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Introduction

Study Background and Purpose

The Kenneth Rainin Foundation tasked NORC at the University of Chicago with a review of the research base documenting effective curricula, programs, interventions, and best practices in the domains of Oral Language and Literacy, Math, and Social & Emotional Development for children aged 0-5. The information will be used to inform the Foundation’s programming efforts and funding decisions in Oakland, CA. Additionally, findings from these reviews of the literature will provide the Foundation’s Oakland-based elementary school partners and community members with objective information to aid their decision-making processes.

NORC conducted three separate reviews of the scientific evidence base, one for each domain. The reviews were intentionally focused on only those curricula, interventions, and programs that were evaluated with sufficient rigor. We defined rigorous evaluations as those which used either a randomized controlled design or were quasi-experimental with established baseline equivalence between the experimental and control group. We further focused the reviews on studies that 1) were published after 2000, 2) were conducted on English-speaking populations, and 3) were focused on children 0 – 5 years of age. This report is comprised of one chapter per review, each including: 1) a definition of the domain, 2) a description of the review methodology (e.g., search terms, inclusion and exclusion criteria), 3) a presentation of the review findings (i.e., results), and 4) a discussion of our conclusions. This report contains a detailed bibliography including all literature that was reviewed. Excel files containing detailed information about each domain’s curricula, programs, interventions, and best practices are available via the Rainin Foundation website.

The review on Oral Language and Literacy was conducted by Dr. Özlem Ece Demir-Lira (University of Chicago). Dr. Matthew Rohn (Minnesota State University Moorhead) carried out the review of Math. Karen Smith (University of Chicago) led the review on Social-Emotional Development with support from Dr. Eileen Graf (NORC at the University of Chicago).

The reviews were commissioned by Susan True, Director, Education Strategy & Ventures at the Kenneth Rainin Foundation, and were directed by Dr. Marc Hernandez, Director, Early Childhood Research & Practice Collaborative at NORC at the University of Chicago.
Oral Language & Literacy by Özlem Ece Demir

Definition

The domain describes the ability to listen, speak, read and write. It includes the development of oral language comprehension (listen) and production (speak) as well as the development of literacy, i.e. decoding (reading) and encoding (writing). Specific oral language skills include conversation (questions), sentence complexity (syntax), narrative/exposition (fiction/fact), and phonological awareness (rhyming, alliteration, blending, segmenting). Specific literacy skills include letter name identification, letter sound correspondence, concepts about print, and manual writing.

Methods

We identified the following keywords for the literature review focusing on oral language and emergent literacy interventions: “oral language”, “literacy” and “emergent literacy”. We then conducted a literature search with the databases Google Scholar, EBSCOhost and What Works Clearinghouse (WWC). We used these terms in combination with “intervention,” “randomized control trial OR quasi-experimental” to identify evidence-based interventions targeting oral language and literacy outcomes. Studies assessing each outcome were searched for separately, and results from each search were narrowed to include only interventions directly assessing the identified outcomes. Studies that did not include a comparison group or did not report any information for the impact evaluation were excluded. Similarly, only studies published after 2000 and studies focusing on children younger than 5 years of age were included in the literature review. Over the course of the search, it was found that many of the studies assessing interventions targeting the relevant outcomes, also assessed changes in teachers, practitioners and parents regarding their behavior about oral language and literacy interactions. These studies are also included in the report.

Results

A total of 63 studies were identified. Only 12 of the studies focused on children younger than 3. The studies assessed the efficacy of programs, curricula and also individual interventions. The activities across the studies targeting oral language and emergent literacy we identified fell into one of the following categories: oral language and gesture, book reading, phonological awareness, alphabet knowledge, book and print rules, emergent reading and emergent writing (Figure 1). Most common activities included book reading and oral language and gesture interventions, whereas emergent reading and writing interventions were less
common. For a majority of the intervention studies, these activities were aimed at improving oral language and emergent literacy outcomes through teachers (33 studies) or parents (24 studies), whereas only 12 of the studies focused uniquely on children. These techniques demonstrated varying degrees of efficacy; 12 studies had high efficacy with large effect sizes, 33 had medium effect sizes, 6 had small effect sizes and 9 did not demonstrate significance.

**Figure 1.** Percent of Studies Involving a Given Activity

The interventions associated with large effect sizes were Hear and Say Reading with Toddlers, Dialogic Reading, Interactive Book Reading, Storybook Reading to Increase Print Awareness, Early Reading First, Literacy Environment Enrichment Program, Alphabet Letter Instruction, Exemplary Model of Early Reading Growth and Excellence, Words of Oral Reading and Language Development and Deictic Gesturing. Common across all these programs was a focus on book reading (9 out of 12) and oral language and gesture (8 out of 12). In addition, most of these studies focused on small group instruction (9 out of 12) (Figure 2). The studies with the largest effect size tended to include oral language and literacy more frequently than studies with small effect size or no significant effects. On the contrary, studies with small effect size or no significant effects were more likely to focus on phonological awareness, alphabet knowledge and book and print rules than studies with high effect sizes. However, it should be highlighted that each studies included multiple activities, making it difficult to determine the effect of a specific activity. More specifically, only 18 of the studies included a single activity. Furthermore, although oral language
and gesture was frequent in studies with medium and large effect sizes, it was also observed in 6 of the 9 studies with no significant effects.

**Figure 2.** Percent of Studies with Large, Medium, Small Effect Size and No Reported Significant Effect Involving a Given Activity

A few factors made it difficult to assess the efficacy of interventions and the activities associated with them. One is that as stated before many studies combined multiple activities and components and the interventions focused on multiple beneficiaries. In addition, many of the activities were somewhat poorly defined. This was especially the case for curricula. The activities also involved involve a great deal of self-tailoring by the teacher or practitioner on an individual basis, which made it hard to compare across as well as within studies. Another important issue is that the majority of the studies focused on children older than 3. It is unclear whether interventions would play a different role at earlier ages.

Another common theme among the studies was the involvement of families. 30 out of 63 studies included a family component. However only 25% of the programs with large effects reported family involvement. This could be due to the fact that most studies did not describe in detail how the families were involved. Most family interventions described the provision of information to the parents through a practitioner, but did not assess the fidelity of the interventions. 35 out of 63 studies included some teacher involvement and 50% of these studies had large effect sizes.
Overall, the identified studies found positive effects on various oral language and emergent literacy outcomes. There is a tendency for effective programs to include oral language and gesture and book reading activities as well as to be conducted in small groups. However, making definitive conclusions about different studies and program components is difficult given that each program consists of multiple activities and focuses on multiple beneficiaries. Overall, multiple factors make it difficult to determine whether differences in programs are due to the individual activities or components themselves or whether they are due to other differences in the ways a given program was administered.
Math

by Matthew Rohn

Definition

Math is a subdomain of the KR domain Cognition and General Knowledge. Math is comprised of number sense, spatial cognition (geometry), patterns (algebra), and measurement. Specific skills include cardinality, ordinality (counting, one-to-one correspondence, number ID), relative set size, operations, shapes (composition and decomposition), mental rotation, pattern recognition, and linear measurement.

Methods

We compiled a list of mathematics-related terms they thought most relevant. It consisted of “math,” “mathematics,” “number sense,” “cardinality,” “counting,” “geometry,” “base-10,” “magnitude,” and “one-to-one correspondence.” A literature search was then conducted with EBSCOhost using these terms in combination with the terms “intervention” and “randomized control trial OR quasi-experimental” to identify evidence based interventions targeting these and related mathematics skills. Search results were narrowed to include only interventions directly assessing outcomes that are relevant to mathematics, and that were completed with sufficient rigor to be considered. References made in studies that were found through this process were also used as resources to find additional studies.

Results

The most common activities across interventions targeting mathematics-related skills were: small group mathematics sessions at least once a week, activities split into separate units with specific mathematics-relevant themes, computer-based mathematics activities, parental involvement through letters containing information on mathematics activities, professional development for staff implementing interventions, time set aside for review of previously covered materials, and the availability of a mathematics center in the classroom. The most common outcomes that these activities and interventions aimed to increase were: general math knowledge and skills, number sense, and geometry knowledge. In addition to these outcomes, researchers often assessed the fidelity of intervention implementation and the quality of the mathematics environment. It should be noted that studies of only a small number of interventions were found, and as such, the commonality of these activities and desired outcomes is not necessarily indicative that they represent best practice.
The interventions assessed were shown to produce medium to large positive effects on geometry knowledge as well as general math knowledge and skills, and medium positive effects on number sense. Medium to large positive effects were also seen for a range of other outcomes that studies assessed less often. Due to the small number of studies found, and the lack of variation on activities employed by the different interventions researched, it is not possible to say if any specific activities were particularly effective.

The interventions associated with the largest effect sizes were Building Blocks and Pre-K Mathematics. Activities seen in both of these interventions were the use of small-group sessions at least once a week, computer-based math activities, parental involvement, and professional development. These were also the most commonly employed activities across the review, however, and it cannot be shown that these particular activities led to the efficacy of the interventions. In the case of small-group sessions, for example, 100 percent of reviewed interventions utilized this activity. In addition, operationalization of small-group sessions was inconsistent, so it cannot be said that this activity was implemented in similar fashion across different interventions. One difference that was defined across interventions concerning small-group sessions was the frequency with which the sessions were utilized. Building Blocks utilized small-group sessions once each week, and Pre-K Mathematics did so twice each week. Overall, Building Blocks was shown to have a greater effect than Pre-K Mathematics on General Math Knowledge and Skills. This may seem counter-intuitive, however, as this would seem to indicate that less small-group math instruction/practice leads to better outcomes. It should be noted that other variations exist between these two interventions, and not enough data exists to sufficiently support claims about this activity’s efficacy.

Professional development is another activity that was inconsistently defined across interventions. Most of the interventions reviewed included some form of professional development; however, this activity ranged in implementation from a few hours of training to multiple seminars and workshops in addition to weekly meetings and ongoing online support. The common components of professional development included in Building Blocks and Pre-K Mathematics are: one or more multi-day trainings with emphasis on math development, strategies and procedures used in the classroom, and formative assessment, and monthly on-site coaching or training. While it is likely that greater amounts of professional development are correlated with increased fidelity of implementation and potentially increased student outcomes, it is also likely that the amount of professional development alone is not a significant factor; the quality of professional development is likely a more powerful factor.

Overall, some evidence supports the efficacy of the two interventions mentioned above. Due to the small number of studies found, as well as inconsistency in the definition of different activities, it cannot be said whether particular activities within these interventions were what led to their efficacy. Mathematics
interventions, particularly for pre-kindergarten students, are currently not well researched, and so best practices are hard to define.
Social-Emotional Development

by Karen E. Smith & Eileen Graf

Definition

Social-Emotional Development is comprised of two subdomains, Emotional Development and Social Interaction. Emotional Development refers broadly to the development of motivational processes in children which influence how they respond to the world around them. These processes encompass attachment and perceptions of control and predictability of their home and school environment. Specific skills often associated with these motivational processes are emotion regulation, emotion knowledge, self-awareness, self-confidence, independence & self-direction, flexibility in changing environments, perspective taking and empathy.

Social Interaction refers to children’s development and maintenance of relationships with others. Specific skills that support positive social interactions include awareness and respect for others, cooperation or ability to work with others toward a common goal, following routines and rules, and a concept of fairness.

Methods

We compiled a list of emotional and affective outcomes we thought most relevant to this domain. It consisted of “perceived stress,” “perceived social support,” “perceived control,” “perceived social status,” “perceived loneliness,” “depression,” “anxiety,” “trauma OR abuse,” “stability of the home environment,” “social capital,” “coping styles,” “attachment,” and “motivation.” A literature search was then conducted with Google Scholar using these terms in combination with “intervention,” “randomized control trial OR quasi-experimental” to identify evidence based interventions targeting these emotional and affective outcomes. Studies assessing each outcome were searched for separately, and results from each search were narrowed to include only interventions directly assessing the identified outcomes. Over the course of the search, it was found that many of the studies assessing interventions targeting the relevant outcomes, also assessed changes in child behavior, parenting behavior, and inhibitory/regulatory processes, so these results are also reported for each intervention. Importantly, programs targeting changes in child behavior only were excluded from this search, since behavior is a symptom, but not a cause of adverse social-emotional development. However, NORC reviewed major behavioral programs separately in a section on programs, interventions and best practices targeting child behavior. This section can be found below the main review.
Results

The most common activities across interventions targeting the identified emotional and affective processes were parent education, parenting technique training, incorporation of home visits, a focus on sensitive responding by the parent, encouragement of a synchronous parent-child relationship, provision of the parent with social support, a focus on attachment, and incorporation of a group setting. For a majority of these intervention studies, these activities were aimed at developing a more secure relationship between the parent and child. These techniques demonstrate some efficacy, producing small to medium positive effects on assessed attachment and the infant parent interaction (e.g. maternal sensitivity, appropriate responsivity, synchronicity across parent and infant/child). However, these effects are inconsistent across studies, and often interventions produce an effect for one small aspect of the parent child relationship, with other coded variables having non-significant changes.

The interventions associated with large effect sizes were Video Feedback Intervention to Promote Positive Parenting with Discussions on the Representation Level (VIPP-R), Day Stay Service, Perinatal Center Training Program (PC-A), and Occupational Therapy. Common across all these programs was a focus on sensitive responding. However, sensitive responding was the fourth most common activity across the interventions, and so these programs with large effect sizes that incorporated this activity are only a small proportion of the programs which utilize it, making up only 16% of the interventions; those associated with no or small effect sizes make up 44% and those with medium 24%.

Additional activities that employed by more than one of the most effective intervention programs are having an attachment focus (VIPP-R, PC-A), encouraging a synchronous relationship between parent and child (VIPP-R, Day Stay Service), incorporating home visits (VIPP-R, Occupational Therapy), parent education (Day Stay Service, PC-A, Occupational Therapy), and parenting technique training (Day Stay Service, PC-A, Occupational Therapy). Again it is important to note that these activities are all among the top seven most utilized activities across all the interventions, and a much larger proportion of studies utilizing these activities produced no to small effect sizes.

It should also be pointed out that one of the interventions producing large effect sizes, VIPP-R, is one of three variations on the VIPP structure, and the other variations produced only small effect sizes, with the only identifiable differences in activities employed seem to be the lack of use of parent diaries and parent education in VIPP-R. This points to a lack of consistency, and suggests that the differences in efficacy across studies may be due to factors other than those outlined by the intervention.
One important factor that makes it difficult to assess the efficacy of interventions and the activities associated with them is that many of the activities are somewhat poorly defined and involve a lot of self-tailoring by the clinician or social worker on an individual basis which makes it hard to compare across, as well as within, studies. This could be contributing to much of the variance in effect sizes from what seem to be fairly similar intervention activities.

Another commonality across many of the interventions, but one not associated with any large effect sizes, is attempts to increase parents’ social/community support and access to community resources. This activity was used by 20 of the 56 identified programs and was primarily associated with small effect sizes. One explanation for this could be that while these studies do provide parents with additional outside support, the majority of them do not assess perceived social support. It is important to assess these perceived changes, as there is a large literature demonstrating perceived social isolation is associated with a large range of detrimental health outcomes above and beyond objective measures of social support (Cacioppo & Hawkley 2003).

Overall, while the identified studies find positive effects on many of the relevant emotional and affective outcomes, there is a lack of consistency in these effects. Even for those programs that do demonstrate large positive effects, it is hard to link those effects to specific activities employed by the program as the activities employed by these programs are also employed by a large number of other less effective programs. This makes it difficult to determine whether differences in programs are due to the activities themselves or whether they are due to more nuanced differences in the ways the program was administered through individual tailoring.

**Programs, Interventions and Best Practices Targeting Child Behavior**

In addition to the main review above, we selectively reviewed other programs targeting child behavior. Specifically, we assessed the following programs: Nurses as Partners, Incredible Years, and Positive Parenting Program. The latter two demonstrated medium effect sizes and the former was characterized by small effects sizes. Somewhat similar to our findings above, the most common activities across these three interventions targeting child behavior were parent education, parenting technique training, and a focus on sensitive responding by the parent. Shared among two programs were coaching, joint goal setting, parent-family communication training and group intervention. The latter two were associated with medium effect sizes and the former two yielded small to medium effect sizes.
Similar to our findings about VIPP-R above, we would like to note that while the Positive Parenting Program interventions produced large effect sizes, the program offers different delivery methods and variations in structure, which resulted in variations among observed effect sizes.

Overall, while programs aimed at child behavior operate at the symptoms level, but not the causal level, they can positively influence children’s social-emotional development by providing caregivers with knowledge and strategies to provide structure and stability for the children in their care.
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**Math**


**Social-Emotional Development**


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