI-SQUARE RESIDUAL ANALYSIS. A chi square test of independence was applied to each item to determine whether the frequencies of External and Internal responses to an item occurred independently of the age category. If an item defined a significant chi square, a residual analysis, following Everitt (1977), was carried out on the cells. The residual analysis of the cells of a contingency table is analogous to a post hoc analysis following a significant F-ratio in analysis of variance. A residual analysis of a cell indicated whether the deviation between the observed frequency for a cell is statistically different from the expected frequency for the cell. Thus, this particular chi-square procedure represents an analysis of the frequency of I/E responses "within" an age group. If the responses of an age group are particularly External for an item, the frequency of External responses for the age group will be greater than the frequency expected by chance under the assumption of independence of age and the locus of control item. At the same time we should find the internal responses for the same group to be fewer than the frequency expected by chance.

RESULTS AND DISCUSSION

THE INITIAL REGRESSION STRATEGY. We initially ruled out a factor analytic strategy based on criticisms of the use of such a statistic when examining binary items (Hofmann & Gray, 1978). Our initial strategy was to use a multiple regression approach, regressing children's ages on their full-scale CN-SIECS scores (predicting their scores from their ages). This allowed us to obtain statistically generated predicted scores which we defined as Age-Dependent (AD) locus of control, as well as residual scores which we defined as Age-Independent (AI) locus of control. Both components of Locus of Control (AI and AD) showed positive relationship with the full scale general measure of Locus of Control. Both AD and AI defined similar score ranges and encompassed the full Internal-External range.

Inasmuch as we had one other intra-personal perception scale available, the Coopersmith Self Esteem Inventory (CSEI) (Robinson & Shaver, 1973; Coopersmith, 1967), we correlated it with both AD and AI scores as well. The rational for examining this relationship was based on a recent book by Waterman (1984) who has hypothesized that the optimally psychological functioning individual will have a sense of personal identity (Erikson, 1968), will be self-actualized (Maslow, 1968), will have an internal locus of control (Rotter, 1966), and will be capable of principled moral reasoning (Kohlberg, 1976). Thus, according to his psychology of individualism, he has predicted that there should be a statistically significant relationship between locus of control and self-esteem in a psychologically healthy population of individuals (Waterman, 1974, p 57). Our full scale scores for both the CN-SIECS and the CSEI were indeed signifcantly correlated with each other (r=-.51) suggesting a validation of Waterman's (1974) hypothesis. Hertz-Lasarowtiz and Sharan (1979) and others (See Waterman, 1984) have reported a similar relationship between self-esteem and locus of control. An interpretation of this relationship has previously been reported in Sherman & Wolf (1984). When we correlated age with Self Esteem we did not obtain a significant relationship (r=.01) where as the correlation between age and full scale locus of control was significant (r=-.47). Oppenheimer et al. (1986) reports a similar relationship between age and locus of control in children between the ages of 3 and 11. When we correlated the statistically derived AD and AI scores with the CSEI scores we found that while AI scores were significantly related (r=-.54), the AD scores were not (r=.00). These findings suggested highly complex relationships among these variables and developmental changes in our pre-adolescent sample. Thus while self-esteem is not predictable on the basis of age, Locus of control is. Furthermore, statistically derived AI is significantly related to self esteem, but AD is not. While Waterman (1984) predicted a significant relationship between Self-Esteem and Locus of Control, we found that only our statistically generated AI component maintained that relationship, while the AD component did not. One interpretation of these findings might be that there are components of Locus of Control as well as Self Esteem which are relatively stable and not nearly as subject to change from the influences of maturation and experience. It might be noted here that Coopersmith (1967) reports test-retest reliability coefficients of r=.88 after a 5-week interval, and r=.70 after a 3-year interval for his Self Esteem Inventory. One might question whether or not this stability is maintained in other cultures. Welz et. al (1984) has suggested cultural differences in locus of control among Japanese and American samples on the basis of a new construct which they noted as "secondary control. Robison-Awana et al., (1986) report that academic achievement and sex role perceptions - certainly two factors which are culturally related - influence 12-yr-olds' self-esteem (it might be especially important to note here that they used the same Self-Esteem instrument which we used). Perhaps the AD component might be relatively more influenced by cultural differences during pre-adolescent development while the AI component might represent a more stable personality characteristic. To further understand the AD and AI components we initiated more detailed analyses.

We attempted to determine which of the 40 individual items were most strongly associated with the statistically generated AD and AI scores. Utilizing point-by-serial correlations each of the items was correlated with the AD and AI scores. Two different sets of items, 15 of which were significantly associated with AI scores (R=.87) and 5 other items which were significantly associated with AD scores (R=.54), were obtained (See Table 1). An analysis such as this assumed that "linear" relationships would be obtained. However, as will be demonstrated later this assumption was not entirely warranted.

Table 1.
Statistics Associated With CN-SIES Items by Age Groups by Case.

ITEM #	MEAN EXTERNAL (1.00) RESPONSES AGES 8, n's 26	9, 28	10, 27	11, 31	12, 27	13, 30	STATISTICS: r with age	$\chi^2_{(5)}$ of Age x responses
CASE #1, 2 BIPOLAR EXTREMES								
19.(AD)[b]	.56E[c]	.26	.22	.23	.08I	.07I[d]	-.34	23.55*
13.	.50	.75E	.62	.48	.19I	.20I	-.33	28.66*
32.	.58E	.48	.35	.29	.11I	.17I	-.33	19.87*
14.(AD)	.77E	.52	.33	.42	.22I	.27	-.32	22.20*
28.	.69	.68E	.56	.52	.37	.23I	-.32	18.13*
38.	.46E	.32	.26	.32	.07I	.10I	-.27	15.71*
1.(AI)[a]	.42E	.18	.18	.29	.26	.07I	-.17	11.47*
CASE #2, ONE EXTREME EXTERNAL GROUP								
22.(AD)	.39E	.14	.15	.07	.00	.10	-.26	19.57*
25.	.19	.25E	.11	.13	.04	.00	-.24	11.59*
29.(AI)	.50E	.30	.15	.32	.15	.17	-.21	13.40*
37.(AD)	.31E	.11	.07	.23	.04	.07	-.17	13.20*
CASE #3, ONE EXTREME INTERNAL GROUP								
20.	.39	.36	.37	.13	.08I	.20	-.22	13.29*
12.(AD)	.73	.74	.59	.71	.52	.40I	-.22	11.40*
31.(AI)	.55	.39	.30	.48	.19I	.17	-.21	12.93*
5.	.73	.54	.59	.71	.30I	.57	-.13	13.68*
9.(AI)	.27	.14	.33	.19	.00I	.33	-.02	13.61*

(continued)

*p<.05.

[a] Fifteen items included in multiple correlation predicting Age-Independent Locus of Control (R=.87).

[b] Five items included in multiple correlation predicting Age-Dependent Locus of Control (R=.54).

[c & d] E and I indicate direction of significant cell residuals from $\chi^2_{(5)}$ analyses.

Table 1. (Continued)

	MEAN EXTERNAL (1.00) RESPONSES						STATISTICS	
							r with age	$\chi^2_{(5)}$ of Age x Response
AGES	8	9	10	11	12	13		
n's	26	28	27	31	27	30		
ITEM #								
CASE #4, ITEMS NOT SIGNIFICANTLY RELATED TO AGE GROUPS								
2.	.58	.54	.48	.48	.48	.40	-.10	2.01
3.	.35	.14	.30	.39	.26	.30	.03	4.91
4.	.35	.25	.30	.16	.07	.07	-.25	11.96*
6.(AI)	.35	.14	.15	.13	.15	.17	-.11	6.14
7.(AI)	.15	.29	.07	.10	.07	.07	-.16	9.30
8.	.15	.36	.22	.13	.15	.23	-.04	6.17
10.(AI)	.35	.25	.22	.26	.19	.23	-.07	2.06
11.	.35	.39	.37	.32	.26	.27	-.09	1.89
15.	.46	.41	.33	.36	.30	.17	-.19	6.57
16.(AI)	.50	.50	.33	.36	.26	.17	-.24	10.80
17.(AI)	.39	.11	.15	.26	.27	.27	.01	7.27
18.(AI)	.31	.32	.19	.23	.37	.43	.09	5.62
21.	.58	.29	.30	.32	.33	.30	-.22	7.21
23.(AI)	.50	.29	.30	.26	.15	.30	-.15	8.26
24.(AI)	.50	.50	.37	.58	.44	.43	-.03	3.02
26.	.08	.07	.00	.07	.00	.07	-.04	4.00
27.	.50	.37	.48	.45	.26	.57	.01	6.65
30.(AI)	.62	.52	.41	.48	.44	.47	-.08	2.75
33.	.60	.50	.41	.36	.30	.33	-.19	7.23
34.(AI)	.85	.71	.60	.61	.89	.70	-.02	9.91
35.	.42	.43	.37	.36	.15	.17	-.22	10.26
36.	.56	.52	.44	.36	.23	.23	-.26	11.31*
39.(AI)	.46	.33	.22	.36	.19	.33	-.09	6.09
40.	.12	.21	.19	.19	.11	.00	-.13	7.45

At this point in our explorations we went back to the empirical raw scores identified by the previous analysis (the 15 AI items and the 5 AD items) and summed the raw responses to produce two subscale scores which we refer now to as the empirical AI or AD scores. We used this approach hoping to see if our statistical conceptualization of AI and AD would generalize at the item response level. While we did not expect these two empirically derived scores to be significantly correlated with each other, much to our consternation we did obtain a significant relationship between them, r=.55. The correlation between the empirically derived AD subscore and age was significant (r= -.51) while the correlation between the empirically derived AI subscore and age was only -.23, a more modest yet significant correlation. Both the empirically derived subscales were also significantly related to Self-Esteem as well (r=-.47 and r=-.33 for empirically derived AI and AD respectively). From our previous analysis, while we expected the empirically derived AI subscale to be significantly related to Self Esteem, we did not expect the empirically derived subscale for AD to be significantly related. Because of these two questionable relationships we concluded that generalizing to the empirically derived subscale from the statistically determined AD and AI components may not be warranted. We then decided to pursue a more detailed analysis of our data at the individual item level.

When dealing with yes/no responses (binary data), quantitatively there are a number of pitfalls that may lead one astray with one's conclusions. In particular the more traditional parametric statistics that utilize correlations with binary data are especially suseptible to problems. The basis for the problem is the distribution associated with a binary variable.

Let us assume that we are going to define the correlation between two binary variables. It is well documented (Ferguson, 1941; Carroll, 1961) that as the variance of the two variables becomes discrepant the magnitude of the maximum possible pearson correlation, also referred to as a phi coefficient, between the two variables is some number less than unity. The more discrepant the variances of the two variables the more the magnitude of the maximum possible correlation departs from unity. Thus, it is possible for two variables, quite discrepant with regard to variance, to achieve a maximum possible correlation (the best possible correlation) that is less in magnitude than a modest correlation: that is, one that is not near the maximum possible value between two variables that have similar variances. The consequence of this lack of robustness manifests itself in several different ways. If one were to factor analyze a matrix of correlations between binary variables the variables defining any one factor would be "relatively homogeneous" with regard to their variances. Ferguson (1941) referred to such factors as difficulty factors. This one reason we obtained KR-20's which appear to be in the acceptable range.

Following a somewhat similar logic a perfect relationship (unity) between a continuous variable, or even an ordinal variable with three or four levels, and a binary variable is simply not possible. With a binary predictor variable there are only two points on the regression line. Therefore all values of the dependent variable are estimated by the two points. To the extent that the continuous variable is bimodal with the proportions associated with the two modes, similar in magnitude to the proportions associated with the "yes" and "no" responses, the pearson correlation, sometimes referred to as a point biserial correlation, between the variables will be a maximum (unity). However, if the continuous variable is either not distributed in a bimodal fashion or if the modes do not represent the same proportions as those associated with the binary variable, the maximum possible magnitude of the correlation coefficient is reduced.

CHI-SQUARE ANALYSES. For our locus of control data we were particularly interested in determining the relationship between the ages of our pre-adolescent subjects and their I/E responses to each of the 40 items. The chi-square analysis clarified the extent of Internality-Externality of a single group. Eighteen items were identified as having significant chi-square values. This eighteen included the five statistically derived AD items that we identified through the multiple regression analysis. The residual analysis of the individual chi-square cells allowed us to identify items as belonging to one of four groups:

Case 1 Items. Bipolar items where there were two sets of extremes, one more External than expected and the other more Internal than expected. The seven items presented in Table 2 are primarily a function of mostly our younger group (primarily 8-yr-olds and in two instances 9-yr-olds) making External responses and our 13-yr-old group responding internally more frequently than would be expected by chance. For the most part our 9, 10 and 11-yr-olds fall somewhere between these two extremes. Two of the items identified by this grouping (items 14 and 19) were also identified as AD variables in our multiple regression analyses predicting Age-Dependent Locus of Control. Unexpectedly, one of the items (item 1) was identified as an AI variable when we predicted Age-Independent Locus of Control. Four new items became identified as significantly associated with age (items 13, 28, 32 and 38). When we attempted to find some common ground within the content of these seven items we became quite confused. There seemed to be little similarity among the items' content.

Case 2 Items. Those items where there was one extreme age group having statistically more External responses than expected. Of the four items associated with this pattern, two (items 22 and 37) were previously identified as AD items in our regression analysis. Once again, unexpectedly one of the items was previously identified as an AI item (item 29). One new item (item 25) not previously identified became associated with age. With the exception of item 25 where 9-yr-olds were responding in an External fashion more frequently, the other three items all demonstrated that 8-yr-olds were responding more Externally than would be expected by chance. Thus the primary contribution to the statistically significant chi-squares in these four analyses was originating in our youngest children. Once again we found it quite difficult to conceptualize any common ground with regard to the content of these four items.

Case 3 items. Those items where there was one or two extreme age groups defining statistically more internal responses than expected. Among these 5 items two had previously been identified as AI items (items 9 and 31) from our multiple regression analysis predicting Age-Independent Locus of Control, while only one item (item 12) had previously been identified as an AD item. For the most part it was the extreme internal responses from our 12-yr-olds which contributed to the significant chi-squares, with the exception of item 12 where the primary contribution was from the 13-yr-olds' extreme internal responses. Two new items (items 5 and 20) were found to be associated with age in this set. Again, we had great difficulty determining any communality in the content of these items.

Case 4 items. Those items which have no statistically significant relationship, at least in our chi-square analyses, with age groups. It should be noted that 11 (73%) of our previously identified 15 AI items were found in this set, while none of the AD items were found here.

While we thought an analysis of each item would enlighten us as to which perceptions were changing over time, we were only more confused by our search. Confusion arose because of two issues: (1) finding AI items where we did not expect them to be and (2) trying to synthesize the content of the items we did find statistically associated with age groups. In addition, those items which did demonstrate a statistical association with age appeared to demonstrate a more discontinuous relationship which did not reflect as clear a linear trend as in our earlier full score analysis of the CN-SIECS. However, it was interesting to see how the two analytic approaches, one using regression and the other chi-square, did arrive at somewhat similar identifications of items related to our pre-adolescent age groups. All the statistically derived AD items were found throughout Case 1 through 3 described above. Clearly, there appear to be changes in perceptions of Locus of Control over time, but the exact nature of these changes may be hidden from us because of the binary nature of the items in the scale we choose to use. Our chi-square analysis suggests that the 40 items are not nearly as homogeneous as we had previously thought, inspite of the KR-20 coefficients which we had computed earlier. The CN-SIECS is a popular instrument which attempts to measure a "general expectancy" perception. It is difficult to obtain more specific perceptions when using dichotomous items such as are used in this instrument as well as many other instruments which Brim (1974) describes as "agree-disagree" scales. If items could have demonstrated greater variance, as in a Likert-type scale, perhaps we could observe the more subtle changes which appear to be occurring between the ages of 9 and 12. We would suggest that an even number of scaled points be used in future construction of locus of control scales and would even go so far as to suggest the use of a 6-point item scale. Since the Locus of Control construct is usually described in a bi-polar fashion from External to Internal, a 6-point scale would not allow for a neutral point, thus forcing choices in either direction yielding much greater response variation. With greater variation available, more powerful factor-analytic techniques could more thoroughly "tease" out the relationships which we sought.

Waterman (1974) made his prediction of a significant association between locus of control and self esteem on the basis of a well integrated individualistic personality type which he only expected to find among an adult population. Part of the ambiguity found in our results may be due to the developing nature of our pre-adolescent sample. Nevertheless, the trends which we have reported appear to be pointing toward the natural development of optimal psychological functioning. It is speculated that similarities and differences between Age-Independent and Age-Dependent locus of control across cultures may clarify the distinction between these components. Studying these distinctions across cultures and across age levels (both cross-sectionally and longitudinally) with an instrument which utilized a six-point Likert scale would allow for a more sophisticated factor-analytic treatment and would also help clarify the role of environmental influences (ie., culture) on the development of locus of control. This strategy should also help identify those aspects of locus of control that are robust across cultures.

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Appendix I.

Children's Nowicki-Strickland Internal-External Control Scale (CN-SIEC). (Y/N indicates External response scored as one point.)

ITEM #	ITEM QUESTION
1.Y	Do you believe that most problems will solve themselves if you just don't fool with them?
2.N	Do you believe that ;you can stop yourself from catching a cold?
3.Y	Are some kids just born lucky?
4.N	Most of the time do you feel that getting good grades means a great deal to you?
5.Y	Are you often blamed for things that just aren't your fault?
6.N	Do you believe that if somebody studies hard enough he or she can pass any subject?
7.Y	Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyway?
8.Y	Do you feel that if things start out well in the morning that it's going to be a good day no matter what you do?
9.N	Do you feel that most of the time parents listen to what their children have to say?
10.Y	Do you believe that wishing can make good things happen?
11.Y	When you get punished does it usually seem it's for no good reason at all?
12.Y	Most of the time do you find it hard to change a friend's (mind) opinion?
13.N	Do you think that cheering more than luck helps a team to win?
14.Y	Do you feel that it's nearly impossible to change your parent's mind about anything?
15.N	Do you believe that your parents should allow you to make most of your own decisions?
16.Y	Do you feel that when you do something wrong there's very little you can do to make it right?
17.Y	Do you believe that most kids are just born good at sports?
18.Y	Are most of the other kids your age stronger than you are?
19.Y	Do you feel that one of the best ways to handle most problems is just not to think about them?
20.N	Do you feel that you have a lot of choice in deciding who your friends are?

(CONTINUED)

Appendix I (Continued)

ITEM #	ITEM QUESTION
21.Y	If you find a four-leaf clover do you believe that it might bring you good luck?
22.N	Do you often feel that whether you do your homework has much to do with what kind of grades you get?
23.Y	Do you feel that when a kid your age decides to hit you, there's little you can do to stop him or her?
24.Y	Have you ever had a good luck charm?
25.N	Do you believe that whether or not people like you depends on how you act?
26.N	Will your parents usually help you if you ask them to?
27.Y	Have you felt that when people were mean to you it was usually for no reason at all?
28.N	Most of the time, do you feel that you can change what might happen tomorrow by what you do today?
29.Y	Do you believe that when bad things are going to happen they just are going to happen no matter what you try to do to stop them?
30.N	Do you think that kids can get their own way if they just keep trying?
31.Y	Most of the time do you find it useless to try to get your own way at home?
32.N	Do you feel that when good things happen they happen because of hard work?
33.Y	Do you feel that when somebody your age wants to be your enemy there's little you can do to change matters?
34.N	Do you feel that it's easy to get friends to do what you want them to?
35.Y	Do you usually feel that you have little to say about what you get to eat at home?
36.Y	Do you feel that when someone doesn't like you there's little you can do about it?
37.Y	Do you usually feel that it's almost useless to try in school because most other children are just plain smarter than you are?
38.N	Are you the kind of person who believes that planning ahead makes things turn out better?
39.Y	Most of the time, do you feel that you have little to say about what your family decides to do?
40.N	Do you think it's better to be smart than to be lucky?