

# Mixing Qualitative and Quantitative Research in Developmental Science: Uses and Methodological Choices

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Multiple methods are vital to understanding development as a dynamic, transactional process. This article focuses on the ways in which quantitative and qualitative methodologies can be combined to enrich developmental science and the study of human development, focusing on the practical questions of “when” and “how.” Research situations that may be especially suited to mixing qualitative and quantitative approaches are described. The authors also discuss potential choices for using mixed quantitative–qualitative approaches in study design, sampling, construction of measures or interview protocols, collaborations, and data analysis relevant to developmental science. Finally, they discuss some common pitfalls that occur in mixing these methods and include suggestions for surmounting them.

*Keywords:* mixed methods, quantitative, qualitative

How does knowledge gleaned from words complement knowledge gleaned from numbers, and vice versa? How and when does the combination of quantitative and qualitative data collection and analytic methods enrich developmental science? Our science increasingly relies on multimethod approaches to examining developmental processes (Garcia Coll, 2005; Society for Research in Child Development, 2005; Weisner, 2005). As a consequence, developmental scholars have broken new ground over the past decade in understanding the cognitive, linguistic, social, cultural,

and biological processes related to human development and family life. In this article, we focus on the many productive ways in which quantitative and qualitative methods can be combined to study human development.

Several summaries and handbooks focusing on integrating qualitative and quantitative data collection and analysis methods in the social sciences have been published recently (Axinn & Pearce, 2006; Bernard, 1995, 1998; Creswell & Plano Clark, in press; Greene & Caracelli, 1997; Tashakkori & Teddlie, 1998, 2003). Onwuegbuzie and Leech (2005) argue for combining the contrasting “Qs” (polarized quantitative and qualitative methods tracks and courses) into, for example, integrated bilingual, pragmatic research methods courses in education. In this article, we focus specifically on the uses of mixed methods for developmental science. We answer practical questions of when and how: When might mixing qualitative and quantitative approaches be useful in a developmental study? What are the methodological choices involved in qualitative and quantitative inquiry in studies of human development?

By quantitative research, we mean methods of inquiry that analyze numeric representations of the world. Survey and questionnaire data as well as biological or physiological data are often analyzed in quantitative units. Inquiry that relies on qualitative methods collects and analyzes non-numeric representations of the world—words, texts, narratives, pictures, and/or observations. The epistemological assumption underlying our discussion of mixed methods is that in scientific endeavors, the world can be represented through both numbers and words and that numbers and words should be given equal status in developmental science. Developmental science is a holistic enterprise including the social, neurological, and biological sciences. Although particular disciplines may emphasize particular methods of data collection and

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analysis, this is no reason to limit a particular program of research in developmental science to a single method.

In this article, we make the distinction between qualitative and quantitative data and qualitative and quantitative data analysis (Axinn & Pearce, 2006). The world is not inherently qualitative or quantitative; it is the act of human representation through numbers or non-numeric signifiers like words that make aspects of the scientific enterprise qualitative or quantitative. Behaviors or contexts relevant to human development are not inherently qualitative or quantitative, but the methods of representation through which behaviors or contexts are recorded in research are. In this article, we define qualitative data as information that has been collected not in numeric form but in texts, narratives, or observations (including pictures and video). We define quantitative data as information that has been collected in numeric form (e.g., counts, levels, or Likert-format responses). We define qualitative data analyses, similarly, as forms of analysis that do not rely on numeric representation and quantitative data analyses as forms that do. Qualitative approaches cover a wide range of methods, just as there is a wide range of quantitative methods.

An important corollary to this distinction between qualitative and quantitative data and data analysis is that all four combinations of these two categorizations are possible. That is, qualitative data can be analyzed through either qualitative or quantitative data analysis techniques, as can quantitative data. Interview transcripts can be reliably coded for the frequency of mention of themes, the numbers of words or keywords, or the complexity of vocabulary and statistically analyzed. Ethnographic data from the world's cultures have been coded for quantitative analysis (Rogoff, Sellers, Pirotta, Fox, & White, 1975). Conversely, individuals above or below a cut-off on a Likert scale or continuous dimension can be analyzed and characterized qualitatively, without further numeric representation.

Before turning to our primary questions, we begin with three general beliefs that guide our discussion of mixing qualitative–quantitative methods in studies of human development. First, integrating these approaches can bring us closer to understanding a developmental process than either set of methods can on its own. This belief goes beyond the commonly stated value of triangulation across methods, a strategy that focuses on convergence across methods on a particular finding, or separating out methods variance. Rather, our belief is that the combination of words and numbers can bring us closer to the complexity of developmental change by providing divergent as well as convergent data. Divergent data across methods can spur further inquiry and refinement of theory rather than simply representing disconfirming information (Sieber, 1973). Integrated methods can also make a study more believable to broader audiences, because they represent the world more completely.

Our second belief is that the particular research question concerning developmental processes should determine whether and how qualitative and quantitative methods should be combined. As with other forms of research, methods should follow the question rather than vice versa. This means that not all research studies in developmental science call for the use of both kinds of methods. We will describe certain common types of research questions that we think lend themselves to the process of mixing methods.

Our third belief is that the qualitative–quantitative distinction itself is somewhat arbitrary and limiting (see also Onwuegbuzie &

Leech, 2005). There are other dimensions of research methods often associated with this distinction (e.g., small–large sample, primary data collection–secondary data analysis, ungeneralizable–generalizable, noncausal–causal, nonexperimental–experimental, and culture-specific–universal) that cross-cut the qualitative–quantitative distinction. Anthropologists have described methods as experience-near (representing the voices, intentions, meanings, and local rationality of parents and children in local settings) and experience-distant (representing the world of groups, institutions, and social address categories). Methods can be particularistic, capturing a part of some phenomenon, or holistic, attempting to capture the whole context or situation (Weisner, 1996b). In this article, we aim to challenge the overly simple conceptualization of a single qualitative–quantitative “divide.”

### Research Circumstances in Developmental Science That Call for Mixing Qualitative and Quantitative Methods

Many, but certainly not all, research situations may be particularly suited to mixed qualitative and quantitative approaches. We discuss several such situations that may be particularly relevant to developmental science here.

#### *Assessing Developmental or Contextual Constructs That Are Difficult to Measure Using Either Set of Methods Alone*

Human development occurs through the reciprocal exchanges between individual growth and change in social contexts (Bronfenbrenner & Morris, 1998; Thelen & Smith, 2006). However, some aspects of individual behavior or contextual characteristics can be difficult to understand using only quantitative or only qualitative methods. For example, recent work by Kathryn Edin and Laura Lein (1997) focusing on single mothers' economic strategies and household budgeting established patterns of household expenditure that have been difficult to measure using traditional survey methods because of the sensitive nature of this information. Their assessment of spending relied first on meeting mothers in person and gaining their trust through interviews, which were usually repeated over several months, until a typical month's budget was fully accounted for. Qualitative data collection methods (semi-structured interviews) allowed the development of rapport that in turn facilitated a more complete and accurate accounting of income sources and expenditures than prior survey studies had achieved. In other words, their research questions required collecting and analyzing quantitative and qualitative data.

Another example of research requiring both quantitative and qualitative information concerns studies of diurnal and nocturnal stress processes in human development. Physiological measures, such as those representing stress processes, provide information about the effects of stress on human development that cannot be reported by individuals (Gunnar & Vazquez, 2001). However, these types of data should be combined with self-report data that provide information on individuals' perceptions of and responses to daily stressful events (Adam, Hawkley, Kudielka, & Cacioppo, 2006), thus allowing researchers to track how individual behavior, at both the psychological and physiological levels, corresponds to individual perceptions and meaning-making. McKenna and McDade (2005) review evidence on perceived norms regarding co-

sleeping between mothers and infants, as well as evidence for contingent psychobiological attunement that occurs in these dyads as they sleep together. Quantitative data are necessary for the monitoring of sleeping parents' and infants' physiological and behavioral patterns. But to understand the meanings, practices, and contexts of sleep patterns between mothers and children, qualitative (ethnography, parent interviews) and quantitative (questionnaires, systematic home observations) data are necessary. The combination of qualitative and quantitative evidence provides both prevalence estimates and information on culturally based goals and beliefs: We know from the combination of these forms of data and analysis that worldwide, parents sleep with infants and toddlers to insure their health and to facilitate breastfeeding; older children and parents sleep together for shared comfort and familiarity. These practices do not lead to excessive dependency or other outcomes that often worry U.S. parents (Morelli, Oppenheim, Rogoff, & Goldsmith, 1992; Okami, Weisner, & Olmstead, 2002).

### *Integrating the Study of Beliefs, Goals, and Practices in Socialization and Development*

Shweder et al. (2006) note that the study of culture in human development benefits from the integration of symbolic (e.g., beliefs, goals, and rules) and behavioral (e.g., customs and behaviors) aspects of cultural communities. In this view, the shared meanings that are passed on from one generation to the next and that constitute culture have both symbolic and behavioral dimensions. Likewise, Super and Harkness's concept of the developmental niche of child rearing integrates attention to the physical setting, behavioral customs, and caregivers' psychology (Harkness & Super, 1996; Super & Harkness, 1986). In order to conduct integrated studies of beliefs and practices in human development, it is necessary to conduct close observation of behaviors and activities in natural settings as well as to explore the beliefs, intentions, meanings, and goals of children, their caregivers, and others over time (Weisner, 2002). Examining behavior and belief systems requires both quantitative and qualitative approaches to research: quantitative methods to understand the prevalence of particular practices, behaviors, and beliefs, and qualitative methods to understand meanings, functions, goals and intentions. Authors of classic cross-cultural studies of children's development have fully integrated qualitative and quantitative methods to examine both beliefs and behaviors of children and their caregivers, resulting in a blend of local and universal knowledge (LeVine et al., 1994; Whiting & Edwards, 1988; Whiting & Whiting, 1975). Ethnographic studies of childhood have a deep and rich literature across cultures and in the United States (Burton & Jarrett, 2000; LeVine, 2007). Ethnographic studies of children are important precisely because developmental pathways and contexts do vary so widely across local populations, cultural communities, historical periods, and ecologies, and so require careful and systematic description and analysis.

Parenting and development include a direction and purpose along a life path, or a cultural career (Goldschmidt, 1992), which organizes both symbolic and behavioral aspects of development. LeVine (2003) calls for the blending of the study of universals in development, with local variations in both the goals and specific practices of socialization and parenting around the world. Normatively "healthy" relationships are thought to require a balance

between opposed dimensions of autonomy and intimacy, which is the dominant cultural relational schema underlying successful development in the United States (Tamis-LeMonda et al., in press; Weisner, 2001). But there are other developmental goals promoting "healthy" development, including "symbiotic harmony," as found in Japan (Rothbaum, Pott, Azuma, Miyake, & Weisz, 2000), or "socially distributed" caretaking and support, as found in many Latin American, African, and Asian countries (LeVine, Miller, & West, 1988; Serpell, 1993; Weisner, 1987).

Beliefs, goals, and practices are particularly interesting when they are not congruent. The combination of quantitative and qualitative evidence can shed light on why this is so. In a recent study, Hughes et al. (in press) examined beliefs regarding the importance of various ethnic and racial socialization practices, as well as frequencies of those practices themselves, in a sample of 210 Chinese, African American, European American, and Latino adolescent-parent pairs. Both survey and semi-structured interview data were collected from both teens and parents. The researchers first uncovered discrepancies in their survey data between levels of beliefs and practices within participants as well as levels of beliefs or reported practices across the teen and parent in a particular family. The semi-structured interview data helped shed light on why the discrepancies occurred. For example, it appeared that routine, everyday activities (revolving around food, books, films, or artifacts, for example) were often identified as associated with ethnicity but not perceived as examples of intentional cultural or ethnic socialization.

### *Estimating and Understanding Developmental Change at Multiple Time Scales*

Developmental growth over time in populations is best discerned by estimating trajectories of changing competencies and skills. Such work is conducted most often using quantitative methods (Collins & Sayer, 2001; Singer & Willett, 2003). However, events of developmental importance can occur at a multitude of time scales and at intervals that are difficult to predict.

Developmental change occurs in part as a result of the cumulative impact of innumerable interactions with parents, caregivers, teachers, siblings, and peers in the settings and at the time scale of the daily routine. Such interactions can be assessed using methods that quantify the data (e.g., structured tasks and time diaries) and with methods that aim to understand the quality of those interactions (e.g., observations and interviews; Johnson, 1996). The spot observation technique, in which random occurrences of behavior are sampled and described in detail, has been used in ethnographic research investigating child rearing and family life in cultures around the world (Jankowiak, 1993; Super, 1976; Whiting & Whiting, 1975). For example, analysis of hundreds of sampled events resulting from systematic participant observation indicated that the balance of sleep, arousal, and restraint among infants in different cultures varied greatly and was associated with patterns of infant motor development (Super, 1976).

Mixing quantitative and qualitative evidence can also shed light on changes that occur within and across entire developmental stages. Parents of children with disabilities in one longitudinal study described hundreds of particular accommodations (e.g., activities intended to alter their daily routine at meal time, seeking services, transportation, caretaking, etc.) and why parents made

them, based on semi-structured ecocultural interviews. Interviewers asked parents to “walk us through your day,” describing how and why families maintain daily routines. Quantitative ratings based on these interviews showed that the frequency of family accommodations remained relatively stable across early to middle childhood, while the intensity of such accommodations declined. Quantitative measures also showed that cognitive assessments of the children did not predict sustainable accommodations, whereas assessments of socio-emotional functioning levels did (Bernheimer & Weisner, 2007; Gallimore, Coots, Weisner, Garnier, & Guthrie, 1996; Weisner, Matheson, Coots, & Bernheimer, 2005).

In a longitudinal study of social and emotional development among urban, low-income adolescents, survey measures of friendship quality indicated that whereas girls reported higher levels of perceived support from their friends in early adolescence, by late adolescence girls and boys were reporting equal levels of friendship support. However, qualitative findings indicated that the meaning and function of friendship support during late adolescence was dramatically different for girls and boys (Way, Becker, & Greene, 2006; Way & Greene, 2006).

#### *Examining Reciprocal Relationships Between Contextual and Individual-Level Factors*

Transactional theories of development posit that individual and contextual characteristics influence each other in reciprocal causal processes across time (Ford & Lerner, 1992; Gottlieb, 1997). In recent years, quantitative methods for modeling such reciprocal influences have grown, such that studies modeling reciprocal associations between individuals and their family, peer, and other contexts have become relatively commonplace (e.g., Eisenberg et al., 2005). The strengths of the quantitative approach include the ability to estimate how the strength of reciprocal causal associations changes over time. For example, quantitative data can be used to estimate how the influence of child characteristics on parenting changes between the periods of early and middle childhood.

Mixing qualitative and quantitative methods can give a richer picture of such reciprocal associations by uncovering in detail the processes by which individuals select their own (or others’) environments. A study using national survey data examined the factors that predicted parents’ choice of center-based care; mothers with higher levels of education, lower levels of social support (e.g., from a co-resident grandparent), and those providing higher levels of cognitive stimulation in the home were more likely to select center-based care (Fuller, Holloway, & Liang, 1996). A complementary qualitative interview study found that parents valued safety and trust in their providers more than other structural or process indicators of quality (Mensing, French, Fuller, & Kagan, 2000). It is important to note that these findings suggest that most survey-based, quantitative studies of child care quality are overlooking factors that parents value the most—in other words, aspects of the caregiver–parent relationship.

#### *Exploring Causal Associations and Their Mechanisms*

Both words and numbers can shed light on causality. However, the contributions of qualitative and quantitative methods are different, and the combination can provide a richer picture of a causal

association than either can alone (Axinn & Pearce, 2006). Quantitative methods are suited to estimating the direction and magnitude of a causal influence on development. Whether using classic, random-assignment experimental methods or a quasi-experimental approach, the goal is most often an unbiased estimate of the effect of a predictor on a developmental outcome (Foster, 2002; Rubin, 1974; Shadish, Cook, & Campbell, 2002).

Qualitative approaches to causal analysis, on the other hand, are most suited to uncovering mechanisms of cause and effect (what some have called “process analysis”; Brady & Collier, 2004). Many researchers who use quantitative analyses to understand causal impacts of a treatment or phenomenon intend to eliminate selection effects; in contrast, qualitative analysis is often aimed at describing in detail these same processes, taking into account human agency. In addition, quantitative approaches, testing particular hypotheses about a delimited number of mediating mechanisms, may not help discern the full range of explanatory processes that hold in any particular cause–effect relationship. Qualitative methods can help uncover such mechanisms. For example, a qualitative analysis using data from the Moving to Opportunity residential-mobility experiment explored why the offer of a move from a low-income to a high-income neighborhood had more positive effects on girls’ academic performance and social behavior than it did on boys’. The qualitative substudy found that boys of parents who took the offer to move from high- to low-poverty neighborhoods had more difficulty adjusting to new neighborhoods. Girls adapted more quickly to the new settings, developing school-based friendship networks whose members were less likely to engage in risky behaviors. Girls felt more harassed in their old neighborhoods and experienced less fear in the new ones. These were experiences that had not been anticipated in the survey but emerged from in-depth qualitative interviews (Clampet-Lundquist, Edin, Kling, & Duncan, 2006).

Another common situation in which quantitative and qualitative data are integrated is in the evaluation of the implementation quality of programs for children and youth. Implementation is partly a matter of what is offered in a program and partly a consequence of families’ perceptions about a program that determine whether they make use of it. Both can explain or moderate the causal effects of an intervention on children. This mix of examining what was offered and how it was perceived is well suited to a combination of quantitative and qualitative methods. Datta (2005), for example, reviewed evidence from quantitative experimental evaluations of the Comer approach to whole-school reform. Quantitative data indicated that the program did not achieve the intended results; merged qualitative and quantitative data indicated that the Comer principles were effective, but only when the approach was appropriately implemented (Datta, 2005, p. 66). The Early Head Start national evaluation (Love et al., 2002) used a series of in-depth and focus-group interviews with staff and program directors in each of the 17 experimental sites to characterize site-specific theories of change (that is, beliefs about how and through what mechanisms the local program was affecting targeted outcomes; Weiss, 1995). These were then categorized as focused on parent processes, child processes, or a combination. The resulting three-category variable was used as a moderator of the experimental impact.

Another example of a puzzling causal association addressed by the integration of quantitative and qualitative research emerged

from a 6-year longitudinal study of adolescent mothers and their children (Way & Leadbeater, 1999). In this study, the survey data indicated that mothers who reported lower levels of emotional support from their own mothers at the time of the birth achieved higher levels of educational attainment after 6 years than their counterparts who reported more emotional support. The qualitative, in-depth interviews with these young mothers indicated that those mothers who reported the least amount of emotional support from their own mothers at birth had mothers who had the highest expectations for their daughters. Thus, the low amount of emotional support received by their own mothers at the birth of their children was due, in part, to the anger and disappointment that their own mothers felt about their daughters' having become pregnant at such a young age. The mothers who were perceived to be the most emotionally supportive of their daughters at the births of their daughters' children, however, had few educational expectations for their daughters; thus, they did not frown on the arrival of a grandchild. The qualitative analysis indicated that the predictors of educational attainment may have had more to do with the expectations the mothers had for their daughters than with the level of emotional support they provided. These findings underscore the ways in which quantitative and qualitative methods can be mixed to produce a clearer understanding of an association uncovered using quantitative methods.

#### *Integrating the Study of Developmental Phenomena That Occur With High Prevalence With Those That Occur in Isolated Cases*

The distinction between quantitative and qualitative research has occasionally been described as variable- versus individual-centered, or nomothetic and idiographic. However, this distinction is not accurate in that both qualitative and quantitative research can be conducted at either the population or individual level of analysis. However, one strength of qualitative research is its usefulness in identifying isolated cases that may uncover an entirely new area of inquiry (Pearce, 2002; Turner, 2004). For example, many quantitative methods used in developmental science summarize information about groups of individuals rather than identifying and exploring unusual cases in depth. The ability to identify and then conduct follow-up detailed exploration of atypical cases may be a particular strength of qualitative approaches. This can occur in two ways. First, a qualitative analysis can uncover a new developmental phenomenon. This can open up the opportunity to explore its prevalence, predictors, and sequelae in quantitative studies. For example, the *Sturm und Drang* theory of adolescent development as a process of individuation requiring conflict with parents was developed largely through data and theorizing from case studies in psychoanalytic scholarship. This theory was then tested in numerous developmental studies of adolescence, most of which employed quantitative methods to the point at which it was discounted as a phenomenon that was a necessary feature of successful adolescent development in middle-class U.S. cultures. Theories of adolescent development were enriched through this process.

Second, a quantitative analysis could uncover an unusual developmental phenomenon, with qualitative research employed to investigate it in more depth. An "outlier" or set of outliers in a quantitative analysis, for example, could be followed up with

qualitative inquiry. Pearce (2002) conducted a study of the influence of religion on family life in Nepal in which a subsample of adults in a survey study were identified who preferred much larger family sizes than predicted in a regression analysis (predictors included demographics as well as religioethnic group and a variety of religious beliefs and activities). This subgroup was then interviewed using qualitative methods about their family size preference. On the basis of the interview findings, which suggested that the proper unit of analysis for religious practice in the sample communities was the household, Pearce recoded activity variables to represent household-level activity and increased the predictive power of her quantitative analysis.

The United States is usually an outlier compared with the world of children and parents to which we should always hope to generalize. Cross-cultural and cross-national samples are needed to test findings from work done in a single community or nation. The United States is an isolated case for which we need much larger and more representative samples of the world's children, parents, and contexts for development. Often, qualitative and quantitative evidence helps to put our own isolated U.S. case into perspective. The *Sturm und Drang* hypothesis, for example, required major modifications when it was compared with studies concerning the quantitative patterning as well as qualitative meaning of adolescent-parent relationships in other cultures (Brown, Larson, & Saraswathi, 2002; Larson & Verma, 1999; Schlegel & Barry, 1991). Comparisons of child and family poverty across the affluent nations of the Europe, the United States, and Canada show sharp differences in poverty levels and in some of the reasons (e.g., social investment and support programs, taxation and income redistribution, and political make-up of elected bodies) for such variation (Rainwater & Smeeding, 2003). The notion that sibling caretaking would inevitably create rivalry and that caretakers would "lose their childhoods" is far from what cross-cultural or U.S. data show; there are costs in well-being but also many benefits for increased child nurturance, responsibility, and the values of socially distributed care and support (East, Weisner, & Reyes, 2006; Serpell, 1993; Weisner, 1996a).

#### Methodological Choices in Mixing Qualitative and Quantitative Approaches

Methodological choices are determined by the particular research question at hand. Here we discuss some of the critical choices one must make when designing studies, sampling, constructing measures or interview protocols, and analyzing data using a mixed quantitative-qualitative approach.

#### *Research Design and Data Collection Modality*

The productive mixing of qualitative and quantitative methods can occur in the context of a variety of research designs, including nonexperimental and experimental studies and prospective longitudinal as well as cross-sectional or retrospective studies. The choice of design should ideally be made a priori, with attention to the particular strengths of each design within the context of the research topic (causal inference, e.g., for experimental studies; the ability to model change for longitudinal studies). The use of integrated methods throughout the stages of a study, and an iterative, cumulative approach to inquiry, rather than the use of a new

set of methods after the research design for the other part of the study has already been finalized, is likely to result in richer data and theory. Goldenberg, Gallimore, and Reese (2005) illustrate this in their 15-year longitudinal research program studying Latino children's literacy development, in which an interest in the contexts that mattered for these children's school success led to the use of ethnography in homes and schools; qualitative interviews with parents, teachers, and children; questionnaires; school records; and developmental assessments. The research team used an iterative process of data collection. For example, their quantitative findings indicated that parental personal and educational backgrounds at school entry significantly influenced the literacy beliefs and home literacy practices of parents and children and also their children's early school achievement. These findings were enriched by qualitative data collection in the cities, small towns, and rural villages of origin of the parents in Mexico to figure out why these associations held.

Much has been written about the choice of the many qualitative methods as well as data collection modalities (e.g., ethnography, in-depth interview, structured open-ended questions, and focus groups) available (Bernard, 1998; Creswell, 1998; Denzin & Lincoln, 1998). In the context of a mixed qualitative-quantitative study, the match between kinds of quantitative and qualitative methods should be considered in addition to the usual match of method to research question. One method might be chosen specifically to fill in the gaps or shortcomings of another. For example, a survey study that examines parenting practices and child development without much attention to the physical context of the home or the community may benefit from participant observation that provides detailed, in-depth descriptions of these social contexts of parenting. For another example, if group process and discourse are important elements of a construct (e.g., peer perceptions) but have not been a focus of research using one set of methods, a data collection method that provides group dynamics data, such as sociometric ratings or focus groups, could be chosen for the next phase in the research.

### *Relationship Between Researcher and Participant*

Developmental researchers should consider the nature of the relationship between themselves and their participants when choosing between qualitative and quantitative data collection and analysis strategies. Direct contact with participants is usually not an option when conducting secondary data analysis, particularly with survey or administrative data. A researcher may wish to complement such secondary analysis with a data collection strategy (qualitative or quantitative or both) that allows more direct contact with a particular population. This more direct contact can result in a more comprehensive understanding of a developmental phenomenon.

If the two sets of methods are to be used with the same participants, one issue to consider is how the relationship between researcher and participant changes across data collection modalities. This change in relationship quality may have consequences for data quality. On one hand, conducting qualitative interviews first can establish a level of rapport that is crucial for collecting rich and personal accounts. On the other hand, some quantitative methods may be more likely to provide confidentiality or anonymity (e.g., computer-assisted survey administration). Pilot samples

and research testing different approaches and obtaining information on participants' experience of the range of data collection methods can help inform choices regarding particular combinations.

### *Sampling*

Mixing qualitative and quantitative approaches brings up vexing tradeoffs regarding how to sample. Typically, qualitative samples are smaller than quantitative samples because of the time demands of qualitative data collection and analysis. However, this need not be the case. Some researchers (e.g., Edin & Lein, 1997; Way, Gingold, Rotenberg, & Kuriakose, 2005; Way & Pahl, 2001) collect both in-depth qualitative interviews and survey measures from entire samples of hundreds of participants. If that is not possible, two common alternatives are embedding or nesting a qualitative sample within a larger quantitative sample and drawing a separate qualitative sample with a similar sampling plan. There are some advantages to the nested design. First, one can examine the quantitative (e.g., survey) data of the qualitative sample. Subgroups of the qualitative sample, for example, can be drawn based on responses obtained from the survey (e.g., at an extreme or in the middle of the range of one or more measures; Miles & Huberman, 1994). Second, one can more easily generalize from one sample to the other if they are nested. Random subsampling can be especially useful in this regard. However, participant burdens are certainly lessened if a qualitative sample is drawn separately (e.g., Cherlin, Burton, Hurt, & Purvin, 2004).

An embedded qualitative sample can be drawn based on particular criteria, such as family structure, risk level, or developmental status. For example, a recent qualitative investigation drew a subsample from a larger quantitative study of welfare recipients on the basis of women's entry into marriage over the 5-year time frame of the larger study (Jayakody & Seefeldt, 2005). Another ethnographic subsample was drawn randomly from both conditions of an experimentally evaluated intervention in the New Hope antipoverty experiment (Duncan, Huston, & Weisner, 2006; Gibson-Davis & Duncan, 2005). In this case, the researchers argued strongly for incorporating both experimental and control-group members in the qualitative substudy in order to gain more powerful insights into the causal effects of the intervention. Over 1,300 program and control sample adults were eligible for the full survey; these adults were randomly assigned to either the New Hope or control group. Of those, over 800 had at least one child between the ages of 1 and 12 years (the focal age group for the child and family study). From this group, equal numbers of program and control families were randomly selected to participate in the ethnographic study (and continue in the survey study sample as well).

Network-based sampling (e.g., "snowball sampling," in which respondents refer the researcher to other respondents) is quite common in qualitative research. By carefully selecting a range of starting cases, engaging in several stages of referrals from those cases, and halting referrals after only a few stages, researchers can represent a relatively wide range of variation on demographic characteristics in a particular population (Heckathorn, 1997). The choice between network-based sampling and population-based sampling should be informed by the type of population as well as the response rate obtained. For example, researchers may better

sample a “hidden” or stigmatized population using network-based sampling than they may using population-based sampling, whereas the reverse may be true for a population from which one can obtain a higher response rate (Small, 2005).

The systematic sampling of particular contexts to highlight variation in qualitative cases is a common approach when the topic of study is development within that context. This task becomes more complicated when it is conducted in combination with sampling in a quantitative study. For example, a qualitative study of child or youth development in neighborhood contexts that is conducted within a larger quantitative study may need a sample of a smaller number of communities than those represented in the larger sample. Neighborhoods may be selected on the basis of particular dimensions that are of interest in the study; the number of dimensions across which neighborhoods are chosen, however, will be more constrained in the qualitative study. Decisions on how many interviews or participants to sample per neighborhood depend, in turn, on the individual-level characteristics across which one would like to ensure variation. This is a topic that is not well understood and would benefit from new research. In the New Hope experiment (Gibson-Davis & Duncan, 2005), the ethnographic cases constituted a qualitative subsample of roughly 8%. The qualitative study sample size was a decision based on time, money, and intuition about how many families and children would be enough. With 44 cases, one could detect a program impact of about 0.6 standard deviation with a 95% confidence interval. However, it turned out that, using the full survey data sample, researchers found no program impacts as large as 0.6. The qualitative data could not be used to detect new experimental impacts in the ethnographic sample.

Variance and other features of the quantitative data also affect decisions about how and how many to select in a subset—features that often cannot be predicted before doing a study. Factors to consider when making decisions about relative sample size of quantitative versus qualitative samples include: ensuring representation of the full range of the target population; allowing for variation in the variable or topic of interest; ensuring that fieldworkers have the time and resources to capture rich, complex, and nuanced developmental processes; and estimating statistical power a priori for key associations. These are methodological dilemmas specific to mixed-methods work for which few established guidelines are as yet available.

### *Measure Development*

The development of assessment and measurement tools in one set of methods can be based on evidence from the other. Perhaps most common is the situation in which qualitative evidence is used to develop quantitative instruments. Pendleton, Poloma, and Garland (1980), for example, used interviews with 53 dual-earner couples to develop quantitative scales tapping aspects of work and family such as domestic responsibility, satisfaction, self-image, and career salience.

Qualitative evidence can also be used to improve on the limitations of measures that have historically been implemented in quantitative survey instruments. Lugo-Gil and Yoshikawa (2006), for example, analyzed qualitative interviews on expenditures on children conducted with immigrant and ethnically diverse parents. These interviews suggested multiple ways in which the standard

U.S. survey approach to expenditure measurement—the Consumer Expenditure Survey—could be revised to better measure expenditures on children in diverse families. Revisions were made to time frames, definitions of household, and phrasing of questions, and categories particularly relevant to consumption in these families, such as informal contributions from others and remittances, were added. The survey measure based on the qualitative findings was then administered to estimate investments in children in a larger survey sample.

Qualitative protocols also can be developed from quantitative data. For example, participants can be asked how two domains of experience are related on the basis of quantitative study of the two domains in association with each other (e.g., asking adolescents how experiences of discrimination in their daily lives might relate to their well-being and their school engagement, a question that is best asked after extensive probing of each of these topics separately). Similarly, the constructs of “time” and “money” have long been studied as key components of family life and child development. In quantitative studies, these constructs are usually assessed separately with time diaries and expenditure grids. A recent qualitative study of unemployed middle-class fathers, however, asked parents about the tradeoffs they perceived in having time versus money as key parenting “investments” in their school-age children. The findings suggested a nuanced portrait of the conditions under which the merits of increased time for children as a result of parents’ job loss outweighed the loss of income from employment. For example, for unemployed fathers who had sufficient savings or other financial resources, and were therefore experiencing relatively little economic stress, the unexpected chance to rekindle or strengthen relationships with children through spending more time together was viewed as a welcome opportunity that would have long-lasting positive consequences. In contrast, for those fathers whose financial obligations weighed more heavily on them, the increased time they were spending at home served only as a frustrating reminder of their unemployment status. These qualitative findings suggest, in turn, revising quantitative measures to assign “weights” to these important inputs in light of a particular family’s circumstance (Kalil, Spindel, & Hart, 2006).

### *Data Analysis*

Quantitative and qualitative data analysis from a mixed-methods study can be sequenced in a variety of ways. As the examples throughout this article illustrate, there is no “best” way for the two kinds of analyses to inform each other. Studies range from two-stage models in which the qualitative analyses follow the quantitative analyses or vice versa to complex iterations in which, at different stages, qualitative and quantitative analyses accomplish different purposes. Odom et al. (2006) conducted a study of the experiences of preschool children with disabilities in inclusive classrooms. They gathered survey, observational, participant observation, and in-depth interview data on children’s experiences in inclusive classrooms. In their analyses, they first identified children at extremes of social acceptance and rejection in the survey data and then analyzed the two groups’ experiences holistically using a range of qualitative methods. Next, they conducted a quantitative cluster analysis to identify patterns of peer sociometric perceptions associated with acceptance or rejection and validated those clusters using participant observation methods. This complex

set of analyses provided a rich picture of the experience of acceptance and rejection of children with disabilities in an educational setting.

Divergent findings from quantitative and qualitative methods do not necessarily represent a “problem” with the data. Miller, Khamarko, and Beard (2005) reported conflicting results from a mixed-methods evaluation of an HIV prevention program for adolescents and young adults. They found that although the program did not achieve substantial impacts on quantitative assessments of risk behavior, the community organizations involved felt that the program brought attention to a neglected health issue and catalyzed community prevention efforts. The divergence of evidence provided useful data that challenged the program’s established theory of change and revealed the plurality of values among stakeholders involved.

One all-too-common way to mix qualitative and quantitative methods within a research project is to have separate analysts collect and analyze data, each using one set of methods. This division of labor is, in our view, not the best choice from scientific and training perspectives. It is preferable to integrate the two perspectives throughout the analysis phase of a research project and have each analyst conduct both quantitative and qualitative data analysis. This can lead to rich integration across methods and analyses. However, this approach also requires training across both sets of methods, a difficult task given the extensive skill sets and traditions within each set. If experts in quantitative methods partner with experts in qualitative methods and jointly explore common developmental questions, new findings as well as new skills can be learned by all. It is not necessary for each individual to be equally expert in all methods. Joint training in qualitative and quantitative methods can be accomplished productively by embedding training opportunities in mixed qualitative–quantitative studies. In a recent book on the effects of low-wage work on family processes and child development, each member of a small team of analysts engaged in both quantitative and qualitative analyses. Many members of the team were at the doctoral or post-doctoral level and were lead analysts on studies focusing on particular aspects of low-wage work and child development (Yoshikawa, Weisner, & Lowe, 2006). The whole team engaged in a core set of coding and analysis tasks using ethnographic field notes, as well as a core quantitative analysis of work and income trajectories and their effects on children (Yoshikawa, Lowe, et al., 2006). Each chapter author then expanded on these core analyses, using both quantitative and qualitative methods to examine a particular aspect of low-wage work and its effects on parents and children (job quality, nonstandard hours and schedules, job discrimination experiences, child care and work, work goals and values, budgeting, work and relationships or marriage, etc.). This approach served simultaneously as an efficient way to conduct mixed-methods analyses and a rich training opportunity across both sets of methods.

#### Common Pitfalls of Mixing Qualitative–Quantitative Methods and How to Surmount Them

In this section, we discuss four common pitfalls in research using mixed qualitative–quantitative methods. Although each is not specific to developmental science, we describe examples rel-

evant to developmental research. For each, we suggest possible remedies.

#### *Finding Publication Outlets and Funding*

A common anxiety about conducting research across qualitative and quantitative methods is whether such work will be received well by reviewers and funders. Chapters, books, or reports do often allow more latitude for mixed-method studies than they do for developmental journals. Some journals may, unfortunately, have “gatekeeping” criteria that make it difficult in practice to present mixed-methods evidence, particularly when including qualitative evidence with thick description. However, developmental journals are increasingly recognizing and publishing mixed-methods research. Some are recognizing the need for space for text evidence. This is a two-way process. The more often developmental research that uses mixed methods is submitted to journals, the more likely it will become that editors will accept such work for publication. Similarly, the more often developmentalists with a range of methodological expertise serve as reviewers for journals and funding agencies, the more likely it is that studies incorporating the different methods will be supported.

#### *Balancing Participant Burdens*

Participants perceive research “burdens” in different ways. Time is an important, but not the only, consideration in understanding participant sense of burden. Participant engagement and involvement is also important. A long, structured, closed-ended survey, or hundreds of questionnaire items to fill out, page after page, can be a burden for many. But a qualitative conversation, despite taking just as long, allows participants to tell their own stories and takes place with a fieldworker listening closely to participants’ concerns. The burden participants experience may be much less. And some forms of collection of qualitative data (e.g., a recording of preschoolers’ naturally occurring conversations in preschool classrooms and playgrounds) have no direct burden on participants (Rizzo & Corsaro, 1995). The personal relationships that participants develop with fieldworkers are positive for many families. Multiple methods, however, often create greater burden; this can be particularly acute if more than one method is attempted in a single visit. Participant payments, support, and number of contacts should be weighted accordingly. Providing meaningful payment, gifts, child care, and flexibility in scheduling can help.

#### *Managing Time and Resources*

Individual investigators can do multiple kinds of data collection and analysis themselves. But partnering with others who have complementary expertise is also valuable. When some members of a team are method-bilingual, barriers to integration of data are lessened. Investing some time and resources across methods, even if the investment has to be small at times, can nonetheless have large payoffs. In practice, many developmentalists are trained in particular data collection and analysis techniques and gradually accrue other expertise over time. Learning a particular data collection technique to help answer a particular, delimited research question is more feasible (and less daunting) than learning all “qualitative research” or “quantitative research” methods.



### Collaboration Among Researchers of Different Scientific Backgrounds

Research using mixed qualitative–quantitative methods often involves collaborations among researchers who have different scientific backgrounds. We use the term “scientific background” rather than “discipline” because researchers within a single discipline can differ greatly in their approach to qualitative and/or quantitative methods. Beliefs about and skills in using different methods are part of our social identities. Differences can occur in epistemological beliefs (e.g., positivism vs. constructivism or post-positivism; Guba & Lincoln, 1994; Onwuegbuzie & Leech, 2005); preferences in data collection approaches with participants; terminology and labeling of concepts, constructs, and methods; or experience with particular kinds of research. All of these issues can affect a multitude of design, implementation, and analysis decisions. Resolving them requires patience, perspective taking, and conflict resolution skills, and most important, the willingness to learn unfamiliar research practices and teach familiar practices to others.

### Conclusion

Researchers can be specialists in a method or analysis technique and can advocate for that method without becoming “methodocentric,” in other words, confounding a method useful for understanding the research problem with the research problem itself. “Methodocentrism,” like ethnocentrism, can have some positive functions, such as building professional expertise and identity, but it has negative consequences too. The questions should focus on the empirical problem, theory, and study participants. What strong evidence does one have that will contribute to understanding the families, children, and participants in a particular study? What does one’s evidence tell us about theory and the validity and reliability of all methods? How does each kind of evidence add to the emerging overall story? How does one’s evidence make a particular story more believable to a wider audience? The focus should be on the participants, the contexts in which they live, the theory, and the emerging story that the accumulated evidence tells—not on which method has been used to gather such evidence (we have argued, of course, that different methods and designs are good for making different parts of an empirical story more believable).

When partnering with others in mixed-method work, it is useful to select partners who all sides trust to have a version of this stance toward the children, families, and contexts under study, who are not methodocentric but who are curious about what different ways of representing the common research questions using mixed methods will reveal, and who focus on testing theories rather than on preapproving the one that might be favored by their discipline.

In doing so, developmental theory will be enriched through the expanded lens that mixing methods can provide on developmental phenomena. This work is just beginning with regard to mixing the study of words and numbers in scientific research. We believe that in future years, as the productive mixing of these methods continues to grow, our understanding of human development will be greatly enhanced.

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