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Innovative Retention Methods in Longitudinal Research: A Case Study of the Developmental Trends Study

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Minimizing participant attrition is vital to the success of longitudinal research. The Developmental Trends Study (DTS), a longitudinal study of the development of disruptive behavior disorders, has achieved a low attrition rate throughout the study. The development of early retention strategies, managing contact and scheduling history through the use of electronic databases, interviewer persistence, and the emergence of new electronic search methods have contributed to the success of our study. A literature review of retention methodology and practical solutions to maintain participant cooperation is described. A case study of the DTS is presented to inform researchers in longitudinal research on new methods used to maintain high retention rates.

KEY WORDS: attrition; subject retention; search methods; difficult subjects; longitudinal research.

Increasing emphasis has been placed on the study of developmental influences, and on fluctuations over time in outcomes of interest. In longitudinal survey research, maintaining subject participation over time is essential to prevent selective attrition, and to allow studies to address their long-term aims. Significant attrition can erode demonstrable intervention effects by diminishing exposure or

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control conditions, by creating nonrepresentative groups, and by reducing statistical power (Prinz, et al., 2001), threatening both the internal and external validity of research findings. Although there are statistical procedures (i.e., endpoint analysis and regression techniques) that may be used to address threats to validity based on subject loss, selective attrition of participants often cannot be avoided (Flick, 1988). Often, the subjects who are lost are not representative of the entire sample. A disproportionate number of antisocial and criminal participants may be lost at follow-up, of whom researchers in psychopathology and criminology are most interested in studying (Farrington, Gallagher, Morley, St. Ledger, & West, 1990).

Subject attrition and a variety of related factors have been the focus of much research. Two factors in which the investigators have the most control are losing contact with the subjects and the subjects' refusal to continue participation (Capaldi & Patterson, 1987). It is important to establish, during the planning stages of a research project, procedures that will be used in locating participants and maintaining their cooperation throughout the study. General guidelines for interviewers to follow in securing interviews have been described in several of studies (Ribisl, et al., 1996; Sullivan, Rumptz, Campbell, Eby, & Davidson, 1996). Sullivan et al., (1996) suggested three components to participant retention: efforts at developing good rapport and acquiring detailed contact information; participant-oriented retention strategies such as phone calls, personal visits, and mailings; and focus on participants' social networks and community-oriented retention strategies.

We review emerging methods, including electronic information searches and data storage, for maintaining contact and continued willingness for study participation. Our goal is to help researchers identify obstacles associated with scheduling and completing assessments when conducting longitudinal research, and offer practical solutions to these problems. An overview of the procedures used to retain reluctant, resistant, and difficult to locate participants is discussed, including new search methods via the Internet. A case study is presented to illustrate the specific uses and yield of new search methods.

CONTACT DOCUMENTATION

Documentation of contact efforts has been extensively described (e.g., Green, Navratil, Loeber, & Lahey, 1994; Navratil, Green, Loeber, & Lahey, 1994; Stouthamer-Loeber, van Kammen, & Loeber, 1992). Participant contact sheets provide an easy reference for tracking and locating participants. From first contact efforts through each subsequent assessment, it is critical to obtain and update as much demographic information as possible. At each interview session, participants should provide their current address and phone number, as well as contact information for at least two individuals who live outside of their household yet are likely to know their whereabouts. Relatives, such as grandparents, and close family friends often prove to be the best references. Also, additional information such as place of

employment, cell phone numbers, pager numbers, and e-mail address are important to obtain.

ELECTRONIC DATABASES

Organization of contact information should allow project staff to quickly reference phone numbers and addresses of participants. In longitudinal studies, the amount of contact information gathered over time can be overwhelming. Simply collecting old contact sheets and phone call logs is not an efficient method of record keeping. Electronic databases permit researchers to efficiently maintain, code, and access a great amount of information. Coen, Patrick, and Shern (1996) described a contact database recording all contact attempts, including nature and results of all attempted contacts for each respondent, along with detailed reasons for non-participation. All of the information from the contact sheets was then entered into an electronic database, allowing regular review and update of contact histories.

RELUCTANT OR RESISTANT PARTICIPANTS

Retaining reluctant or transient subjects is perhaps the most difficult task for project staff. Reviewing participation histories gives project staff a good indication of the difficulty in scheduling future interviews, and highlights unique circumstances bearing on individual participants that might affect participation. Further, if there are systematic differences between easy to retain and difficult to retain participants, procedures can be designed to address these differences (Ullman & Newcomb, 1998).

Participants may be reluctant to participate for any number of reasons. It is the interviewers' task to uncover what makes a particular participant apprehensive and encourage participation. Stouthamer-Loeber et al., (1992) described reluctance as a temporary problem, unique to each individual, to be solved on a case-by-case basis. Some research topics, such as deviant behavior, require questions that may make some respondents feel uneasy and may increase their reluctance to participate in future interviews (Navratil et al., 1994). They emphasized the importance of developing good rapport, making the participant feel comfortable with the interviewer and the interview, and having regular correspondence between assessments. Further, the process of participating in a research project will also have a strong influence on participants' willingness to continue with a study. Stouthamer-Loeber et al., (1992) suggested that if an interviewer is courteous, the interview not too long, the questions not too painful or embarrassing, and the remuneration worthwhile, the participant is likely to be receptive to future interviews.

Staff selection is also very important in creating a comfortable atmosphere for the participant. All staff, not only interviewers, with whom the participant interacts may have an influence on retention. These staff should have good listening skills,

relate easily to others, adopt a nonjudgmental approach, pay close attention to detail, and be persistent in the face of frustrating and distracting obstacles (Prinz et al., 2001). Further, it is crucial that interviewers accept perspectives and lifestyles that are different from their own. A pleasant tone of voice, careful listening to concerns and questions, and sensitivity to the participant's personal situations are ways of conveying openness and acceptance.

It has been our experience in the Developmental Trends Study (DTS), a longitudinal study of the development of Conduct Disorder and Antisocial Personality Disorder, that positive and negative interactions with all staff are long remembered. Initially, interviewers developed a strong rapport with not only participants but also family members, usually parents. In contacting participants for current interviews, many have spontaneously asked about specific staff members whom they last spoke with more than five years ago.

TRANSIENT OR HARD TO LOCATE PARTICIPANTS

In longitudinal research, it is almost inevitable that some percentage of the sample will eventually become difficult to locate. Eckland (1968) stated that the number of cases that initially appear to be lost is usually quite high. However, most of these cases can be retrieved, and if retention is ultimately poor in a longitudinal study, it is usually because little or no effort was made to do so.

It is important to distinguish between reluctant and hard to reach participants so that the appropriate search and retention methods can be employed. Frequently encountered are cases where past contact information is no longer valid, mailings are returned, phone numbers disconnected, and family and friends unsure of the participant's whereabouts. A good first step in tracking down mobile participants is to review all previously collected personal and collateral information. Occasionally, once invalid contact information, such as old phone numbers or addresses, may again be valid methods for reaching the subject. Additional information that may provide further leads in tracking lost participants includes aliases, mother's maiden names, names of significant others, social security numbers, past occupations, and names of employers (Navratil et al., 1994). Following up on these leads can be time consuming and often result in dead-ends, yet project staff must remain persistent and exhaust every potential avenue to retain these individuals. The large number of potential leads further illustrates the benefits of maintaining a well-organized electronic database of contact information.

INTERNET SEARCHES

Since our last report on participant cooperation in the DTS (Navratil et al., 1994), researchers have a resource that was not available just a few years ago. The Internet offers a vast amount of information available on-line. While much of

this information can be accessed with no cost to the user, some websites require a fee. Considering the time and cost tracking efforts may involve, and the potential loss of participants, subscribing to an Internet site may be more economical in the end. Websites specializing in locating individuals likely have greater resources and expertise in tracking people, but any website charging a fee should be investigated by the user before entering into contractual agreements.

Researchers attempting to track down lost participants will find it useful to conduct reverse searches (Elliott, 2001), commonly available on-line. The reverse search is a method of acquiring or verifying contact information when only a telephone number or address is known. Table I lists some websites and on-line

Table I. Helpful Websites for Locating Participants

Internet site	Internet address	Information provided
Reverse Searches		
Whowhere	www.whowhere.com	Addresses & Telephone Numbers
Anywho	www.anywho.com	Addresses & Telephone Numbers
Switchboard	www.switchboard.com	Addresses & Telephone Numbers
555-1212	www.555-1212.com	Addresses & Telephone Numbers
Directories		
National Address Server	www.cedar.buffalo.edu	Addresses and Zip Codes
U.S. Post Offices	www.usps.com	Addresses and Zip Codes
State Government	www.states.org	State Government Directory
Big Book	www.bigbook.com	U.S. Businesses on the Internet
Bureau of Prisons	www.bop.gov	Provides Info. On Federal Prisons
State Prisons	www.state.(insert state).us	Provides Info. On State Prisons
Military	www.militarycity.com	Military Searches
E-mail Directories		
Finger	www.emailman.com/finger	Locate someone currently on-line
Internet Address Finder	www.iaf.net	e-mail Directory
People Finder	www.home.netscape.com	e-mail Addresses of on-line users
Four 11 People Finder	www.four11.com	e-mail Addresses of on-line users
Maps		
Mapquest	www.mapquest.com	Offers maps, directions, distances, etc.
Mapblast	www.mapblast.com	Offers maps, directions, distances, etc.
411 Locate	www.411locate.com	Maps & Addresses
Miscellaneous		
Death Records	www.obituary.com	Updated Death Notices
Ancestors	www.ancestry.com	Genealogy Database
Vital Records	www.inlink.com	Foreign & Domestic Records
Public Records	www.brbpub.com	Free Public Records
Search Engines		
Alta Vista	www.altavista.digital.com	
AOL Netfind	www.aol.com/netfind/business.html	
Big Foot	www.bigfoot.com	
Infoseek	www.infoseek.com	
Lycos	www.lycos.com	
Starting Point	www.stpt.com	
Switchboard	www.switchboard.com	
Webcrawler	www.webcrawler.com	
Yahoo People Search	www.yahoo.com	

directories that may be helpful in locating participants. In many cases, the other contacts provided may be difficult to locate as well. Reverse searches done on old contacts may reveal updated information on their whereabouts, providing a possible lead to locating the participant. It is important to note that not all individuals are listed in every database, so different websites and search directories should be explored. E-mail searches, both forward and backward, are an emerging method to locate participants. The reverse form starts with the e-mail address and returns the associated name and location.

We have been very successful in locating participants through prison and military websites. Most federal and state prisons, as well as some county jails, have websites that provide information on inmates, visitation policies, directions, and contact information. The United States military has websites available that provide information on individuals enlisted in all branches of the armed services. These indicate whether an individual is on active duty, a reservist, or retired, as well as where they are stationed, with contact information for that base. In addition, it is not uncommon for participants to pass away during the course of a long-term study, especially for individuals who engage in high-risk behaviors. Databases with information on death notices are available and updated periodically.

The Internet can also be used to access public records. The resources described by Eckland (1968), such as utility companies, alumni associations, licensing bureaus, and the Bureau of the Census may provide websites that can be explored. Various government and state agencies also make information available on-line, such as records of professional licensure and property ownership.

A commercial credit agency used by Badawi, Myllyluoma, Weimer, and Gallo (1999) resulted in the retention of a significant number of participants. When a person applies for a new credit card, buys a car, takes out a loan, or engages in other similar activity, their credit report is updated. The report will usually list several addresses for an individual, depending on the number of times they have moved. Having this information, interviewers can then send out letters to the addresses listed. Also, telephone numbers can be obtained through Directory Assistance for the cities named on the report. It is incumbent upon the researchers to follow ethical guidelines in participant retention efforts. Participants should be informed about the nature of records that may be searched, especially if information other than basic contact information is to be collected.

A CASE STUDY OF MINIMIZING ATTRITION

The Developmental Trends Study, a longitudinal research project that began in 1987, examines the development of disruptive behavior disorders. The sample consisted of 177 clinic-referred boys recruited in two states (Pittsburgh, Pennsylvania ($n = 96$); Athens and Atlanta, Georgia ($n = 81$)), most of who were referred for a disruptive behavior disorder. Initial inclusion criteria were gender (male) and age (7 to 12 inclusive), full scale IQ greater than 70, no inpatient

psychiatric hospitalizations within the previous six months, and no psychotic symptomatology.

The sample was 70.1% white and 29.9% African-American. Regarding socioeconomic status, 40.9% of the sample fell within the lower two levels of the Hollingshead (1975) index, while the remaining 59.1% were categorized among the upper three levels. Nearly half of the sample lived in a rural setting (47.5%), and the remainder was considered urban residents. The sample did include high proportions of disruptive behavior disorders. Using the DSM-III-R, 83.6% met the criteria for Oppositional Defiant Disorder, 38.4% for Conduct Disorder, and 68.9% for Attention Deficit Hyperactivity Disorder.

Each of the participants and a biological parent (the mother in almost all cases) were assessed for approximately three hours by trained interviewers up until the participant was 17 years of age. After the age of 17 the participants were considered young adults and assessments were completed without their parents. The data for the current paper does not include contact attempts or retention rates for parental participation. The participants were paid for their annual participation, with the amount increasing $5 per year.

Navratil et al., (1994) discussed the techniques to minimize participant loss in this study. Specifically, the researchers concerned themselves with securing the cooperation of reluctant and resistant participants, as well as those participants who had refused prior assessments. The researchers used data collected in the first four years of the DTS, where contact efforts and scheduling difficulty for the Pittsburgh portion of the sample ($N = 96$) was analyzed. They reported retention rates for project years two through four of the DTS, for the Pittsburgh sample as 100%, 97.9%, and 100% respectively. The overall retention rate for project years two through four was 100%, 97.7%, and 98.0% respectively.

We expand on this database and examine how retention methods developed early in the study, along with new search techniques, have led to a low attrition rate in the DTS. We analyzed contact information and scheduling history of the entire sample ($n = 177$) for project years 6 through 13. The number of contact attempts for each participant in each phase was used as the outcome variable.

A subjective scoring system was created to rate the overall participation history of each of the participants. Reviewing a participant's history of contacting and scheduling interviews throughout the study, a score was assigned to designate the difficulty of each category. This information, although subjective, is quite useful because it enables interviewers to foresee which cases will be difficult, and plan strategies for retention.

Contact Management

The DTS utilizes a database to keep record of contact history. Information is taken from the contact sheets and phone call logs and recorded in a manner that entering and retrieving information is easily accomplished. For each contact

attempt, the date, time, and phone number are entered. Additional information such as the name of the person contacted and their relationship to the participant, the status of the interview, and the search method used is also recorded. This database allows an interviewer to keep track of wrong phone numbers or phone numbers that are no longer valid, address changes, as well as any notes that may be pertinent to a particular contact.

This database can produce a record showing the contact efforts made for each individual participant in the study. This is useful because such reports allow researchers to review follow-up rates, detect address changes immediately, and to plan accurately for budget, staff, and timetables each year.

Retention Rates

The study has maintained a high retention rate. Interviews completed up until the participant was 17 years old were considered youth interviews, while interviews completed while the participants were 18–19 years old were categorized as young adult interviews. The top panel of Fig. 1 displays the retention rates across years 6 through 13 of the DTS. On average, the retention rate for the youth cohort was 92.6%, with a 7.4% refusal rate and 0% of the participants not located. The retention rate for the young adult cohort was 90.3%, with a 7.7% refusal rate and 2.0% of the participants not located.

The standard interview protocol was to have the participant come in to the office to complete the assessment. If the participant was unable to come in to the office, a home interview was then attempted, and as a last resort, a telephone interview. Telephone interviews were only completed if the participant had moved out of state and a face-to-face interview was not practical, or if the participant canceled/did not show up for scheduled appointments three or more times. If a participant was incarcerated or institutionalized the interviewer would then get permission to interview the participant at the facility.

Table II displays the interviews completed in years 6 through 13 of the DTS, as well as the retention rate of each phase. The study across this time period comprised of 614 office interviews, 189 home interviews, 95 telephone interviews, 17 jail/prison interviews, and 24 institution interviews. Across this same time period, 77 interviews were refused, 7 interviews were not conducted because the participant could not be located, and 4 participants died. Of the 77 interviews that were refused, 22 participants refused to complete one or more assessments across the time period; however, 16 of these participants were retained in later phases, with only 6 participants continuing to refuse. Of the 8 cases where participants could not be located, the same participant was not located in 2 consecutive phases, but was eventually located the following year and retained. One participant was not located in year 7, but retained in year 8, and one participant in year 12 and two in year 13 were not located.

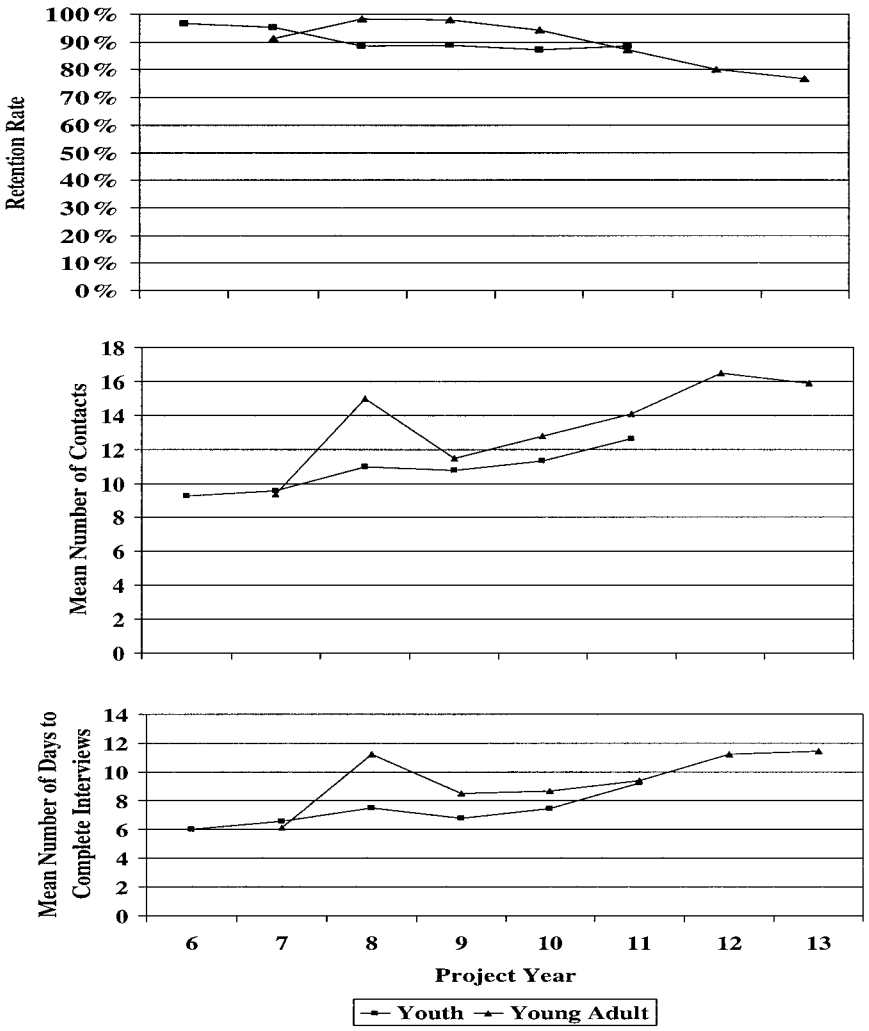

Fig. 1. Retention rates, mean number of contact attempts, and mean number of days to complete interviews for years 6-13 of the Developmental Trends Study.

The mean number of contact attempts steadily increased each year, in both the youth and young adult cohorts, except for year 9 where there was a slight decrease in the number of contact attempts (see middle panel, Fig. 1). Therefore, as participants aged, more work and time was needed on the part of the interviewer in order to locate them and complete interviews. Also, there was a difference in

Table II. Retention Rates and Interview Types for Years 6–13 of the Developmental Trends Study

	6F*	7G*	7T**	8H*	8U**	9I*	9V**	10J*	10W**	11K*	11X**	12Y**	13Z**	
Retention rate	96.6% ($N = 177$)	95.4% ($N = 176$)	91.2% ($N = 34$)	88.7% ($N = 142$)	98.4% ($N = 61$)	88.8% ($N = 90$)	98.1% ($N = 54$)	87.1% ($N = 62$)	94.2% ($N = 52$)	88.5% ($N = 26$)	87.3% ($N = 63$)	80.0% ($N = 60$)	76.9% ($N = 26$)	
Office Interviews	120	116	22	82	39	54	30	34	28	13	33	32	11	614
Home Interviews	31	29	5	29	8	16	12	12	13	8	15	8	3	189
Phone Interviews	14	16	2	11	7	7	8	6	5	2	5	7	5	95
Jail Interviews	0	1	2	0	6	1	2	0	2	0	2	0	1	17
Institution Interviews	6	6	0	5	0	2	1	2	1	0	0	1	0	24
Refusals	6	8	1	15	0	10	1	8	3	3	7	11	4	77
Not Located	0	0	2	0	1	0	0	0	0	0	1	1	2	7

*Youth Interviews
**Young Adult Interviews

the mean number of contact attempts between completers ($M = 11.1$) and those who refused ($M = 16.6$).

Similar to the number of contact attempts, the number of days it took to locate participants steadily increased each year for both age groups, again with a slight decrease in year 9. The total number of days was calculated by summing the days where contact attempts were made. Days where contact attempts were not made were not included in the total. Figure 1 shows the mean number of days of contact it took to complete interviews for years 6–13. Like the number of contact attempts, the results show that as participants got older, the average number of days it took to locate them and complete interviews increased, from 6.0 days in year 6 to 11.4 days in year 13.

Subjective Summary

To gain an overall picture of participant contact and scheduling effort in the DTS, a subjective scoring system was developed. This scoring system reflects the participation history for each participant from the beginning of the study. Two 5-point scales were developed to obtain a general overview of each participant's difficulty in contacting and difficulty in scheduling. After reviewing past contact documentation, each participant was given a score on each scale. Although these scales are subjective, the information gathered is useful because it categorizes the participants into groups where scheduling and contact problems are common. Having this information prepares interviewers for any problems that are likely to arise and will also give them a sense of the time it may take to locate and schedule participants.

The following information was obtained from the scoring system. On the scale measuring the difficulty of contacting, 38.6% (68) participants had phone numbers that remained constant across each year, 17.0% (30) participants were able to be contacted by using numbers provided on their past contact sheets, 9.6% (17) participants required multiple contacts to be reached each year, 19.8% (35) participants required alternative search methods to be located each year, and 14.7% (26) participants had phone numbers that were frequently disconnected and no information could be located through alternative search methods.

On the scale measuring difficulty of scheduling, 36.9% (65) participants were easy to schedule in each year and these individuals kept their scheduled appointments, 14.2% (25) required multiple contacts in order to be scheduled, 22.1% (39) participants scheduled interviews but were reluctant or resistant in doing so, 19.3% (34) participants did not show up for scheduled appoints in 3 or more years, and 7.3% (13) participant's refused to be interviewed or were not located in 3 or more years. One participant was not included in this analysis because he passed away prior to year six.

CONCLUSIONS

A high retention rate was maintained throughout the entirety of the study, including years 6–13. This was due in large measure to the persistence of the project staff, and to the diversity of methods used to try to locate participants. Early in the study, strategies were developed to manage reluctant, resistant, and hard to locate participants, and new techniques, such as those provided by the Internet, were added whenever possible. Acquiring detailed contact information, the organization of contact efforts, hiring skilled interviewers, and retaining staff over time, are important components of maintaining a high retention rate. Anecdotal evidence also told us the significance of rapport between project staff, family members, and participants. Participants continue to inquire about departed staff that they came to know based on their annual contact through late childhood and adolescence.

Keeping all contact information in an organized system allows research staff to efficiently deal with vast amounts of information. In short order, using electronic databases, project staff could review a participant's history of scheduling, notes regarding prior experiences, and lists of contact information. Navratil et al., (1994) observation of the benefits to having staff review historical documentation to anticipate scheduling difficulties and solutions to resolve these problems was borne out over time with this sample. Such solutions may be unique to each individual, thus time not spent in collecting and organizing documentation allows for time spent in brainstorming and developing creative solutions to idiomatic problems. While the integrity of research materials must be maintained, making each assessment a pleasant experience for the participant appeared to increase the likelihood that they would be receptive to future interviews. Since some topics of an assessment may make participants feel uneasy or embarrassed, interviews were trained to accept different perspectives and listen carefully to a participant's concerns without expressing undue judgment.

Interviewer qualities also had a significant impact on retention. Interviewers' flexibility with scheduling and arranging interviews, including traveling and working irregular hours, such as evenings and weekends, often were instrumental in completing interviews. Navratil et al., (1994) are correct in stating that participants who have difficult schedules should be handled with patience, tact, and respect in order to schedule appointment times that are convenient to them. Interviewers were provided with support and understanding in their frustration when interviews were not easy to complete, and persistence and optimism were encouraged and rewarded.

Not giving up on difficult to schedule or hard to locate participants was a key point made by Eckland (1968), who stressed the importance of interviewer effort in completing interviews. By remaining persistent year after year, our study was moderately successful in retaining participants who previously refused interviews. Navratil et al., (1994) defined these cases as "turn-arounds" and viewed their refusals as circumstantial, thus approaching the participant the following year

may yield favorable results. In our study, 72% of the participants who refused an assessment were retained in the following years.

The subjective scales that we developed were helpful to interviewers in preparing for difficult to schedule participants. Interviewers were able to focus more of their time and resources on those participants who have been historically difficult to schedule interviews with by developing retention strategies unique to each case. Researchers conducting longitudinal studies are encouraged to develop similar scales because they reflect the major problems associated with scheduling difficulty.

Our experiences have led us to several hypotheses regarding participation in longitudinal research that we are unfortunately unable to test. Taking part in a longitudinal research project requires a long-term commitment on the part of the participants. The individuals in our study have participated for much of their childhood and adolescence. Some have expressed feelings of fatigue with the process. When attempting to schedule interviews, reluctant participants often make comments such as "I'm just tired of doing it (the study)," or "I don't feel like doing it this year." We took care to balance between encouraging resistant participants to participate now versus alienating a participant to all future participation. Our mindset that the current refusal may be largely circumstantial allowed us to pull back and recontact a participant a short time later, often with better success.

We wondered about the role that the project played in the minds of the participants, given that participating in the study was something they did from late childhood through late adolescence and into early adulthood. We speculated that, with growing maturity, refusal to participate might have reflected a process of rejecting childhood institutions. In addition, the nature of our study focused attention on issues of difficult behavior, family conflict, and potentially embarrassing childhood experiences. As young adults, participants may have been increasingly reluctant to discuss past issues and present problems.

Relatedly, a participant's family dynamics may have also contributed to attrition. For instance, from the beginning of the project, we attempted to develop good rapport with parents, often the mother. In those instances where family relationships were ultimately not positive, maturing participants may have viewed the project as being "allied" with their parents, and may have refused participation as a part of general rebellion. Additionally, if participants left home on bad terms, they occasionally cut ties with the family members with whom we had contact, meaning that to locate them we had to essentially begin anew.

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