"Behavior Observations in Ethnography"

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by

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Introduction

The goal of direct observations of behavior is to produce quantitative descriptions of behavior in a variety of natural settings. This approach is relatively new and uncommon in anthropology compared to behavioral biology, where researchers cannot rely on informant accounts of behavior. As noted by Johnson and Sackett (1998), what people actually do on a daily basis and who they interact with is not accurately reported in the standard ethnographic literature or textbook, and this is especially true of the activities of women and children. To a large extent, the development of behavior observations has been initiated and developed by ecologically and economically oriented researchers. This is not surprising given the importance of quantitative behavioral data (e.g., hours worked in various tasks) required for adequate descriptions and tests of hypotheses in those fields. In recent times the scope of behavioral research has broadened to examine non-economic topics such as child and caretaker interactions, doctor-patient dynamics, and visiting patterns.

A modest sized literature exists on techniques of direct behavior observation. Early synthetic reviews are found in naturalistic and laboratory studies of animal behavior or ethology such as a classic paper by Altmann (1974) and Martin and Bateson's (1993) textbook with a focus on psychology and ethology. In anthropology, methodological summaries and ethnographic uses of behavior observations are found in Johnson and Sackett (1998), Borgerhoff Mulder and Caro (1985), Hames (1992) and Paolisso and Hames (2010). Strictly speaking direct observation are observations generated by a researcher on an observed subject or subjects. However, in some instances indirect observations where the observer and subject are the same are important tools that can produce reliable quantitative data on naturalistic behaviors (Paolisso and Hames, 2010). These methods include forms of traditional time diaries and the "Day Reconstruction Method" or DRM (Kahneman et al., 2004). The major challenges to these indirect approaches are inaccurate recordings based on faulty or biased recall. However, recent methodological advances in

real time data entry using Experience Sampling Methods and Ecological Momentary Assessment (ESM/EMA), combined with smart phones and data entry software, may revolutionize indirect behavior observations (Trull and Ebner-Priemer, 2009).

Direct behavior observation methods are employed to collect quantitative data on a variety of behaviors to better describe them in terms of frequency, duration, or periodicity and to test hypotheses that make predictions about behavior under a variety of conditions. Behavior observations are not designed to be a substitute for standard ethnographic techniques such as participant observation, interviews, surveys, or experiments. Furthermore, direct and systematic observation can be time consuming. Nevertheless, there are a number of advantages to the method that makes it useful in a variety of situations. Some of these advantages have little to do with utility of collecting behavior observations per se. For example, in community based research direct observation requires an ethnographer to get out in the community on a regular basis and become familiar with all households and all segments of the community including children and the elderly. By following direct observation protocols one gains a greater understanding of the community geography, social patterns, and how people move about on a daily basis. It also enhances rapport by giving households individualized attention through regular visits and gives an ethnographer the opportunity to discover rare or interesting practices that otherwise would have gone undetected.

The more direct advantages revolve around gaining accurate descriptions of behavior. In traditional participant observational research one quickly begins to form beliefs on who does what and how often and under what conditions sometimes leading to a confirmation bias. That is, once a belief is established exposures to counter examples fail to extinguish it and rare confirmations serve as reinforcement. This implicit knowledge often strongly colors qualitative ethnographic reporting. From our own personal experiences, impressions gained through participant observations of the division of labor, association patterns, and childcare responsibilities often turned out to be incorrect after we analyzed our time allocation data - sometimes wildly so. So even if behavior observation is not a major research protocol, data gathered through systematic observation is likely to enhance the general quality of ethnographic reporting.

A powerful case for using time allocation in comparative research is made by Johnson and Behrens (1989) on the topic of paternal care of children. They show that categories developed by HRAF researchers on normative patterns of behavior are not consistent with observed patterns of behavior in time allocation studies taken from a robust sample of societies. They further argue that cross-cultural analysis of time allocation data is a more powerful way to test comparative theory. The example they give is of HRAF codes that rate fathers as dedicated or indifferent caregivers. High ratings seem to be based on ethnographic descriptions of fathers who take delight in playing and caring for their children. However, quantitative data shows that in such cultures fathers spend no more than five to seven minutes per day interacting with infants and toddlers, which suggest

that normative generalizations poorly represent paternal care. A good example of this change in the comparative approach is the recent spate of time allocation research on the grandmother hypothesis which is the idea that a grandmother's alloparental efforts and economic support of her daughter is adaptively crucial (Scelza, 2009) and alloparental care in general (Kramer, 2010).

Behavior Observations in relation to other forms of data collection

The uses of behavior observations (direct and indirect) depend on the kinds of questions or hypotheses posed. Johnson and Sackett (1998) note that behavior observation is an expensive research method and following Whiting (1973) they recommend that it only be used when other methods of gathering data on behavior cannot yield the precision necessary to answer research questions. We think Whiting's view extreme because there are many interesting questions that cannot be answered without the quantitative data afforded by behavior observations. Interviewing is simply not up to the task. This is starkly revealed in Vitzthum's (1994) comparison of the accuracy of recall versus direct observation in nursing for an Andean people. We need more of these comparative studies to allow us to understand the circumstances under which recall is an adequate method. A great strength of behavior observations is that one collects data on a large number of individuals and this allows one to examine how, for example, age and sex may account for variation in behavior. More to the point, use of the method depends on whether the research question requires behavior observations. As mentioned, economic and ecological research in anthropology has historically emphasized use of quantitative data on labor inputs (Hames, 2010) and economic researchers made some of the earliest contributions to behavior observations (e.g., Richards 1939). Investigations of time allocation and division of labor in relation to cultural evolution (Minge-Klevanna, 1980), changes in individual productive activities across the lifespan (Bock, 2002), and recent historic shifts in the division of household labor (Bianchi et al. 2000) have been powerfully illuminated by behavior observations. It is hard to imagine accurately answering these questions without recourse to behavior observations. Another area that emphasizes behavior observations is childcare and alloparenting and human development (e.g., the collection of chapters in Hewlett and Lamb (2005) and life history theory (Kramer 2010). Finally, certain theoretical approaches such as behavioral ecology frequently demand behavior observations because the models employed require quantitative measures of somatic, reproductive, and nepotistic efforts which are often operationalized as behaviors that have costs in terms of time, energy, or risk gained through behavior observations (Winterhalder and Smith, 2000).

A typology behavior observation techniques: sampling and recording rules

Any researcher seriously considering collecting behavior observations should fully understand the different kind of data produced, the costs and benefits of each, methodological challenges, and, most importantly, which technique yields the best kind of data given hypotheses to be tested or descriptions required. There are a variety of different

ways in which behavior observations can be accomplished. In the simplified figure below (Figure 1) basic types of behavior observations are a combination of a recording rule and a sampling rule. The sampling rule determines whether a group scan or an individual (or focal follow) will be observed. The recording rule specifies how the observations will be measured. The model represented in Figure 1 is derived from studies employing direct observations. Studies using indirect observations or self-reports create data that can be incorporated into this scheme. For example, the day reconstruction method is a kind of continuous focal observation while ecological momentary assessment is a kind of instantaneous focal observation. Both are discussed below.

Figure 1

Basic Observational Techniques

	Sampling Rules		
		Group	Individual
Recording Rules	Instantaneous (event)	Instantaneous scan	Instantaneous focal
	Continuous (state)	Continuous scan	Continuous focal

Sampling Rules

While observing behavior one selects between sampling a single individual (a focal person or a focal follow) or scan sampling which is a sample of a group of individuals. Focal sampling is commonly used in conjunction with continuous recording. In fact, it is very difficult to use continuous recording for more than one individual at a time. However, scan observations are possible if they are limited to closely interacting dyads such as a parent and offspring (Ivey 2000; Ivey et al. 2005; Fouts and Lamb 2005) or spatially delimited groups, such as a group involved in a ritual, a shouting match (Flinn 1988) or cooperative agricultural labor (Hames 1987). A solution to the problem of attempting to record more than several individuals on a continuous basis is use video recording, followed by a review of the video to carefully extract data for analysis, as in Takada's (2005) work on mother infant interactions among !Xun foragers (see also Peregrine et al. 1993). An alternative strategy of observing a group would be to code the behavior very generally. For example, if a group of people were gathered for a ritual performance one could record some of them as watching and others performing instead of more precisely coding behavior as watching while talking, waiting to perform while watching, or performing a specific ritual act.

Focal sampling in conjunction with instantaneous recording is desirable if a researcher is interested in a detailed characterization of a behavior or a behavior complex. In such a situation one might make instantaneous observation every three to five minutes on the subject. This is the approach taken by Bird and Bliege Bird (2002) to collect details of hunting behavior in terms of measuring travel, search, rest, successful and unsuccessful pursuits, tools used, processing, and return.

There is some inconsistency in the literature with the terms scan sampling and spot checks by ethnographers working in a traditional village field setting. In the "spot check" procedure pioneered by Johnson (1975), a researcher visits houses at random hours of the day and in random order and records the behavior of those present in an attempt to sample all village members. In some instances subjects were engaged in solo or non-interactive behaviors but in other instances they engaged in interactive behaviors such as conversation, grooming, or childcare. If non-household members are observed their behavior is also recorded. These spot checks are really scans samples of all those present at a household at a particular instant.

Most sampling rules are dependent on whether one preselects an individual or group to observe. An alternative approach is called behavior sampling. Researchers with interest in a specific set of behaviors such as aggression and reconciliation record such behaviors in a group setting whenever they occur without preselecting an individual. This approach is used to measure rare but important behaviors and may be used in conjunction with scan sampling (see Martin and Bateson, 1993:51) for further details.

Recording Rules

There are two types of recording rules: continuous (state) versus instantaneous (event). The chief difference between continuous and instantaneous recordings is that in continuous recording one sequentially records the behavior of an individual for a pre-determined length of time. Continuous recording is a moment-to-moment short-hand description of a behavior stream. For example, one might visit a house and watch a resident prepare a meal and sequentially record all the steps from beginning to end. In contrast, in event or instantaneous recording one records the behavior of an individual at the instant they are first observed at pre-determined intervals. For example, upon entering a house you might decide to record the behavior of all individuals in the house the moment you encounter them, wait for 5 minutes and then record what all are doing again. Alternatively, in a focal follow you might decide to instantaneously record the behavior of only one individual once every five minutes. The easiest way to conceptualize the differences between the two is that continuous recording is like a video whereas instantaneous recording is like a photo. Each technique has its strengths and weakness in terms of detail, recording accuracy, costliness, and obtrusiveness. Thus, the kind of data gained through continuous versus instantaneous recording are fundamentally different. Instantaneous recording leads to the collection of "dimensionless" data. Each datum is a classification of the kind of behavior

observed and perhaps the intensity of the behavior. It is dimensionless because no information is collected on duration, frequency, or other useful dimensions of behavior.

Continuous recording is most commonly used by psychologists who focus on very well defined and restricted patterns of behavior, often in a laboratory setting. A coarser form of continuous recording is also used in time diary (Robinson and Godbey 1999) and DRM (day reconstruction method) research. In DRM protocols an individual is asked to reconstruct a serial ordering of the major episodes of the day and after that is established they are asked to note the start and end times and answer a variety of questions (e.g., they select from a list of 16 activities) about what went on in each episode (Kahneman et al. 2004). Instantaneous recording, as its name implies, is the instantaneous recording of a behavior, a snapshot, if you will. While it lacks the depth of complexity of continuous recording it is exceptionally versatile and is designed to quickly gather behavior observations on a large number of individuals in a variety of contexts. Below we describe these two approaches in greater detail.

Continuous Recording

As mentioned, continuous recording is a moment-to-moment recording of a stream of behavior over a short time scale typically of no more than a half-hour. In practice continuous recording is limited to the fine-grained analysis of specific kinds of behaviors or behavior complexes such as parent child interactions, patterns of attachment (Roggman et al. 1994), communicative and social interactions (Pettit and Bates 1989), and classroom behavior (Pianata 2007 et al.). The kind of data gained through continuous versus instantaneous recording are remarkably different. By using continuous recording one can collect nearly anything of interest in a behavioral stream such as:

- Frequency: how frequently a behavior occurs within a particular time period
- Intensity: how energetically or forcefully the behavior is acted. There are numerous field and laboratory experimental studies (e.g., Hipsley and Kirk 1966; Durnin and Passmore 1967; Montgomery and Johnson 1976) that can be adapted to one's field data to create good estimates of caloric expenditures of effort.
- Latency: the period of time prior to the onset of a behavior
- Duration: how long a behavior lasts
- Sequence: the ordering of behaviors through time or in relation to external contexts.

Despite the richness of the data collected through continuous recording there are a number of limitations to this technique. The first is that is extremely intrusive because the observer is minutely recording the behavior of a subject. Some subjects may find such close attention unnerving and distracting. It can affect how behaviors are initiated and their duration compared to how the behavior unfolds if the subject is unobserved. For example, a subject may alter the way it responds to a fussy infant knowing the observer may not

approve or appreciate a slow or irritated response, which would occur if the subject were unobserved.

Coding the behavioral stream can be difficult. Knowing when a behavior begins or ends or whether it is really a subcomponent of an on-going behavior presents difficulties. Obviously, the coding scheme needs to be derived from numerous practice sessions so the coding issues can be worked out with clear operational definitions of all behaviors and transitions. Most research using continuous recording such those in developmental psychology, medicine, and consumer behavior is restricted to laboratories or in highly structured setting such as classrooms (Pianata et al. 2009) or medical examination rooms (Stange et al. 1998) which reduces intrusiveness and researchers invariably have a highly structured set of codes to classify behavior. Video recordings are often employed to carefully analyze behavior (Peregrine et al.1993).

Finally, a major problem with this method is that the number of different individuals representing various age and gender classes tends to be limited because of the time required to employ this method making generalization across a population difficult. As we note below, being able to include a well-sampled cross section of a community is a major strength of instantaneous recording.

Instantaneous Recording

Instantaneous recording leads to the collection of "dimensionless" data. Each datum is a classification of the kind of behavior observed and perhaps the intensity of the behavior. It is dimensionless because no information is collected on duration, frequency, or other useful dimensions of behavior. Ethnographers working in small traditional agricultural villages or among hunter-gatherers have been exceptionally active in using instantaneous recording (see http://www.yale.edu/hraf/publications_body_completepublist.htm#Time%20Allocation%20Series) for a list of compuer databases from this research). Typically, researchers visit households at random hours and immediately record the behavior of those present. If one or more individuals are absent the ethnographer asks a household member where the missing individuals are and what they are doing. Procedures for randomizing visits and the order in which household are visited and other adjustments to produce candid recordings are detailed in Johnson (1975) Borgerhoff Mulder and Caro (1985), Betzig and Turke (1985), and Hames (1992).

One-zero recording (sometimes known as behavior sampling) is another kind of instantaneous recording used infrequently used by ethnographers but extensively used in animal behavior. Good examples of ethnographic use are found in classroom setting (Smith 1985) and among Hadza hunter-gatherers (Marlowe 2004) on the frequency and type of paternal care of infants and children. The basic procedure is to count whether or not (hence one-zero) a behavior occurs within a limited time frame. For example, one might plan a 10-minute observation period and decide to check whether the behavior occurred at 30-second

intervals. If the behavior was expressed within a 30 second interval then it is recorded. If the behavior of interest is not expressed then a zero is recorded.

So long as the sampling intervals are short (e.g., sampling every minute versus every five minutes) this method produces reasonably accurate measures (Martin and Bateson 1993: 55). It is identical to an instantaneous recording rule because duration measurements are not made. Furthermore, who is sampled is determined by who expresses the behavior. A major advantage of this method is that it can be used in a group setting such as a classroom or social gathering of more than a dozen individuals. Finally, behavior sampling is useful for recording behaviors that are rare but significant (e.g., disputes).

One might assume that since instantaneous recording only produce counts of behavior such a technique might be very limiting. However, counts can be legitimately transformed into real time measures under certain conditions and with certain reasonable assumptions. For example, if one samples behavior during waking hours, say a 14-hour day, and one knows that 15 percent of observations were in food preparation activities, then one could reasonably conclude that 2.1 hours per day were spent in this activity. (Of course, this assumes that this behavior only occurs during the daylight-sampling period; see Scaglion, 1986 on nighttime sampling).

Direct and indirect observations: a role for self-reports

We can distinguish between two types of behavior observations. In the classic approach developed in ethology, behavioral ecology, and allied field studies such as primatology, the observer and the subject are not the same individual. This approach is used in traditional ethnographic research in a small community setting (Johnson and Sackett,1998). But when humans are the focus of research they can act as observer and subject by recording their own behavior. Traditional time diaries (Paolisso and Hames 2010) fit this definition and it has a variety of implementations. Given the difficulties of using direct observation in modern settings we argue that time diary or self-report techniques should be more fully explored and implemented by anthropologists. Significant methodological innovations have been made using of smart phones and other electronic devices. We believe that these subject dependent methods are extremely important for researchers working in modern settings where observer dependent methods may be time consuming (reducing sample size), intrusive (inhibiting natural behavior), or unwelcomed.

In traditional time diary research, study participants provide a description of the day's activities along with an assignment of the approximate starting and stopping times for each activity, recorded either in free format or in fixed intervals (Stinson1999). Data from time diary studies have been used to advance a wide range of social science research, including trends and gender differentials in housework (Bianchi et al. 2000), parental time with children (Sandberg and Hofferth 2001; Sayer et al. 2004), and leisure activities (Schor 1991; Robinson and Godbey 1999; Jacobs and Gerson 2004). Other time diary studies have

investigated trends in TV viewing, Internet use, civic involvement (Putman 2000; Sayer 2001), and religious participation (Presser and Stinson 1998).

In time diaries, the most commonly used recall period is the previous 24 hours. More distant recall periods are also possible, such as last week or month, although they are used much less often than the 24-hour recall for good reason. The general rule is that the more distant the recall period, the more general and inaccurate will be the recall. A nice demonstration of this phenomenon is made by Wutich (2009) in her comparison of time diary, prompted recall, and free recall methods on water use in a Bolivian squatter community. Today, most studies use an ordinal listing (earliest to latest) of activities rather than a clock. There are two formats for these listing. First, beginning at a specified time (e.g., 4:00 a.m. or "the time you woke up"), the respondent is asked to list the activities she or he engaged in for specified increments of time during the day, for example, every 15 minutes. Alternatively, past activities can be elicited using a less-structured ordinal listing. Rather than prompting behavioral recall for small intervals of time, respondents are asked to list the activities they undertook in the order they completed them. In this approach, the beginning and ending times are dictated by the respondents' reported length of time they spent in each behavior. There is less respondent burden in this approach, although the interviewer has less control over the recall process.

The documentation of behavior for specified periods of time produces fine-grained data, if interviewers and respondents can manage the cognitive burden of recalling behavior in such small segments. Piloting is critical to determine the optimal time interval, which should be the smallest possible that guides respondents through the day's activities without creating mental fatigue and loss of recall accuracy.

Increased availability of the Internet, wireless communication, and inexpensive mobile computers and smartphones has helped to usher in a number of new innovations in time diary research using an instantaneous recording rule. For example, Experience Sampling Method (ESM) prompts study participants, with a pager beep or cell phone call, to ask them to record where they are, what they are doing, and even how they are feeling (cf. Czikszentmihalyi and Larson, 1987). ESM in turn has been modified to produce the Day Reconstruction Method (DRM) that collects 24-hour recall data that study participants then review and discuss each recorded activity in terms of the feelings they experienced. This approach is a kind of generalized continuous recording whereas ESM is instantaneous. In this hybrid approach DRM is intended to reproduce the information that would be collected by asking about experiences and feelings in real time, and thus reducing respondent burden and disruption of normal activity (Kahneman et al. 2004). On the issue of respondent burden we are unsure that DRM is less burdensome than ESM because it takes 45 to 70 minutes to complete the form (Kahneman et al., 2004: 1777) while ESM reports take 1-3 minutes to complete (Stone and Shiffman, 2007: 240). However, the burden may be less given the subject controls when he or she must respond. The obvious downside of this

approach is that it relies on informant recall although the way the protocol is structured may reduce recall error.

Also closely related to ESM is a broader approach known Ecological Momentary Assessments (EMA) an approach widely used in behavioral medicine (see Trull and Ebner-Priemer, 2009:457, for a comparison of the two approaches). ESM researchers seek to collect information about individuals' behavioral states at specific moments during their daily lives in their natural environments (cf. Shiffman et al., 2008; Stone and Shiffman, 1994). The approaches for EMA data collection use either event-based recordings to capture behavior and context for specific events/activities or time-based prompted assessments (usually randomly scheduled) to capture subjects' experience around those events (Shiffman 2009). Recent implementations of EMA include the collection of physiological states use a variety of biosensors integrated with smart phones (Gaggioli et al., in press). Finally, in anthropology DeCaro et al. (2012) employ what they call the Daily Life Architecture (DLA) that combines experience-sampling methods with a structured diary approach. Several times a day, in response to beeps or cell phone calls, participants reconstruct their daily experiences, adding to information they have recorded, on a PDA or notebook, earlier in the day.

The major problem with some early time diary approaches is that long-term memory is less accurate than short-term memory. Johnson and Sackett (1998) use an example of a study of university faculty who were asked to estimate the number of hours they worked per week. We agree that this sort of question will not yield reliable information for the reasons given by Johnson and Sackett. However, new implementations of self-report where individuals are instructed to record their behavior using a restricted set of choices after being alerted by a smart phone or timer on a PDA avoids the memory problem by providing a near real time recording of behavior. A number of recent studies using PDAs and cell phones convince us that subject responses are likely to produce accurate observations (Stone et al. 2007 and Shiffman et al., 2008). To a significant degree, accuracy is dependent on the study participant's willingness to implement the study protocol. If there is strong compliance, reinforced by an understanding by the participant of the goals and objectives of the study, this new generation of recall studies, assisted by technology, may provide a cost-effective and less-intrusive approach to collecting information on behaviors and associated cognitive and emotional states. We believe that such approaches closely mirror instantaneous observations employed in traditional observer-subject approaches and avoids many of the pitfalls seen in traditional time diary approaches such as recall problems and imprecise descriptions of behavior explored in more detail below.

Methodological Issues

While there are a number of methodological issues that require further attention in direct and indirect behavior observations to improve reliability and validity, we highlight two that revolve around reactivity and accuracy.

Observer presence and subject reactivity

Independently of how it is implemented, direct observation is intrusive and, as mentioned above, it poses difficulties in an urban setting where privacy is valued or expected. This is because an observer could enter a house at unpredictable hours to make observations in order create a random set of observations. How much it will affect what is observed will depend on a variety of factors, such as the culture's rules about what should be hidden or freely seen in everyday life, the rapport the observer establishes with study participants, and whether instantaneous or continuous recording is employed. Analysis by Harvey et al. (2009) shows that subject reactivity in observational approaches does exist but it does not bias study results and they suggest ways to minimize the effect. Instantaneous observations in a traditional ethnographic setting where the researcher is more or less a member of an intimate, community does not pose the problems it would in modern setting where the observer is not a community member and is not known outside his or her role as detached scientific observer. A way to get around the problem of instantaneous scans in an urban setting might be "block sampling" as Behrens (1981) did in a Shipibo village of widely scattered households. In this approach a researcher would enter a home and record an observation of all present household members every five to ten minutes during a two to four hour block of time (see also Gurven and Kaplan 2006).

In contrast, time diaries and other forms of indirect observations are much less intrusive. Typical time diary and DRM protocols encourage subjects to serially piece together their reports in the evening at a time of their choosing making it minimally intrusive. So called "beeper studies," such as those used in EMA research, are probably in the middle ground – less intrusive than direct observation but more so than time diaries and DRM. Typically, subjects must quickly respond to unpredictable calls, pages, or other cues. Before the widespread use of cell phones this might have been intrusive but with cell phone use being the norm it is probably much less intrusive than in the past.

Informant Accuracy

The major weakness of self-report of behavior is accuracy. Inaccurate reports can result from a variety of causes such as cultural and reputational factors, biased recall, poor informant training, culturally sensitive behaviors, and lack of informant commitment to the project. These problems extend to any research using surveys or interviews where informants must generate responses to queries. There is a large literature addressing such problems (e.g., Bernard et al. 1984) and researchers are advised to learn how to avoid pitfalls and enhance the accuracy and reliability of informant responses. Shiffman et al. (2008) provide a comparison of recall versus EMA in informant accuracy. In some cases the two methods are comparable in other cases they are not. The problem for us is the kind of data collected through EMA research focuses on internal states of interest to behavioral medical researchers such as perceptions of pain, levels of anxiety, tiredness, and other medically relevant psychological and physiological measures. Whether or not one is more

or less accurate than another for everyday behaviors, such as shopping, television viewing, or social interaction is unclear.

Aside from Vitzthum (1994) mentioned earlier, there have been a few studies that have attempted to compare direct observations to informant recall, although there are examples from medical research (Stange et al. 1988) and to some extent in factory ergonomic research (Barriera-Viruet et al. 2006). In these studies a third party, a nurse, records the interaction between a doctor and patient. After the interaction the patient and doctor fill out a questionnaire asking them about the procedures performed, questions asked, responses given, etc. The interview information is then compared to the nurse's notes, referred to as the "gold standard," to determine how accurately what is recalled by the doctor and the patient matches with the nurse's observations. More studies comparing different methods are merited.

Coding

How to classify behavior, or coding, presents a variety of challenges that include standardization for comparisons, how to characterize behavior in terms of its function or structure, standard codes, simultaneous behaviors, and others we discuss below. This being said, one should categorize behavior in ways that will allow the descriptive and theoretical goals of one's research to be satisfied. Considerable research has been done on behavior observations leading to a multiplicity of standardized coding schemes. When possible it is always a good idea to make one's coding scheme compatible with others to permit comparisons and meta-analyses.

Structural versus functional codes

There are two radically different approaches to coding. In one instance a code could be a longhand description of the various bodily movements that compose a behavior. Such codes are referred to as structural (Hames 1992) or physical descriptions (Borgerhoff Mulder and Caro 1985). For example, one could describe a person standing near a counter with a potato in one hand and a peeler in the other while the peeler moves across the potato and removing peels. That is a structural description because it highlights the physical movement that composes the behavior. Such an approach often requires a multivariate description such as stance, limb movement, and tool use. In short, it is similar to a longhand description. Alternatively, one could use a functional code and call the behavior "peeling potatoes", which describes the purpose or consequence of the behavior. Because of their simplicity and intuitiveness functional codes are most commonly used. However, in certain instances structural codes are necessary. In studies of infant care (Borgerhoff Mulder 1985), for example, the structural components of parent child interactions often require a very detailed descriptions of parental movements, parent sensing an infant's distress, and handling of the child, and the child's response. Furthermore, the function of some kinds of behavior must initially at least be described structurally because we may not know their function significance.

Betzig and Turke (1985) make a distinction between observed versus inferred behavior in instantaneous recording. For example, if a person is resting with hoe in hand while others are working in the garden the observed behavior would be resting but the inferred behavior is hoeing. It is inferred because the individual had gone there to hoe, had done some hoeing, but was resting at the time moment observed. Is it justifiable to classify the behavior as hoeing or weeding because rests breaks are part of the process of this complex behavior? Betzig and Turke recommend that one take a two tiered approach and code for observed and inferred behavior.

Standard Codes

In the sociological study of western societies many use coding schemes based on the structure developed by Szalai (1972). These codes are arranged into mutually exclusive behavior groups that cover all aspects of human behavior. They commonly include personal care, employment, education, domestic work, childcare, purchasing goods and services, voluntary work, social and community activities, recreation and leisure, and travel. However, we believe that a hierarchical scheme is much superior. The ATUS (American Time Use Survey) coding system (http://www.bls.gov/tus/lexicons.htm) of the US Bureau of Labor Statistics (http://www.bls.gov/tus/) uses a hierarchical structure, classifying reported activities into 17 major categories, with two additional levels of detail in each category. ATUS coders assign a six-digit classification code to each diary activity (rather than the three-digit code commonly used in some time-use surveys). The first two digits represent the major activity categories; the next two digits represent the second-tier level of detail; the final two digits represent the third—the most detailed level of activity (Shelley 2005), resulting in 400 detailed activities. The website http://www.bls.gov/tus/lexicons.htm contains the ATUS codes and instructions which are the result of the efforts of numerous researchers to develop a robust and general scheme. For those interested in more closely examining the codes, a data extract builder (ATUS-X) has been designed to make it easy for users to create data files that contain the time use, personal characteristic, and household characteristic variables they want, thus making the data more accessible to a broader audience. Finally, ATUS-X is a project dedicated to making it easy for researchers to use archived ATUS data. ATUS is an ongoing time diary study with freely available data archives from 2003 to the present.

Under the leadership of Allen Johnson researchers who had collected data employing instantaneous recording contributed to the establishment of a time allocation digital database of 13 small scale societies and a coding scheme along with cultural descriptions (Johnson and Sackett, 1998). The scheme is hierarchical with ten major categories and numerous sub-categories especially geared for small-scale forager, agricultural and pastoral groups (Johnson and Sackett, 1998: 325-328; for a list of time allocation data bases developed in this project see http://www.yale.edu/hraf/publications_body_completepublist.htm#Time%20Allocation%20Series).

Simultaneity

People can engage in more than one activity at a time. Therefore the problem of what we call simultaneity is problematic in setting up a coding scheme. In the modern context one can talk on a phone while preparing a meal. In a more traditional situation, encountered by those who study childcare activities, are situations such as nursing a child while making a basket (Lamb and Hewlett 2005). There is no easy solution to this problem. One approach would be to record all behaviors with or without priority. If one wants to assign a particular behavior as the primary behavior then one needs to apply a consistent rule for such a decision. In the examples given above, environmental context may be a reasonable guide. In the examples above, the primary activities would be food preparation (being in the kitchen is the context) and basket making. Johnson and Sackett (1998: 327) discuss the pros and cons of various solutions to this problem.

Codes Beyond Simple Behavior

A typical data entry line in a behavior observation typically consists of the subject and date and time of the observation along with the location. How behavior varies with time and day of week or season and place is of obvious interest because such factors fundamentally affect behavior. For example, Hames (1987) used a location variable to measure how much time individuals spent laboring in their own gardens and those of their co-resident neighbors and the sharing of meals (Hames and McCabe 2005). Other researchers such as Sugawara (1988) used the location variable to document inter-camp visiting among !Kung foragers and Ohtsuka et al (2004) documented gender-based difference in the exposure to environmental toxins. Below we describe some interesting uses to which behavior observations have been put that go beyond the recording of activities in space and time coordinates to gain fuller and more complex characterizations of behavior.

Internal States

One can record a subject's internal feelings. As noted earlier in experiential sampling and the newer DRM approach (Kahneman et al., 2004) a subject is asked to report his or her subjective state while they are engaged in a particular behavior (Csikszentmihalyi and Larson 1987; Chick 1994). Such internal states include whether they are bored, excited, focused, tired, impatient, etc., as well as their behavior. Such information can be collected whether one is following instantaneous or continuous recording protocols. In psychology Fisher and colleagues (Fisher et al. 2011) asked students to depress a counter (for golf) every time they thought of sleep, food, or sex. At the end of the day they recorded the count and reset the counter. Finally, Trull and Ebner-Priemer, 200: 460) predict that biosenors to monitor physiological states such as heart rate and galvanic skin response will become common as their cost and obtrusiveness decrease.

Food transfers

In egalitarian societies individuals are expected to share food resources outside of the family but how often it is done and to whom resources are given and received is difficult to measure. Initial research into this area (e.g., Henry 1951) revolved around watching food entering a camp and then observing distributions to individuals. This approach is fraught with a variety of sampling biases and is time consuming. Kaplan (Kaplan et al. 1984) used instantaneous observations to document food distributions among the foraging Ache. In the course of instantaneous recording anytime Kaplan observed someone eating he identified the kind of food eaten, asked who gave it and who produced it. Through this information he was able to richly describe food-sharing networks among the Ache.

Social interaction

Charting patterns of social interaction would seem to be an excellent way of revealing the social and communicative organization of any group. Who a person spends time with, how frequently, and in what sorts of activities would seem a basic way to understand the social nature of any group or personal network. Yet few researchers have bothered with this kind of analysis. Early on Allen and Orna Johnson (1976) measured the amount of time husband and wife dyads among the Machiguenga spent together in a variety of activities. Although such research is essential to understanding the nature of the marital bond and household organization, sadly it has never been replicated. Mark Flinn (1988a; 1988b) did two interesting studies on mate and daughter guarding in a Trinidadian community describing agonistic interactions between potential suitors of their wives and daughters. Sugawara (1984, Sugawara et al., 1988) mapped patterns of spatial interaction, conversation, grooming, and contact in a Kalahari San camp. Finally, Dunbar and Marriott (1997) recorded the topics of conversation among groups of students in pubs. Although conversation is one of most common behaviors, and defines us as human, this study is about the only study that bothers to classify conversational topics (e.g., gossip and work-related stories) in a naturalistic setting. Describing social interaction from an observational and naturalistic basis is a field ripe for investigation.

The major exception to the dearth of studies on social interaction are the many studies of caretaker or alloparent interactions with infants and children. In these studies researchers identify the children a subject is holding, feeding, grooming, or carrying and this sort of research has led to considerable understanding of the alloparenting networks that seem to be a fundamental aspect of social life in traditional societies (see for example the collection in Lamb and Hewlett 2005).

Computers and Software for Behavior Observation

There is now a number of software programs designed for data input by researchers or self-reports generated by subjects that run on computers, smart phones, and other devices capable of electronic data entry. We believe that those innovations allowing subject self-reports in real time represent an important methodological advance because they reduce

problems of inaccurate reports and reactivity, and permit frequent sampling and efficient data collection.

Most of these programs not only permit data entry and management for both continuous and instantaneous recording but also observer training, inter-observer agreement, data management, and data analysis as well as the integration of video and audio recording. Many of the products listed below represent long-term development of software that run on standard computer platforms and are designed for data entry by observers and not subjects and most of the development has focused on continuous recording of behavior with the ability to integrate video and audio streams. However, the important innovation comes in hardware and software platforms, such as eCove and Techneos Entryware below, that are designed for real time self-reports that we explore below. Some of the better-known vendors are described below with Internet links to provide more details to those who are interested.

- *EBASS* or (Ecobehavioral Assessment Software Systems) at http://www.jgcp.ku.edu/~jgcp/products/EBASS/ebass_descrp.htm is recommended only for those who have a need for instantaneous recording. The program is relatively inexpensive compared to the others but only runs on Windows based PC's.
- *Annotation* at http://www.saysosoft.com/ is another relatively inexpensive program that runs only on Macs and can be programmed to record instantaneous or continuous behavior and can be integrated with video and audio recording.
- *eCove* at http://www.ecove.net/ is an expensive multifaceted program with a variety of modules that runs on iPad, iPhone, Android operating systems, Windows PC's, and Apple computers.
- *Noldus* at http://www.noldus.com/ is software and hardware system is the richest in terms of features and appears to be used by more than any other package for behavior observation and is extremely well-supported. Reviews of this package have been made by ethnographers (Ice, 2004 and Koster, 2006). Unfortunately, it is exceptionally weak on instantaneous recording except through its Pocket Observer, a bulky-looking, handheld device with a raised keypad for relatively easy data entry.
- *Invivodata* at http://www.invivodata.com/solutions/diarypro-ediary/ sells software and hardware for self-reports that can be run on a variety of hand-held devices. Importantly, they offer Internet recording of subject input and data base management.
- *Entryware* by Techneos Systems at http://www.techneos.com/sites/default/files/pdfs/Entryware_product_info_sheet.pdf and Techneos Systems home page at http://www.techneos.com/ has an simple-to-set-up data entry program for self-reports and designed for use on smart phones, PDAs, and tablets with the ability to output the data to data base and statistical programs.

The importance of products such as eCove and Entryware, in the above list is that they are well designed for the development of easy to use data entry programs for self-reports (see Gravlee et al. 2006 for an example). While these software solutions have not been deployed extensively by ethnographers (for exceptions, see Gravlee et al. 2006 and DeCaro et al. 2012), they are widely used in educational, medical, and consumer fields and we believe they have the potential to enhance the quality of self-reports. The software can be programmed to query subjects at random or fixed intervals. When a subject responds a time and date stamped data-entry module opens, the subject responds by using drop down lists to answer queries, and the saved file can be transmitted to a web site or emailed to the researcher. Invivodata offers web-based recording of subject reports that we believe to be an important innovation especially when it supports a generic smart phone interface. It seems to us that Internet based reporting coupled with "cloud" storage has obvious advantages over data stored in a personal electronic device. Data is securely stored and time stamped, subjects do not have to upload, and researchers can monitor subject compliance and behavior in near real time.

Conclusion

Our goal in this chapter has been to review the theoretical and methodological progress that has been made in behavior observation research over the past few decades, with an emphasis, though not completely, on anthropological contributions. In doing so, we have documented parallel efforts in allied behavior science fields such as animal behavior, behavioral medicine and sociology. Behavior in naturalistic setting has always been important in the social sciences but attempts to study behavior intensively have been slow to develop because of the perceived costliness of doing so and the comparative ease in asking informants to tell us what they do, an option unavailable to those who study non-humans. To a large extent, the benefits of studying behavior has changed with the employment of theory demanding that behavior be studied in a quantifiable fashion to evaluate a variety of hypotheses. In this regard Allen Johnson's seminal introduction of "spot checks" (1975) has led to a proliferation of studies and methodological improvements in behavior observation.

We need a new generation of behavioral research in anthropology using direct and indirect observations in creative ways, and sharing methodological lessons learned. New technology from smart phone and web based data entry holds the promise of reducing the problems of reactivity and costliness in direct observations and increasing the accuracy of indirect observation. While there has been steady methodological advances in behavioral medicine to increase the reliability and validity of indirect or subject based observations ethnographers have barely begun to grapple with these problems. While some lessons learned in behavioral medicine may be applicable to ethnographers strong differences in what behaviors or internal states are studied may make some of the lessons learned in medicine not applicable to the kinds of questions ethnographers ask.

The information presented in this chapter covers a wide range of methodological strengths and weaknesses of behavioral research to date. As described above, we know a significant amount of about how to observe and code behaviors, the strengths and weaknesses of existing approaches, and the associated methodological challenges. The wide spread availability of cell phones capable of photos and videos, coupled with an almost global acceptance of sharing that information on the Internet, suggests that societally we are now more comfortable with recording ourselves and sharing that information. Our daily news is filled with these examples from the Arab Spring uprising, Afghanistan war, and every day rescues and natural disasters.

This "new normal" on informal and public sharing of our actions and intents for behavioral research methods will create new research opportunities and challenges. For example: How can this almost global willingness, requirement in some cases, to capture and share behavior be linked with the approaches we described above? If individuals or groups are already actively documenting an event or behavior, how can behavior research integrate and complement this public documentation and use? Also, how are ethical, moral and research limits of observation research evolving in response to this new global and public-driven sharing of behavior? We are increasingly recording behaviors (security and traffic cameras, Twitter, Facebook, etc.). At a global scale, individuals, organizations and governments are collecting, interpreting and acting upon new forms of documented behaviors. The implications of these streams of behavior information for anthropological studies of behavior are fertile grounds for conceptual and methodological work.

Future behavioral research in anthropology can build upon a solid conceptual and methodological foundation and benefit from new technologies to collect and involve study participants. This future research can also collaborate with and contribute to new pubic-driven collection and interpretation of behaviors. It is a very exciting time to be an anthropologist engaged in behavioral research.

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