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Behavioral Economics and Developmental Science: A New Framework to Support Early Childhood Interventions

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Introduction

Public policies have actively responded to an emergent social and neuroscientific evidence base documenting the benefits of targeting services to children during the earliest period of development, particularly for those children from economically poor households.¹⁻¹⁰ Prominent examples include President Obama's "Preschool for All Initiative" to create a national universal preschool program at the federal level¹¹ as well as more local efforts such as those actively percolating in California and New York.^{12,13}

Although many early childhood interventions, including large-scale initiatives like Early Head Start, show some impacts on early learning and development, population-level effect sizes are modest.^{14,15} One clear reason for small effects is inconsistent quality of services.¹⁶ Other probable reasons include problems of low utilization, inconsistent participation, and low retention that interfere with maximizing intended benefits to children and their parents.¹⁷ With the goal of providing the best possible environment for young children's learning and development, many programs incorporate best practices and actively evolve to address barriers to full enrollment and participation. However, best practices are often determined based on children's needs and not on the behaviors of parents; indeed, programs are largely designed presuming certain behaviors by parents. Parents are assumed to be clearly evaluating whether a program is worth signing up for; understanding and acting on all of the steps to enroll; and having the attention and energy to listen and execute good parenting practices every day. Many of these assumptions implicitly or explicitly emerge from conventional models of decision making. Parents want to do what is best for their children. But these assumptions—and any one theory underlying those assumptions—do not allow for the inevitable ways that busy lives, distractions, and crises contribute to decisions that deviate from good intentions and may result in less than optimal effects of promising early childhood programs. Recently, insights and tools from behavioral economics have been used successfully to supplement program design to increase the likelihood of achieving program impacts on outcomes in areas such as finance, nutrition, and energy conservation.^{18,19} The interdisciplinary framework of behavioral economics—combining the theories of conventional economics with social psychology and cognitive decision making—recognizes the ways in which context, and the cognitive processing related to attention, self-control, social norms, and identity, affect people's real-world, in-the-moment decision making. We describe these emerging insights and describe the application of this interdisciplinary theory to early childhood interventions as a potentially promising

framework. By doing so, we hope to uncover approaches that could enhance and support participation and engagement of parents of children who are eligible for early interventions.

Parents play an integral role as active agents on behalf of their children. Simplified, program participation and engagement are often assumed to be the result of an active evaluation by parents about costs versus benefits. This evaluation is also assumed to be largely context-agnostic and to reflect relatively stable preferences and full understanding of available information. However, recent developments from behavioral economics suggest otherwise.²⁰⁻²² Does the overwhelmed and confused parent—who in all observed ways is a target of early childhood intervention—walk away because certain steps are too complicated despite ample information? Does a busy parent miss opportunities to read words out loud to a child because there are too many other distractions and because the future rewards of doing so seem far-fetched and irrelevant compared to the struggles of today?

Parents' and their children's experiences with programs are profoundly intertwined with parents' decisions. Programs can be designed to alter one's decision-making environment²³ and, as such, could improve parent engagement across a range of promising interventions aimed at improving outcomes in early childhood. Successful examples shown in other domains include: (a) the use of text reminders to refocus attention—reminders that have been shown to increase exercise and savings and reduce smoking²⁴⁻²⁷; (b) social norm messaging that makes explicit the behaviors of like-minded peers to reduce energy use^{28,29}; and (c) the use of defaults like opting out of employee benefit plans to overcome procrastination, defaults which increased enrollment by 40 percentage points as compared to opting in.³⁰

The behavioral economic perspective presents another, quite appealing feature by guiding us to questions that may uncover potentially overlooked sources of heterogeneity in early childhood program success or failure. It is well documented that a variety of socioeconomic or demographic characteristics, as well as variations in implementation, can influence interactions with the program, interventionists, and the families' subsequent flow through services.^{31,32} However, little is understood about whether and how the context and circumstances in which individuals experience these interactions inform and fuel their choices and decisions to access, follow through, and stay engaged with services. By recognizing the constraints and opportunities of their current context, the behavioral economic perspective may uncover new design innovations and thereby facilitate access and engagement among individuals who might benefit the

most from programs yet do not engage because of small situational features.

This manuscript broadly describes the potential application of behavioral insights—particularly behavioral economics—to early childhood interventions (broadly construed as parent-targeted initiatives designed to support and improve early childhood learning and development). We start by giving an overview of the current work being done in early childhood interventions. This is followed by an overview of behavioral economics and the ways in which it sheds light on early human development, especially in the context of poverty, and the intersection of underlying conceptual constructs between behavioral economics and developmental theory. We then describe the application of behavioral economic insights to programs more generally and provide a few examples with illustrative parent coaching, early childhood literacy, and home visiting program models.

Early Childhood Programs and the Role of Parents

Early and high-quality education and care is rapidly emerging as an approach to addressing poverty-related disparities in school readiness.³³ The potential rewards of intervening during early childhood is informed by theories from both child development and economics that posit hypotheses about how the nature and timing of investments in young children affect their future life trajectories^{34,35} and by complementary theories of nonparental care decision making.^{36,37} These theories are backed by an impressive evidence base. Results from lab-based measurement of brain activity conducted by neuroscientists find differences among low-income children compared with children reared in higher-income families in neural structure and brain regions that affect language, memory, and executive functioning.^{2,9} Social science researchers document similar types of income disparities in more general measures of children's achievement, school performance, and learning-related behaviors such as attention and self-regulation.^{1,3,38,39}

The recent neuroscience and social science research surge has caught the attention of policy makers and educators. The application of research to practice began with a focus on kindergarten (as an example of universal access) and has been extended to the earliest years of life. For 0- to 3-year-olds, the range of infant/toddler programmatic types initially grew from nonparental center- or small-group-based settings, as success in 3- to 4-year-old programmatic types pressed downstream earlier in the developmental stages of children. Home visiting, and related pre- and immediate post-natal services, complement these efforts by specifically targeting parenting practices or parent-child interactions. (For a review of

models, see the US Department of Health and Human Services' Home Visiting Evidence of Effectiveness project.⁴⁰) What nearly all of these early childhood models share is a common focus on two primary avenues of improving children's developmental trajectories: the quality of their early environments and the quality of parenting practices. Bronfenbrenner's bioecological model of human development has been a driving force guiding the development of programs to look beyond the child to factors that influence the child's environment.⁴¹⁻⁴³ This framework was particularly influential in the initial design of the Head Start program in 1965.⁴⁴

The broader environmental or family circumstances of income-poor children impose a variety of challenges that can interfere with their ability and capacity to take advantage of existing programs. Some of these observed challenges over the past several decades include maintenance of staff quality, staff workload, and turnover; cultural and linguistic sensitivity in delivery of services; and the presence of one or more psychological or physical individual barriers such as domestic violence, substance abuse and depression, and children with special physical or emotional needs.⁴⁵⁻⁴⁷ The bioecological framework, along with selective theories brought to bear from other developmental theories and complementary social science disciplines, have sought to address many of these structural, contextual, and personal barriers that appear to be stumbling blocks to maximizing program efficacy and effectiveness. The more deliberate and systematic blending of social science theories with practitioner experience has further contributed to a new field called implementation science.^{48,49} A number of creative solutions have resulted. These solutions include a range from facilitation of referral and access to comprehensive services to caseworker strategies to meet parents "where they are," targeting of program services to the time that the issue is salient (e.g., during pregnancy or at the moment a child behavior issue emerges or is developmentally expected to emerge), and active goal setting of parents as part of the planning process.

Indeed, over time, many of these promising program practices have become proactively integrated and implemented into program models rather than incorporated post-hoc as responsive program elements to address particular problems after observed patterns of reoccurrence.^{47,50-55} Qualitative studies of some of these best practices have shown ways in which specific program alterations can prove particularly effective at increasing engagement.⁴⁵ For example, Nurse Home Visiting strategies have adapted their strategy to include visits to child care providers, as it was often difficult to arrange to meet parents at home due to erratic work hours.⁴⁷

Even so, most of these well-intended initiatives presume that once structural or personal barriers have been addressed, eligible parents are

able and willing to respond to the availability of programs and will do so as programs require and suggest. This assumption has not been borne out. In fact, nearly one-third of the enrollees in the Early Head Start program, which serves nearly 100,000 children aged 3 and younger, and their families do not complete the program because they either move away or drop out before their eligibility ends, with a sizable minority voluntarily leaving the program.^{55,56} A similar disappointing pattern is observed when looking at the intensity of utilization: only about half of participating families receive services at prescribed intensity levels. A review of home visiting programs funded by the US Department of Health and Human Services Home Visiting Evidence of Effectiveness Project reports that in the 15 studies that reported the number of visits families actually received, most families received an average of 3 home visits per month (of the planned 4 visits per month).⁴⁰ According to 5 studies, visits normally lasted more than 1 hour but less than the recommended 90 minutes. And one study reported that, on average, families participated in the program for 21 months of the possible 36 months and that nearly half of the families participated for fewer than 24 months.⁵⁷ In 2011, the annual turnover rate for children and pregnant women who remain eligible to receive Head Start services was 12%.^{58,59} These issues are not unique to early childhood interventions per se. Statistics on many economic-mobility-enhancing programs in the US show a persistent gap between the proportion of individuals who are eligible to receive the benefits or services of the program and the percentage who actually take up the program, a group that is not adequately explained by decisions among policy makers to strategically and proactively allocate scarce resources.⁶⁰ In the context of the developing world, questions about show-up rates permeate policy efforts to reduce child mortality, such that simply making it to one prenatal clinic to receive an immunization alone doubles the rate of child survival.⁶¹

Like most social assistance and related programs, the success of these early childhood interventions hinges on the behavior of individuals—parents, caseworkers, and program administrators. Enrolling requires the completion and submission of documentation and any related paperwork. Completing a program requires regular and timely participation. Providing effective case management depends on the ways parents and caseworkers interact. As such, parents are essential agents in the functioning and prospective success of early childhood interventions. A framework that sheds light on these important (though seemingly minor) aspects of decision making could help serve as a guide to maximizing the intended benefits of programs to children and their families. As an example of growing recognition of these and other types of challenges to engagement, we note

the following observation made in a publication from the Early Head Start and Evaluation Consortium⁴⁵:

An in-depth, qualitative study in two sites showed that parents were best able to engage in services when the program (1) clearly conveyed program purposes, (2) emphasized the child's needs, (3) followed through consistently, (4) helped parents relate to the program as well as to individual home visitors, and (5) developed systems for tracking families in spite of mobility. These factors were found to relate to engagement even in the face of high levels of parental demographic risk (e.g., teen parents, single parent, lack of education) and staff turnover.

Our proposition is that behavioral economics offers one promising guiding perspective and framework that can translate observations such as these into actionable steps to program design.

A Behavioral Economics Perspective

To put behavioral economics in perspective, it is useful to begin with traditional economic models. These models are often built on the rational-actor theory and result in powerful hypotheses that have helped inform the design of a plethora of programs (e.g., by addressing the range of cost and price through financial subsidies) and related structural and possible informational impediments (e.g., housing, transportation, and information pamphlets). These same models have informed predictions of who will enroll, participate, and complete programs. Rational-actor models operate on the assumption that individuals respond to their environment in an optimal way.⁶² In rational-actor models, people are assumed to affirmatively choose what they want and actively reject what they do not want. Further, individuals are believed to be able to objectively evaluate their options, largely independent from the context of that evaluation. Revealed preference theory further suggests that intentions can be inferred—nearly perfectly—by observing behavior. It is thought that if someone does not sign up for a program it is because he or she is not interested (or is not aware of it). To increase take-up, therefore, a policy maker might look to make the program more attractive or expand outreach and increase knowledge. In fact, according to the predominant traditional economic theories, such behavior is predicted to contribute to efficiency in delivering program services: the screening and sorting under existing hurdles will allow those who can perform these cost-benefit analyses to be served.

In contrast to standard economics, behavioral economics operates on the principle that individuals are *boundedly* rational and do not perfectly respond to their environment. This view emerged out of a recognition that the human mind does not have limitless processing power and thus softens the assumptions underlying pure rationality.⁶³ The “behavioral” in “behavioral economics” also has a different meaning than the “behavioral” in “behavioral psychology.” A behavioral psychologist (in contrast to a cognitive psychologist) primarily studies behavior, with limited consideration of mental processes. In this respect, a behavioral psychologist is most similar to a traditional (or neoclassical) economist, while a behavioral economist is most similar to a cognitive scientist. Several behavioral economists have reflected that the field was misnamed.⁶⁴ Much of behavioral economics has been about applying insights from psychology in the context of economic decision making.⁶⁵ It may appear that this knowledge transfer is one way and that psychologists have little to learn from behavioral economists. However, adding psychological insights to the economic framework can yield insights that are new to both fields.

By not addressing *how* and *why* people make decisions, economics has been able to specialize in describing the ways in which institutions (considered broadly to also encompass families or households) can affect the behavior of simple agents or individuals. For example, one branch of economics—game theory—describes how optimizing agents would make strategic decisions. Small changes in the structure of the game (such as which player moves first) can have large effects on the game outcomes.⁶⁶ Similarly, how businesses decide to set prices depends on the institutional structure of the market—a monopolist will set higher prices than a business in a perfectly competitive environment.⁶⁷ In these scenarios, the decisions people make are altered by the context in which they are made. Historically, economists typically have made little attempt to represent internal states or to deal with variation in individuals. Psychology, on the other hand, has generated a rich set of findings about what motivates individual behavior but has spent relatively less effort systematically examining the institutional contexts in which decisions are made. Several complementary social sciences present a spectrum of blended and related lenses for analysis (e.g., sociology particularly focuses on social norms and behaviors that are embedded in a social context whereas anthropology focuses on the diversity, internal logic, and variance of cultures).

Behavioral economics integrates the economic and psychological frameworks, incorporating concepts about individual decision making behavior from psychology, while maintaining a focus on context and institutions. It presents an effective approach to thinking about how

institutions and small institutional changes can affect the behavior of psychologically complex agents.⁶⁸

Consequently, in our view, behavioral economics offers a new framework for approaching program design, the space in which actors or individuals and agents interact with institutions. Small, contextual changes in the design of a program—often termed “nudges”⁶⁹—can facilitate or frustrate aspirational behaviors. By examining with a new lens the broader contexts and specific situations that parents face when making choices—choices as seemingly minor as reading to their child every day—behavioral economists can generate new ideas about how to redesign programs such that parents will be more likely to make a desired choice or action, without constraining their ability to choose.⁶⁹⁻⁷¹ This framework implies that constraints on our attention, self-control, how we see ourselves in certain situations, and elements of our social environment (what our peers do) interfere with reasonable evaluation of cost-benefit trade-offs even in the presence of full information and that these constraints sway many individuals from participating when they might in fact benefit the most.

From existing research and our broad-based knowledge of parents’ typical behaviors in the context of early childhood interventions, we can make educated guesses about the important concepts from psychology and cognitive decision making likely to be relevant in this context. Two concepts, limited attention and limited self-control, have been broadly applied across many fields and are likely to apply to early childhood intervention. A third concept, the context of scarcity, shows how these limitations can be exacerbated in the presence of resource scarcity faced by low-income families, who are often the target of early childhood interventions.

Limited Attention

Like money and time, humans only have a limited amount of attention.⁷² The limits of our capacity to attend manifest themselves when our minds have too much to do. To stay on track, we need to impose attentional control, both to disengage our attention from current distractions and to redirect our attention to what matters most.⁷³ But paradoxically, that gets increasingly more difficult to do as our mind finds itself processing additional information, when it experiences what psychologists call cognitive load. Cognitive load refers to short-term stresses on executive control and working memory.⁷⁴ It is difficult to focus attention, particularly under high cognitive load. Cognitive load is distinct from cognitive demand, the latter of which has been long incorporated into program development. Cognitive demand generally refers to the interaction between task difficulty relative to one’s cognitive ability and the ensuing difficulty associated with

understanding or digesting information. Cognitive load refers to one's current capacity to focus on and digest information. An important resulting distinguishing feature of cognitive load is that it is a short-term phenomenon that presents itself irrespective of overall cognitive capacities. Aspects of our environment can easily distract us. As one relevant example, children in New York City classrooms that were located near subway tracks were found to perform substantially less well on an achievement test as compared with children located in classrooms away from the tracks, a situation that appeared to resolve itself with the installation of noise-proof insulation.⁷⁵ Other times, distractions have been found to happen without individuals realizing it as the human mind naturally wanders. Students' minds were shown to veer from the task of reading a difficult book over 30% of the time.⁷⁶ The wandering and distracted mind can exact greater costs than missing a passage in a book. Highly skilled pilots have been found to focus so much of their mental resources on one problem that they sometimes fail to consider other seemingly obvious factors, such as switching on a light. Over 30% of military crashes appear to be due to failure to notice an "obvious" fact.⁷⁷ Similarly, most people are familiar with the phenomenon of focusing our attention on urgent tasks, while neglecting tasks that are important but not time-sensitive.

This limited attention can have far-reaching implications. Because we can only attend to certain phenomena at any given point in time, interventions that temporarily manipulate the salience of different cues can have large effects on decision making. For example, there is a large literature on how identity affects decision.⁷⁸ But individuals often hold multiple, sometimes conflicting, identities. Drawing attention to cues that increase the salience of a given identity can change how individuals evaluate options.⁷⁹ This can affect not only decisions but also performance. When the race of Asian women is made salient (invoking stereotypes of strong math skills), they perform better on a tough mathematics exam than when their gender is made apparent (invoking stereotypes of weak math skills).⁸⁰ Similarly, we often make our decisions with reference to our beliefs about the prevalent social norms.⁸¹ Feedback and information about social norms can change the saliency of the norm at the point of decision making and consequently alter choices.²⁹

Limited Self Control

Second, self-control often impedes our ability to translate intentions into actions. Self-control is entailed in managing the tension between long-term goals and short-term visceral impulses. Decisions that require self-control are influenced by two competing forces: present-focused drives that

push people in the direction of succumbing to temptation, counteracted by long-term goals that require more resource-intensive cognitions that help resist that temptation.⁸²⁻⁸⁴ Self-control problems pervade most social programs, including early childhood programs. We often want to change our behavior but are frustrated in our attempts: as one of many striking examples in the health domain, only 3% to 5% of smokers are actually able to quit smoking unaided.⁸⁵ A variety of physiological and biological factors of course may confound any well-intended attempt to quit smoking, but a variety of simpler temptations also point to our limits of self-control. Perhaps the most well-known psychological test of self-control is one conducted by Walter Mischel showing the time-limited nature of children's (and adults') ability to resist eating marshmallows.⁷³

Behavioral economists typically model limited self-control using a model of “quasi-hyperbolic” discounting in discrete time. Individuals are seen as being extremely impatient in the short term while being patient over long time periods. Returning to the Mischel marshmallow experiments, the economic concept of “hyperbolic discounting” can explain the inconsistency in decision making.⁸⁶ An individual given the choice between one marshmallow now or two marshmallows tomorrow will be tempted to eat the currently available marshmallow. However, the same individual would be less likely to prefer a marshmallow in 365 days to 2 marshmallows in 366—patience is easy in the long run.

The Context of Poverty

In addition to providing a new framework for considering parental decision-making behavior, behavioral economics—and the concepts of limited attention and self-control—also presents an alternative framework for understanding the context of poverty. It suggests that poverty is not simply a matter of scarce financial resources but that the context of poverty can drain and strain cognitive resources.⁸⁷⁻⁸⁹ Adhering to a budget is one example. Difficult choices must be made when financial resources are tight. The process of decision making, i.e., making choices, can increase cognitive load and exhaust self-control, and this has potential spiraling implications for budgeting with the future in mind. Slack in one's budget is less taxing both on cognitive load and self-control, making the evaluation and follow-through of choices less difficult.⁹⁰

While previous studies have shown a correlation between behavioral biases and resource scarcity,⁹¹ recent studies have been able to induce conditions of scarcity in laboratory conditions. For example, while playing a simple guessing game (similar to the TV show *Family Feud*), some subjects were given a large time-budget in order to make decisions, while others had

a shorter time-budget and had to make guesses quickly. In the time-scarce condition, participants were more willing to borrow time (at a high between-round interest rate). Similar to payday loans, the ability to borrow time actually led to poorer performance across all rounds in condition of time scarcity, while those who had a larger time budget were able to use this ability in a more strategic and productive manner.⁸⁹

These artefactual lab findings have been extended to the field. A study in New Jersey malls found that financial “primes” (defined as presenting illustrations of financial scenarios related to repairs needed to fix a car of varying monetary values) reduced accuracy on Raven’s matrices and other cognitive control tasks in the poor but not the rich.⁹² More directly, a natural experiment with sugar cane farmers found that variations in resource scarcity affect cognitive capacities. Farmers experience resource scarcity before the harvest, but after the harvest they are in a condition of plenty. Sugar cane, which is not seasonal and can be harvested at any point during the year, presents an opportunity for a natural experiment. Measuring farmers’ cognitive resources before and after the harvest period shows a dramatic increase in scores on a variety of cognitive tests.⁹² These effects can be generalized across a variety of contexts.^{92,93}

Bridging Behavioral Economic Insights and Developmental Theory

When applying behavioral economic principles and insights to the challenges of understanding and improving early childhood interventions, it is valuable to first build a theoretical bridge between the two perspectives. From the point of view of developmental theory, Bronfenbrenner’s concept of “proximal processes” is one such bridge. Bronfenbrenner conceptualized proximal processes as the driving force, the primary mechanism, for child development. In his bioecological theory of human development, Bronfenbrenner formulated two central propositions regarding the role of proximal processes in development. The first proposition is as follows:

Proposition 1: [H]uman development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate external environment. To be effective, the interaction must occur on a fairly regular basis over extended periods of time. Such enduring forms of interaction in the immediate environment are referred to as proximal processes.⁹⁴

Thus, proximal processes are the unfolding of interactions over time between developing persons (in our case, the young child) and features of their environments (in our case, parents and non-parental caregivers). Bronfenbrenner identifies such activities as playing with others or reading as paradigmatic examples of such processes. The exact nature of how such processes function depends on the characteristics of the person (e.g., their cognitive abilities or their genetically based dispositions) and the context (e.g., the nature and quality of parenting). Hence, Bronfenbrenner's second key proposition:

Proposition 2: The form, power, content, and direction of the proximal processes affecting development vary systematically as a joint function of the characteristics of the developing person; of the environment—both immediate and more remote—in which the processes are taking place; the nature of the developmental outcomes under consideration; and the social continuities and changes occurring over time through the life course and the historical period during which the person has lived.⁹⁴

Over the last several decades, developmental scientists have identified and closely examined a number of features of parent/child relationships over the first 3 years of life (infancy and toddlerhood) that meet Bronfenbrenner's criteria for proximal processes. Two such features—joint parent/child attention and parent contingent responsiveness to child cues—help us link central insights from behavioral economics to the emerging science of early childhood development.

Joint Parent/Child Attention

For nearly 40 years, developmental scientists have been investigating the important role of joint (parent/child) attention in early language development.⁹⁵⁻¹⁰⁰ In this line of work, joint attention is conceptualized as the ability of an infant or toddler to coordinate his or her attention with a parent or caregiver in focusing upon an event or object. Joint attention is hypothesized to promote early language development because these types of “proximal processes” help infants and toddlers understand “the intended referent of parents’ language” and thus facilitate word-object mappings and early vocabulary development.^{97,101,102} Empirical research testing the hypothesis that individual differences in the capacity to engage in joint attention are associated with early language development has largely supported this hypothesis.^{103,104}

Finally, it is thought that individual differences in the capacity for joint attention are affected by environmental and other interactional processes.¹⁰⁵ As described above, poverty can create short-term stressors on parents' attentional control and working memory (referred to as "high cognitive load"). The resulting difficulty in paying attention is a major challenge to achieving the joint parent/child attention that has been found to promote early language development. As depicted in Figure 1, then, behavioral economic interventions can directly improve parent attentional capacity and indirectly improve joint attention and language development. It may also be possible to develop behavioral economic interventions to directly impact joint attention.

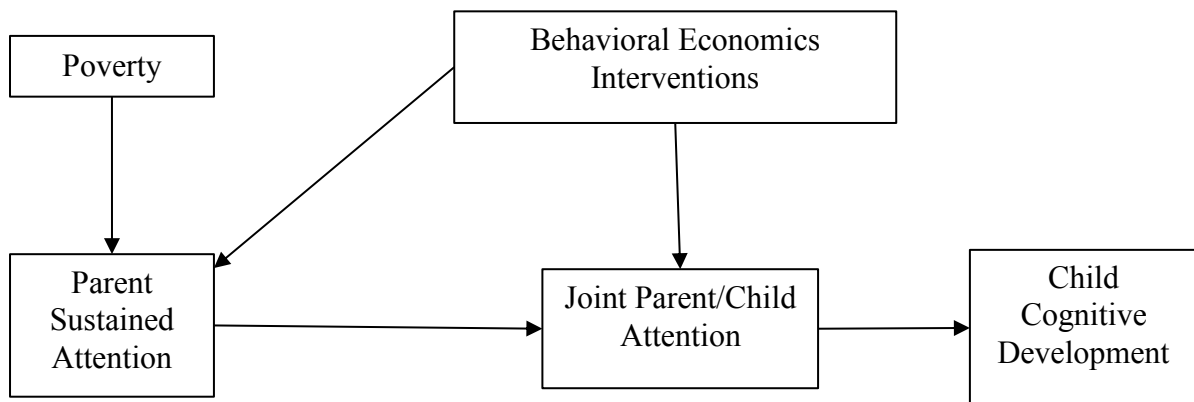


Figure 1. Behavioral Economic Interventions, Parental Attentional Capacity, and Child Cognitive Development.

This figure depicts the relation between behavioral economic interventions and poverty with parental attentional capacity, joint parent/child attention, and child cognitive development.

Parental Sensitivity to Child Cues

Another proximal process thought to drive child development in the early years is parent sensitivity to child cues. This concept overlaps conceptually and operationally with related concepts such as "responsive parenting" and "parent contingent responsiveness" and has roots in attachment theory,¹⁰⁶ socialization theories,¹⁰⁷ and transactional theories¹⁰⁸ of early childhood development. Parent/caregiver behaviors are considered to be sensitive or responsive to child cues if they are prompt (within a few seconds of child cue), emotionally supportive (meet child's emotional needs), contingent (dependent on the child's signal), and developmentally

appropriate (not intrusive/controlling or unresponsive/disengaged).^{109,110} The process has been described as a “three-term chain of events”: the child performs an action/sends a cue; the parent responds to that action/cue promptly, contingently, and appropriately; and the child experiences the consequences positively.¹¹¹

Parent sensitivity/responsiveness is limited by ecological factors like the stress associated with poverty and by parent characteristics like depression.¹¹² In turn, parental sensitivity/responsiveness to infant/toddler cues has been shown to predict young children’s language and play,^{113,114} children’s security of attachment,^{50,115} and their acquisition of social skills and competence.¹¹⁶

Just as parents’ sustained attention is necessary to attain joint parent/child attention, parental self-control is necessary to attain parent sensitivity/responsiveness to child cues. Thus, we conceive the proximal process of parent sensitivity/responsiveness as a bridge between the behavioral economic research on how poverty affects parental self-control and how parental self-control influences early childhood language and social-emotional development. And as depicted in Figure 2, behavioral economic interventions that are designed to enhance parent self-control can directly and indirectly promote parent sensitivity/responsiveness and in turn early childhood development.

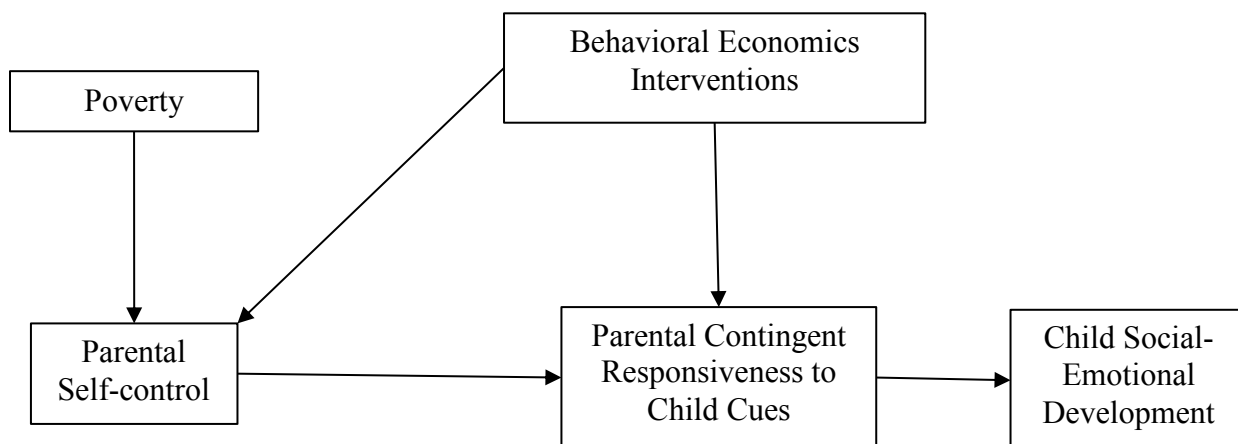


Figure 2. Behavioral Economic Interventions, Parental Self-control, and Child Socio-emotional Development

This figure depicts the relation between behavioral economic interventions and poverty with parental self-control, parent responsiveness to child cues, and children’s socio-emotional development.

The Role of Surrounding Circumstances

The bridging of the developmental and behavioral economic theories also jointly points to the influence of surrounding circumstances (whether in the home or micro-, meso-, macro-, or exosystem in the language of Bronfenbrenner's theory) on parent decision-making behaviors. The consequences for the poor can be particularly high—not only in potentially making unstable situations worse but in missing opportunities to make things better. Consequences are even higher for very young children in poverty, as developmental milestones and behaviors that signal need may be missed in the context of juggling day-to-day responsibilities that strain cognitive capacity.⁸⁷ The behavioral framework suggests that the context of poverty can deplete cognitive resources, and thus lack of subsequent parent engagement may not be a result of clear cost-benefit trade-off thinking. By this reasoning, the discrepancies between what is expected by way of parent engagement and what is actualized also cannot be fully explained by strategic rationing (as predicted by the traditional economic model) or necessarily by streamlining flow of services (as would be designed by implementation science).^a A behavioral economics lens not only questions assumptions of well-calibrated planning but also does not assume context-free decision making.

That surrounding circumstances have influence on parents' decisions (and on parenting) implies that certain features of programs can be designed or redesigned to foster certain behaviors. Often described as "choice architecture," such conditions surrounding a decision can change the processes used to evaluate outcomes and take actions.¹¹⁷ Thus, a developmentally infused behavioral economics framework also provides a theoretical foundation that can directly inform certain types of small-cost design changes, or augmentations, to existing programs that are hypothesized to facilitate and maximize the types of behaviors and outcomes that programs were originally designed to improve. Framing messages can facilitate the likelihood of observing certain types of parenting behaviors and outcomes. Changes in environment can affect how

^a Conventional economic theory also differs from what might be implied by implementation science because, under assumptions of full information, lower than maximum enrollment and participation is seen as an efficient outcome that sorts between those who really need the program from those who need it less. Under this scenario, hurdles (e.g., required documentation, long waits, or complicated eligibility rules) act as a selection mechanism for those whose cost-benefit analyses dictate the greatest need to be served. Drawing out these examples, an economist might ask "what are individuals optimizing, and how can cost, prices, or information induce that behavior?" An implementation scientist might instead ask "how can the intended flow of services be designed with minimal obstruction?" This leads to an alternative direction of design solutions.

parents see themselves and might influence their subsequent interactions with their children. Examples of the types of low-cost design features that emerge out of this framework are provided in an appendix along with evidence garnered about their effectiveness in contexts other than early childhood interventions.

Applying Behavioral Economic Insights in Practice

How does one apply insights from behavioral economics to uncover amenable solutions to challenges that early childhood interventions face? The exercise begins by identifying key points of behavior, and contingent behavior, that underlie an intervention's broader logic model. This includes, for example, attendance (on time, prepared), application of recommendations during visits, and application of program recommendations in the home. Figure 3 presents an illustrative series of generic parent-driven steps that are presumed to occur for nearly any early intervention programs to prove effective. Figure 3 also offers a rough prototype of the ways in which micro-intermediary processes—that affect show-up and dose of interventions—are identified. For example, the first listed cognitive process is that parents may miscalculate the expected future benefits of participation in an early childhood intervention program. This parallels an observation that has been made in developing countries: parents often underestimate the returns to education¹¹⁸ and allow (or encourage) their children to drop out to work or contribute to household labor that is necessary for their current needs. A potential intervention to navigate around this process would be to incorporate small financial incentives that tie a concrete financial reward in the present (via participation in the program) to the more abstract rewards of the future. Such small, salient incentives have been shown to triple immunization rates in the developing world from 6% to 18%.¹¹⁹ We believe that such small incentives could, if designed properly, have big effects in the US as well.

The second column of Figure 3 lists mismatched identity as a potential barrier to a parent's receptiveness to listening and digesting the recommendations of the intervention as they occur in real time during an office or home visit. A sense of learned helplessness^{120,121} can easily filter into a parent's identity when meeting with a caseworker or interventionist. Certain contexts that low-income parents face (such as violence or extreme stress) prime identities (e.g., "I'm tough and impervious to harm") that are inconsistent with the identities needed to be responsive both to program influences and infant/toddler needs (e.g., "I'm sensitive and responsive to the needs of others"). Maximizing potential receptiveness through some type of positive affirmation for the parent, perhaps priming parents to identify

as empowered nurturing mothers,^b might be particularly helpful in the context of anxiety or concerns that might be raised over the course of a visit.

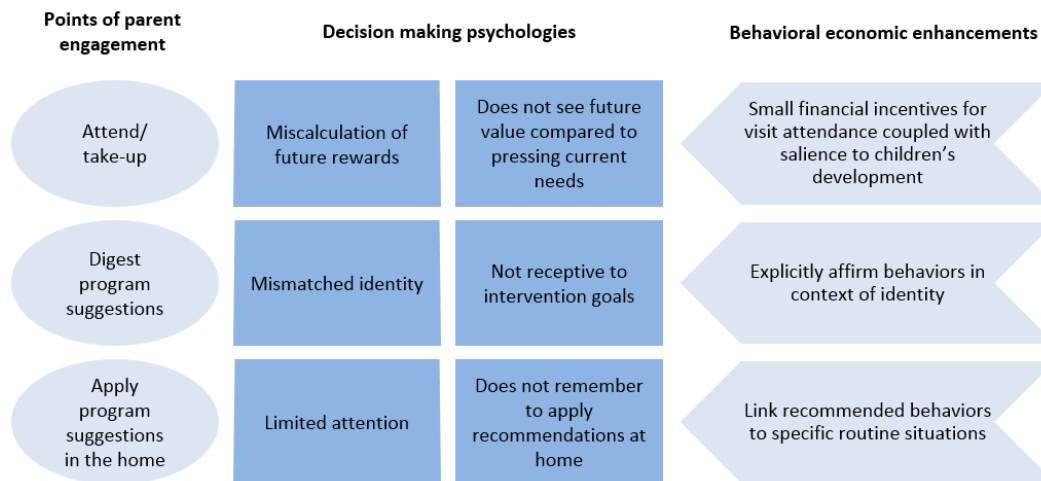


Figure 3. Hypothetical Processes Informing Behavioral Economic Interventions

This figure provides examples of the types of behavioral economic enhancements that might be implemented and tested in early childhood programs addressing what might be considered typical psychologies that could interfere with parent engagement.

The last column provides yet another example of what might occur at home or outside of the immediate context of the program's delivery of services that could interfere with applying and practicing recommendations on a frequent or daily basis. Attention could easily be distracted or recommendations easily forgotten in the context of juggling a busy home life, especially in the context of poverty and economic instability as

^b A poignant, and somewhat costly, example of the power of such positive affirmation has been incorporated into the Vroom initiative, funded by The Bezos Foundation. In the initiative's efforts to encourage early literacy and self-regulation and to empower parents, parents receive a small box mailed to their home. The opened box has nothing inside except for a mirror lying flat on the bottom (thus, one sees an immediate reflection of oneself) and a message on top "You already have what it takes." http://www.joinvroom.org/sites/default/files/VroomBox-LongForm-English_960x540_768_96.mp4

previously described. Linking the desired behaviors recommended by the intervention to daily routines at home could increase the likelihood that those behaviors are practiced and indeed become incorporated into routines (whether it is listening to a book recording during bath time or reading ingredients [or menu items] out loud while preparing [or ordering] dinner, thus reinforcing some of the literacy feedback skills). Simple regular text messages have been shown to increase savings rates by 6%²⁵; the probability of loan repayments by 7% to 9%²⁴; exercise levels by 8%,²⁶ and smoking cessation rates by 15%.²⁷ Plan-making activities have been able to increase vaccination rates from 33% to 37%.¹²²

Studies emerging from the beELL initiative at New York University (directed by Lisa A. Gennetian) provide additional concrete examples about the ways in which the theoretical insights from behavioral economics are applied and tested among existing early childhood interventions and programs. The first example is a study that integrates a city-wide early language media and text-based program campaign with home visiting services to minimize the demands on parents' limited attention and also to provide positive affirmations of motherhood. Although the early language texting program—Talk to Your Baby (TTYB)¹²³—launched in 2015, it had few users. There was interest in increasing uptake among new mothers and seeking ways to do this, as seamlessly as possible, among new mothers served by New York City's Newborn Home Visiting Program (NHVP).¹²⁴ The study developed various behavioral economic strategies to be experimentally tested. Mothers in the experimental group are automatically enrolled in Talk to Your Baby (opting out shifts the burden of making a decision); receive text reminders that reinforce early language habits and provide positive affirmation of maternal identity (to redirect attention to reinforce parents' daily habits); are shown a video with positive parent-infant language interaction; receive a positive affirmation during the second home visit (a teachable moment from a trusted NHVP caseworker cements new ideas); and are sent a gift packet at the 4- to 6-month infant birthday with tailored geographic information about New York City literacy resources, an activated library card, and links to the public library system (small rewards and opening channels at a sensitive child development period). Parental engagement in existing early learning and language resources is hypothesized to favorably support positive parenting behaviors, including singing, talking, reading, and contingent responsive parenting. The above described behavioral economic enhancements are proposed to facilitate engagement. Engagement and subsequent positive parenting in turn translate to eye contact and reciprocity during infancy, both of which support children's later print awareness, word recognition, vocabulary, and verbal

fluency. Data collection is under way to measure some of these aspects of engagement and assess whether the behavioral economic strategies have any effect.

The second example from the beELL initiative integrates behavioral economic approaches into the Getting Ready for School (GRS) program, a supplementary play-based preschool program targeting the development of language, literacy, mathematics, and social emotional skills.^{125,126} GRS has evolved into an innovative curriculum with parallel implementation across the home and school contexts. With the assistance of a GRS coach, teachers choose weekly activities to play in the classroom and then assign similar activities for parents to do at home, via a weekly letter. During the 2015-2016 school year, GRS was implemented in 8 classrooms in 4 Head Start centers across New York City, with 6 classrooms serving as controls. During its first years, parent enrollment and participation in GRS was low and inconsistent. Parents reported that they were aware of GRS and were eager to improve their children's learning and that they trusted and respected their children's teachers; however, they remained confused about GRS materials and goals and were distracted at home.¹²⁷ During the 2015-2016 school year, several behavioral economic strategies aimed to favorably increase parent participation and subsequent time spent with their children on GRS activities. These strategies included: 1) personalized invitations and text reminders to increase attendance at the GRS kick-off orientation and 2) weekly activity charts and text reminders to increase time spent engaging in GRS activities. Preliminary analyses suggest that the behavioral economic interventions substantially increased attendance at the GRS kickoff orientation and increased the time parents spent on GRS activities with their children. GRS parents in the experimental group were also more likely to return weekly activity charts. Scale-up and further piloting of these and additional behavioral economic strategies is continuing through 2016-2017.

As suggested by these examples, the behavioral economics lens offers potentially promising innovative, low-cost solutions to a variety of early childhood interventions programs—during those critical years of brain growth—that broadly aim to reduce observed socioeconomic differences in children's developmental outcomes and aim to do so through strengthening parenting, or parent-child interaction, and supporting positive parenting habits.

Discussion

Engaging parents as active agents is a vital ingredient to the success of parent-focused early childhood interventions with the objective of addressing income-related disparities in outcomes. Striking income gradients have been documented across a range of educational and behavioral outcomes that predict high school completion and a range of risky behaviors that interfere with future earnings. Innovators (from High Scope to federally funded initiatives like Early Head Start and Head Start) have spent a great deal of time and resources focused on developing interventions to level the playing field, appropriately target and identify children's needs, and simultaneously address a range of structural and psychosocial caregiver barriers to participation.

Less is understood about promising and low-cost design strategies to improve the participation and engagement of otherwise able and capable parents. Even those parents who have good intentions and who have easy and free interventions available to them may not be utilizing available resources. Children cannot benefit from programs if parents do not enroll them or if parents are not receptive to new skills. Parents cannot be expected to practice new skills without some tools or circumstances to help remind and support them to do so. The circumstances of poverty, and the financial juggling that results, are draining on parents' attention and self-control, and this can impact responsive parenting and sensitivity to children's cues even among parents with good intentions. The interdisciplinary framework emerging from behavioral economics broadens our understanding of parent behaviors that can subsequently inform design strategies to facilitate parent engagement.

These behavioral insights can also be used in several other complementary ways. First, the insights have supported creation of new lighter-touch parent-focused early childhood interventions, such as PACT,¹²⁸ a tablet-based reading intervention that incorporates goal-setting and feedback made available to children in Head Start centers with promising favorable impacts on parent reading time with their children. Second, behavioral economic strategies can enhance the impact of existing curricula or large-scale system-wide interventions (e.g., through pediatric care platforms, home visiting or larger scale public health or early childhood development campaigns). The effect of behavioral economic enhancements can be tested through a set of embedded mini-experiments randomly assigning cohorts, potentially at one or more of the identified critical decision making points to enroll, participate, and follow through. Experimentation can also test whether a particular sequence of behavioral economic interventions is more effective (e.g., affirming particular identities

may be more influential during early interactions with a program whereas small financial incentives may be more influential for ongoing participation in a program). The results of mini-experiments would be immediately apparent in part because the outcomes are tangible steps expected to be observed and easily measured through parent's actions: Does a small financial incentive tied to attendance actually increase attendance to the next visit? Does it change the incidence of rescheduling a visit? Does it increase attendance to the overall number of visits over the first 3 months of a child's life? Over the first 9 months?

As the interdisciplinary field of behavioral economics continues to develop and applications to real-world programs become more refined, we believe that there are beneficial synergies to parallel conceptual and on-the-ground activities and collaborations in the domain of early childhood intervention. Furthermore, the behavioral economic perspective can bring a framework to insights and emerging anecdotal and descriptive evidence on the linkages between parent and family take-up, engagement, and follow-through with subsequent outcomes.⁴⁶ As children grow older, the actors in their lives expand and change, as do the systems and environments with which they interact. The behavioral economics perspective can be applied to each of these contexts in light of the actors and environments in which they operate. Early education and elementary school teachers and administrators have to similarly show up at school to be able to deliver curricula, be focused and receptive when trained, and be attentive to practicing new skills in the classroom. Applications from behavioral economics could expand the available tool set to augment the range of existing and promising interventions from early childhood through elementary school.

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Appendix

Examples of behaviorally informed design features and their applications to programs, policies, or services in other domains are described below. This is not a comprehensive list. There may be a variety of other cognitive processes and behavioral mechanisms in addition to those described below that prove valuable for analysis and application in the early childhood domain, including the use of framing¹²⁹ or commitment devices.¹³⁰

Defaults

Defaults are the selections that are made in the absence of a choice and can counteract the influence of procrastination or choice complexity. One example of its recent effective use is in the context of 401(k) contributions that policy makers have struggled to increase. Subsidies and financial education only showed limited success. Behavioral economists had a simple insight. Most employees are given a choice to either turn in a form to enroll or to not turn in the form and not enroll, but many employees do not make an active choice not to enroll. They simply fail to turn in the form. Simply changing the default such that employees needed to turn in a form declaring their intention to not enroll increased enrollment rates by 40 percentage points.³⁰ Even a slightly different version of this intervention, where not turning in a form was simply not an option (a forced choice intervention), had similarly large effects on enrollment.¹³¹

Implementation intentions

Implementation intentions are prompts to develop a specific “if-then” plan. Rather than holding to unstructured intentions (“I should exercise more”), implementation intentions prompt an individual to link situational cues with a response (“I will run 3 miles every Tuesday after work”).¹³² An implementation intention intervention in the voting domain had a caller ask potential voters when and where they were intending to vote. Simply asking this question increased the probability they would vote by 9.1 percentage points over voters who got the standard call.¹³³ A prompt like this could be incorporated in multiple ways in pamphlets for parents to encourage show-up rates to learn or enroll in new programs, prompt them to set aside a specific time to read or play with their child, or set aside a time to meet with an interventionist at home.

Reminders

Simple regular text messages have been shown to increase savings rates by 6%,²⁵ increase the probability of loan repayments by 7% to 9%,²⁴ exercise levels by 8%,²⁶ and smoking cessation rates by 15%.²⁷ Reminders

are most effective when they occur in the context in which one makes decisions. A reminder to pick up the milk before coming home will not prompt action if delivered before lunch but may prompt if it is delivered at the end of the workday. Varying the medium (text messages, phone calls, individualized refrigerator magnets), frequency (daily, every other day, weekly), timing (morning, evening, every other day), and message (“When will you play with your child today?”) of the reminder can have differing magnitudes of effects.

Positive Affirmations

Because people derive their identity from the social groups to which they belong,¹³⁴ shifting the salience of these identities can affect choices.⁷⁹ When certain groups (e.g., race or gender groups) face a negative stereotype, making that identity salient, the action raises worries, and this depletes working memory.¹³⁵⁻¹³⁸ Simple positive affirmations can be effective at reducing identity barriers linked with socioeconomic status. A very simple self-affirmation task performed at a soup kitchen—recalling a proud moment while exiting a soup kitchen and otherwise feeling poor—increased receipt of literature about the Earned Income Tax Credit (a refundable credit available to workers below some earnings threshold) literature from 36% to 79%.¹³⁹

Identity-based motivation (IBM) is a related though not entirely similar theory of human motivation and behavioral choice stemming from identity-congruence.^{140,141} Prior research has used the IBM model to demonstrate that small interventions can have large effects on school effort and attainment among low-income and minority school children. Field experiments and a randomized clinical trial utilizing IBM improved academic outcomes of low-income and minority children by making school-focused identities salient and connected to other important identities and by framing experienced difficulty as meaning that the goal was important but not impossible.^{140,141} IBM, like affirmation approaches, may be an active ingredient to incentivize parents, for example, by linking talking to their child or having a bedtime routine to their identity as potentially good parents.

Social Norms

Other people’s choices can shape our own, sometimes unconsciously. One study found that hotel guests were much more likely to reuse their towels when told that “the majority of guests reuse their towels” than when asked to reuse towels to “help protect the environment.”¹⁴² Researchers collaborated with a utility company to send a simple letter to households. The newly designed energy statement that showed each

household's monthly utilization compared to their neighbors and separately to their most efficient neighbors. This small design change reduced overall energy usage by 2%,²⁸ translating to an annual savings of \$300 million, along with secondary environmental benefits.

Microincentives

Being busy and poor can also reduce future-minded behaviors or lead to miscalculation of future rewards. Small incentives can bring rewards from the future to the present and may be especially useful for early childhood education, where the benefits of intervention are not realized for years or even decades. Financial rewards can also signal that the provider is confident in the positive effects of the rewarded action, especially powerful when coming from a trusted entity, such as a pediatrician.¹⁴³ Conditional cash transfers, in which recipients can receive money for meeting certain conditions, are nearly as effective when the monetary reward is small as when it is large.¹⁴⁴ Carefully structured, even small financial incentives have been effectively used to increase vaccination rates, school attendance, and take up of clean water technology.^{145,146}