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The impact of RISE Up! in promoting positive parenting and safety behaviors of parents with young children

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ABSTRACT

The objective of this study was to examine the extent to which a brief tailored parenting program administered in a pediatric clinic can change high-risk parenting behaviors. Parents with a child five years old or younger presenting to a University-based primary care pediatric clinic in a large Midwestern children's hospital were invited to participate in the study. Parents completed RISE UP!, which included an assessment completed on a tablet computer and then received a tailored, printed report that provided recommendations to address the personal high-risk parenting practices identified by the assessment. A follow-up assessment was completed with 125 parents (58%) about six weeks after the pediatric visit. Overall, 75% of parents reported trying at least one of the recommendations included in the report. Analysis of parenting risk indicated that 53% of parents had different highest parenting risk areas after RISE Up! and 33% of identified parenting risk scores decreased after RISE Up! Of the 231 priority unintentional injury risk behaviors identified, 34% were reported as non-risk behaviors at follow-up. Race and education were significantly associated with program effects in bivariate analysis; program effects were also correlated with communication mediators in a strong dose-response relationship. Reducing both child abuse and neglect and pediatric unintentional injuries are global priorities. Several childhood injury prevention frameworks and evidence-based policy recommendations highlight shared etiologies and opportunities for intervention. RISE Up! shows promise for universal prevention to promote the adoption of parenting practices to reduce injury risk and positive parenting behaviors.

1. Introduction

In the fourth edition of Bright Futures: Guidelines for Health Supervision of Infants, Children and Adolescents, the authors highlight the importance of the ecological contexts in which children are raised, emphasizing children's need for a home that provides psychological and physical safety and is free of undue risks for injury, violence, abuse, and exposure to environmental toxins (Hagan, Shaw, & Duncan, 2017). Pediatricians have been charged with delivering well-child care within a medical home framework that engages parents in a range of these topics that affect their children's health and development including safety, behavioral health, and parenting (Asarnow, Kolko, Miranda, & Kazak, 2017; Duby, 2016). Given their mission and trustworthiness, pediatric hospitals and other clinical settings are a natural partner in advancing child safety. However, while pediatricians continue to be an important source of information for parents of young children, the limitations of the clinic environment may not allow for sufficient anticipatory guidance and preventative care. One recent survey found that almost one-third of well-child visits were conducted in < 10 min and that the length of visit time was directly associated with more opportunities for anticipatory guidance, psychosocial risk assessment, and greater ratings of family-centered care (Halfon, Stevens, Larson, & Olson, 2011). These findings are particularly concerning for children of low-income families who are disproportionately at risk for injuries (Gielen et al., 2012b), and child abuse and neglect (Kim, Wildeman, Jonson-Reid, & Drake, 2017) who may benefit from additional provider guidance.

Because both unintentional injury and intentional injury are public

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health priorities globally and present the biggest threat to the health of children, the American Academy of Pediatrics has recommended that positive parenting and injury prevention topics are covered in clinical practice (AAP, 2008). In order to be successful, this guidance must address a complex set of related, contextual risk factors, including community poverty, employment, education and access to services, which were found in a meta-analysis to be consistent area-level predictors of injury (McClure, Kegler, Davey, & Clay, 2015). This may be in part due to risks common in low income family environments (e.g., increased injury hazards such as un-gated stairs, unsecured windows, scalding water, unsecured medications) as well as fewer injury protections such as smoke alarms (Gielen et al., 2012a). Similar risks are present for child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Maguire-Jack, Lanier, Johnson-Motoyama, Welch, & Dineen, 2015; Molnar et al., 2016). Thus, demographics and other factors are important to explore as effect modifiers of potential prevention programs.

The Vision of Pediatrics for 2020 from the American Academy of Pediatrics describes eight megatrends that will challenge the field of pediatrics in the near future (Starmer, Duby, Slaw, Edwards, & Leslie, 2010). Herein, the field recognizes the importance of health information technology as a method for engaging consumers, which is particularly relevant for topics related to parenting. There are several approaches that have been developed to address this demand by assessing individual risks in a clinical context and providing tailored guidance to caregivers to address those specific risks. Electronic medical records (EMR) now easily integrate prevention messaging into discharge instructions and standalone computer programs offer customized guidance for caregivers by assessing individual risks and providing prevention messages to address those risks. (Omaki et al., 2017) Such health communication programs have become an important component of preventative care, generally, and have demonstrated efficacy across a variety of health topics. (Shields et al., 2013) Kiosk-based systems use computer applications to first gather information from patients and then provide personally relevant feedback based on that information. Thus, they are tailored to the needs of the individual patients, they are highly relevant, efficient, can be culturally framed, and thus are more likely to lead to sustained healthy behaviors. While programs with a more singular foci have been evaluated (e.g., programs addressing only unintentional injuries), the literature has not yet determined the extent to which both high priority unintentional injury areas and positive parenting approaches can be addressed simultaneously.

The current manuscript reports the evaluation of RISE Up!, a computerized program, housed on a tablet computer, that provides printed, tailored reports to promote positive parenting and injury prevention for caregivers of young children (0–6 years). RISE Up! builds on a framework that unifies and integrates messaging to prevent both unintentional and intentional injuries, while extending previous successful approaches to unintentional injury prevention. A parent completes an assessment and then receives a customized printed report with information specific to their priority injury risks. This evaluation seeks to answer the question: Do parents who receive RISE Up! report a decrease in risk from baseline to follow-up and are there differences of effects among participant subgroups? The development of RISE Up!, including a fuller discussion of theory and design, is discussed elsewhere (Weaver et al., 2017).

2. Methods

2.1. Participants

Caregivers with a child five years old or younger presenting to a university-based primary care, outpatient, pediatric clinic in a large Midwestern children's hospital were invited to participate in the study. Caregivers who spoke English were eligible to participate. From July 2013 to May 2014, 214 caregivers completed the program assessment and received the tailored communication intervention. The study was approved by the Institutional Review Board of Saint Louis University.

2.2. Instrument

The baseline and follow-up assessment included items capturing safety behaviors and perceived stress of parenting situations. Measures were informed by previous literature and formative research. Safety behaviors related to unintentional injury areas were assessed, including those related to passenger safety, suffocation, poisoning, fires, burns, drowning, falls, crushing injuries, choking, pedestrian injuries, animal-related injuries, and gun-related injuries. Questions assessing injury risk were presented in decreasing order of risk, such that the highest potential injury risks were assessed first. From the first 10 injury areas assessed, the two highest risk injury areas were identified; additional questions were asked if no risks were identified in the first 10 injury areas. Because injury risks vary by age, the order was customized for each age group: 0–6 months, 7–11 months, 12–17 months, 18–24 months, 2 years, 3 years, 4 years and 5 years. (Weaver et al., 2008). Because risks vary by age, the total number of safety behaviors assessed varied with age, from 17 (for 0–6 months) to 27 (for 12–17 months), in the event that no risks were identified by the first 10 questions.

Parents were asked to “think about the times when it might be hard to parent [child's name]”. Five parenting situations shown to be most stressful to caregivers were presented: “It's meal time or you are feeding [child's name], you are getting [child's name] to bed and to sleep, [child's name] misbehaves, you are changing [child's name]’s diaper or helping [him/her] use the toilet, and [child's name] cries or has a temper-tantrum,” with the response options “not at all hard, a little hard, somewhat hard, hard, and very hard”. In the case of a tie for the most stressful situation, the parent was asked, “When is it the *hardest* for you to be a parent?” and the tied choices were offered.

Demographics (marital status, annual income, race, age of child, age of caregiver, and education level of caregiver) were asked to all caregivers on the baseline assessment.

On the follow-up assessment, we asked directly whether or not the caregiver had tried any of the tips reported in RISE Up! We also assessed communication mediators as a way to evaluate the process of using communication materials to advance positive parenting and to provide information about any possible dose-response relations that might support evaluation findings. For example, the follow-up included items to assess recall of RISE Up!, reported reading of RISE Up!, and talking about RISE Up! with family members, friends, and their pediatrician. Because tailored materials affect outcomes by making materials more relevant to individual caregivers, we also asked how much RISE Up! applied to their life, how much they liked RISE Up!, how much they liked learning about parenting at the clinic, the extent to which RISE Up! helped them to think about changing a parenting behavior, and how much they felt that people who wrote RISE Up! knew about them as parents. Full text of the communication mediator items are provided in Supplementary Table S1.

2.3. Intervention

The RISE Up! program was housed on a tablet computer and consisted of the baseline assessment and the algorithms that produced tailored feedback to caregivers. The report was tailored to the caregiver's self-selected parenting situation, two unintentional high-risk injury areas, and microtailored to the personal characteristics of the caregiver and child (e.g., the report used the child's name, appropriate pronouns and referenced the specific age of the child). Based on the assessment, a RISE Up! tailored report was generated and printed for each caregiver. Very specific behavioral recommendations were offered to address both the highest-stress parenting situation and the two priority unintentional injury areas. These topics were selected from

Table 1
Associations between demographic variables and trying RISE Up! suggested tip.

	Total n (column %)	Tried tip n (row %)	Did not try tip n (row %)	Chi-squared statistic (df)	*p*-value
Caregiver race				6.5 (2)	0.039
Caucasian	24 (19.2)	13 (59.1)	9 (40.9)		
African American	84 (67.2)	68 (84.0)	13 (16.0)		
Other	17 (13.6)	13 (81.3)	3 (18.7)		
Caregiver education level				10.6 (4)	0.031
Elementary and junior high school	5 (4.0)	3 (60.0)	2 (40.0)		
High school diploma or GED	33 (26.4)	30 (93.8)	2 (6.2)		
Some college	49 (39.2)	38 (82.6)	8 (17.4)		
College graduate	26 (20.8)	16 (64.0)	9 (36.0)		
Post-graduate	12 (9.6)	7 (63.6)	4 (36.4)		
Caregiver age				3.1 (4)	0.547
21 or younger	18 (14.4)	16 (88.9)	2 (11.1)		
22–25	24 (19.2)	14 (66.7)	7 (33.3)		
26–30	40 (32.0)	32 (80.0)	8 (20.0)		
31–40	31 (24.8)	23 (79.3)	6 (20.7)		
Older than 40	12 (9.6)	9 (81.8)	2 (18.2)		
Marital status				7.5 (4)	0.113
Married	29 (23.2)	17 (63.0)	10 (37.0)		
Living with a boyfriend or girlfriend	26 (20.8)	21 (84.0)	4 (16.0)		
Single, never married	46 (36.8)	35 (79.5)	9 (20.5)		
Have a boyfriend or girlfriend	14 (11.2)	11 (84.6)	2 (15.4)		
Divorced or separated	10 (8.0)	10 (100.0)	0 (0.0)		
Family income				0.6 (2)	0.746
Less than $20,000	75 (60.0)	59 (80.8)	14 (19.2)		
$20,000 - $50,000	34 (27.2)	23 (74.2)	8 (25.8)		
$50,000 or over	16 (12.8)	12 (80.0)	3 (20.0)		
Child's age				2.6 (5)	0.765
< 1 year	60 (45.8)	41 (73.2)	15 (26.8)		
Between 1 and 2 years	30 (22.9)	25 (86.2)	4 (13.8)		
Between 2 and 3 years	14 (10.7)	11 (78.6)	3 (21.4)		
Between 3 and 4 years	9 (6.9)	8 (88.9)	1 (11.1)		
Between 4 and 5 years	9 (6.9)	6 (75.0)	2 (25.0)		
> 5 years	9 (6.9)	7 (77.8)	2 (22.2)		

formative research during program development phase (Weaver, 2017). Further, the report listed these high priority topics to inform the anticipatory guidance of the pediatrician so that discussion during the patient visit could focus on the injury and parenting topics that most warranted discussion.

The content of RISE Up! was developed through extensive formative work (Weaver, 2017) and informed by the guidelines of the American Academy of Pediatrics, building upon the five protective factors that have been shown to decrease child abuse and neglect (U.S. Department of Health and Human Services, 2008). Specifically, the tailored feedback provided direct behavioral guidance to promote nurturing and attachment, knowledge of child development, parental resiliency, social connection, and use of concrete supports, within the context of unintentional injury prevention recommendations. Each caregiver received messages from an integrated message library; for example, a caregiver might be encouraged to make bath time a meaningful experience by both talking to their child (promoting nurturing and attachment) and by carefully supervising their child by avoiding distractions (decreasing risk of drowning).

2.4. Procedures

Caregivers completed the assessment in the waiting room of the pediatric clinic on a tablet computer. The assessment took on average ten minutes to complete. Per protocol, RISE Up! was printed in the clinic and delivered to the caregiver by a trained research assistant. The research assistant did not review RISE Up! with the caregiver, but suggested that the caregiver discuss the content of RISE Up! with the pediatrician to inform their conversation about any concerns they had or topics they wanted to address with the pediatrician. Trained research staff contacted all participants by phone at follow-up and were able to complete a follow-up assessment with 125 caregivers (58%) about six weeks after the pediatric visit (median length to follow-up: 47 days). Caregivers participating in the program received a $20 gift card incentive for participating in each of the two data collection activities.

2.5. Data analysis

Analysis compared baseline data and follow-up data for indicators of positive parenting, as well as caregiver adoption of the recommended safety behaviors and the recommended strategies to promote positive parenting in high-stress parenting situations as reported in the follow-up survey. Self-report at follow-up of behavior change and communication mediators were also considered.

In order to determine whether RISE Up! was more effective for certain subgroups of participants, proportions of participants who reported trying the RISE Up! tips were compared across demographic variables and communication mediators using chi-squared tests. Binary logistic regressions were performed to identify demographic predictors of improved parenting stress and decreased injury risk. Trying the RISE Up! tips and communication mediators associated with RISE Up! were also considered as predictors in the binary logistic regression analyses. Changes in highest-stress situations were compared to changes in other situations using a randomization test. In the randomization procedure, one of the five caregiver risk factors was randomly identified to be the priority and the change in this factor was compared to the average change of the four randomly non-identified factors. This within-subject comparison accounts for the correlations between responses from the same participant. The randomization process was repeated 10,000 times to build a distribution of what a hypothetical intervention would look like under the assumption of a null effect. Then the difference between the true identified risk and the averages of the true unidentified risks was compared to this distribution. The proportion of the 10,000 of randomizations which exceeded the observed difference was interpreted as the *p*-value for the test (Ernst, 2004). For all analyses, *p*-values below 0.05 were considered statistically significant.

Table 2
Associations between recall and trying RISE UP tips.

	Total n (column %)	Tried tip n (row %)	Did not try tip n (row %)	Chi-squared statistic (df)	*p*-value
Remembered doctor's name				1.2 (1)	0.190
Yes	70 (55.6)	58 (82.9)	12 (17.1)		
No	56 (44.4)	41 (73.2)	15 (26.8)		
Remembered using tablet to answer questions about parenting				0.3 (1)	0.611
Yes	123 (97.6)	97 (78.9)	26 (21.1)		
No	3 (2.4)	2 (66.7)	1 (33.3)		
Remembered getting handout				7.0 (1)	0.008
Yes	122 (96.8)	98 (80.3)	24 (19.7)		
No	4 (3.2)	1 (25.0)	3 (75.0)		
Remembered name of handout				0.1 (1)	0.799
Yes	8 (6.3)	6 (75.0)	2 (25.0)		
No	118 (93.7)	93 (78.8)	25 (21.2)		
How much of RISE UP read				9.0. (2)	0.026
None of it	4 (3.2)	3 (75.0)	1 (25.0)		
Some of it	57 (45.6)	38 (66.7)	19 (33.3)		
All of it	64 (51.2)	57 (89.1)	7 (10.9)		
Talked about RISE UP with family, friends				6.3 (1)	0.021
Yes	68 (56.2)	60 (88.2)	8 (11.8)		
No	53 (43.8)	36 (67.9)	17 (32.1)		
Talk to doctor about RISE UP				0.7 (3)	0.381
Not at all	39 (32.2)	32 (82.1)	7 (17.9)		
Briefly	37 (30.6)	30 (81.1)	7 (18.9)		
A lot	5 (4.1)	4 (80.0)	1 (20.0)		
I didn't get the print out before I spoke with my doctor	40 (33.1)	30 (75.0)	10 (25.0)		
Talked to doctor about keeping child safe				9.2 (2)	0.023
Not at all	16 (13.2)	8 (50.0)	8 (50.0)		
Briefly	57 (47.1)	46 (80.7)	11 (19.3)		
A lot	48 (39.7)	41 (85.4)	7 (14.6)		

3. Results

The demographic distributions of the caregivers reflected that of the pediatric clinic, 23% were married, 60% reported less than $20,000 in annual income, and 67% were African American. The large majority (69%) of caregivers had children < 2 and 34% of caregivers were younger than 25 (Table 1).

At baseline, crying was the most often reported parenting stress area (48%), followed by bed time (21%), social situations (16%), meal time (9%), and toileting (6%). The highest-risk unintentional injury areas were passenger safety (22%), suffocation (19%), poisoning (19%), and fires (16%).

Caregivers responding to the follow-up interview request were demographically similar to those who did not respond (Supplementary Table S2). Analysis of parenting risks from baseline to follow-up indicated that 53% of caregivers had different highest parenting risk areas after RISE Up! (95% CI: 44 to 61) and 33% of identified parenting risk area scores decreased after RISE Up! (95% CI: 25 to 42). By comparison, only 19% of the non-identified parenting risk scores decreased after RISE Up! (randomization test $p = .009$). Of the 231 priority unintentional injury risk behaviors identified, 34% (95% CI 28, 40) received lower risk scores at follow-up with 23% (95% CI 18, 29) being completely resolved. Specifically, 16% (95% CI: 7.2, 29.1) of passenger safety risks were lower or non-existent at follow-up, as were 44% (95% CI: 29.6, 60.0) of suffocation risks, 20% (95% CI: 9.8, 35.3) of poisoning risks, and 69% (95% CI: 51.9, 83.7) of fire risks.

At follow-up, overall, 75% of caregivers reported trying at least one of the recommendations included in the report. Of those who reported having used one of the RISE Up! tips, 43% (43 of 99) reported using the safety tip, 29% (29 of 99) reported using the stress tip, 5% (5 of 99) reported using both tips, and 19% (19 of 99) did not remember which tip they implemented. Race ($\chi^2(2) = 6.5$, $p = .039$) and education ($\chi^2(4) = 10.6$, $p = .031$) were significantly associated with caregivers trying the suggested tips. African Americans were more likely than Whites (84% to 59%) to try the tips, as were caregivers with lower education levels, compared to those with higher educational attainment. No significant differences in trying a tip were found by caregiver's age, marital status, family income, or child's age (see Table 1). Multivariate analyses found no statistically significant demographic predictors of decreased caregiver risk scores or decreased injury risk scores.

Of those reporting trying the RISE Up! tip, 37% reported a reduced score on the highest-risk caregiver stress measure, compared to 17% of those who did not report trying the RISE Up! tip (comparison $p = .14$, 95% CI: [−2, 41]). Results did not qualitatively differ in multivariate analyses.

Program effects, as measured by self-reported trying of recommendations, were also correlated with recall (Table 2) and communication mediators (Table 3) in a strong dose-response relationship. Caregivers who remembered the RISE Up! handout at follow-up ($\chi^2(1) = 7.0$, $p = .008$), reported reading RISE Up! ($\chi^2(2) = 9.0$, $p = .026$), talked about RISE Up! with family or friends ($\chi^2(1) = 6.3$, $p = .021$), and talked with their pediatrician about keeping their child safe ($\chi^2(2) = 9.2$, $p = .023$) all reported higher utilization of the RISE Up! tips than those giving negative responses to the questions. The tips were also tried more often by caregivers who reported feeling that RISE Up! applied to their life ($\chi^2(4) = 19.0$, $p = .001$), liking RISE Up! ($\chi^2(4) = 19.4$, $p = .001$), liking learning about parenting at the clinic ($\chi^2(4) = 14.0$, $p = .007$), those who used RISE Up! as an impetus for changing their parenting ($\chi^2(4) = 21.8$, $p < .001$), and felt the people who wrote RISE Up! knew about them as parents ($\chi^2(4) = 22.9$, $p < .001$).

4. Discussion

This manuscript demonstrates that RISE Up! shows promise in promoting parenting practices that reduce injury risk and promote positive parenting behaviors that reduce the risk of child abuse and neglect. Caregivers not only liked using the program but they felt it was a good use of time while they waited in the clinic and the report prompted them to make specific, high-priority changes in their parenting practices.

While the impact of RISE Up! is not yet conclusive, given the evaluation design, caregivers using RISE Up! reported improvement in

Table 3
Associations between communication mediators and trying RISE UP tips.

	Total n (column %)	Tried tip n (row %)	Did not try tip n (row %)	Chi-squared statistic (df)	*p*-value
RISE UP applied to life as parent				19.0 (4)	0.001
Not at all	5 (4.0)	1 (20.0)	4 (80.0)		
Slightly	19 (15.1)	11 (57.9)	8 (42.1)		
Moderately	23 (18.3)	20 (87.0)	3 (13.0)		
Mostly	27 (21.4)	21 (77.8)	6 (22.2)		
A lot	52 (41.30)	46 (88.5)	6 (11.5)		
Liked using RISE UP				19.4 (4)	0.001
Not at all	2 (1.6)	0 (0.0)	2 (100.0)		
Slightly	12 (9.5)	6 (50.0)	6 (50.0)		
Moderately	25 (19.8)	18 (72.0)	7 (28.0)		
Mostly	36 (28.6)	28 (77.8)	8 (22.2)		
A lot	51 (40.5)	47 (92.2)	4 (7.8)		
Liked learning about parenting at clinic				14.0 (4)	0.007
Not at all	2 (1.6)	1 (50.0)	1 (50.0)		
Slightly	2 (1.6)	0 (0.0)	2 (100.0)		
Moderately	12 (9.5)	7 (58.3)	5 (41.7)		
Mostly	22 (17.5)	16 (72.7)	6 (27.3)		
A lot	88 (69.8)	75 (85.2)	13 (14.8)		
Glad for chance to use RISE UP				5.4 (3)	0.144
Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)		
Disagree	1 (0.8)	0 (0.0)	1 (100.0)		
Neither disagree or agree	8 (6.3)	5 (65.2)	3 (37.5)		
Agree	60 (47.6)	47 (78.3)	13 (21.7)		
Strongly agree	57 (45.2)	47 (82.5)	10 (17.5)		
Easy to complete RISE UP survey				6.7 (4)	0.154
Strongly disagree	2 (1.6)	1 (50.0)	1 (50.0)		
Disagree	5 (4.0)	3 (60.0)	2 (40.0)		
Neither disagree or agree	8 (6.3)	4 (50.0)	4 (50.0)		
Agree	26 (20.6)	21 (80.8)	5 (19.2)		
Strongly agree	85 (67.5)	70 (82.4)	15 (17.6)		
RISE UP good way to spend time waiting				1.8 (3)	0.620
Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)		
Disagree	3 (2.4)	2 (66.7)	1 (33.3)		
Neither disagree or agree	5 (4.0)	3 (60.0)	2 (40.0)		
Agree	33 (26.2)	25 (75.8)	8 (24.2)		
Strongly agree	85 (67.5)	69 (81.2)	16 (18.8)		
RISE UP made time go quickly				5.2 (4)	0.266
Strongly disagree	1 (0.8)	1 (100.0)	0 (0.0)		
Disagree	5 (4.0)	2 (40.0)	3 (60.0)		
Neither disagree or agree	12 (9.5)	10 (83.3)	2 (16.7)		
Agree	34 (27.0)	26 (76.5)	8 (23.5)		
Strongly agree	74 (58.7)	60 (81.1)	14 (18.9)		
Decided to do things differently as parent				21.8 (4)	< 0.001
Strongly disagree	4 (3.2)	2 (50.0)	2 (50.0)		
Disagree	10 (7.9)	3 (30.0)	7 (70.0)		
Neither disagree or agree	15 (11.9)	10 (66.7)	5 (33.3)		
Agree	53 (42.1)	44 (83.0)	9 (17.0)		
Strongly agree	44 (34.9)	40 (90.9)	4 (9.1)		
People who wrote RISE UP seemed to know a lot about me as a parent				22.9 (4)	< 0.001
Strongly disagree	6 (4.8)	1 (16.7)	5 (83.3)		
Disagree	13 (10.4)	7 (53.8)	6 (46.2)		
Neither disagree or agree	33 (26.4)	27 (81.8)	6 (18.2)		
Agree	41 (32.8)	33 (80.5)	8 (19.5)		
Strongly agree	32 (25.6)	30 (93.8)	2 (6.3)		

their parenting strategies; 33% of caregivers no longer reported their baseline, highest priority parenting need at follow-up and 34% of all unintentional injury risks were no longer identified as high priority. Effects were more pronounced for African American caregivers and those with lower educational attainment. Compared to 69% of Caucasian caregivers, 85% of African American caregivers reported trying a tip, a relationship that has been found in other tailoring literature (Nansel, Weaver, Jacobsen, Glasheen, & Kreuter, 2008).

The objective of RISE Up! was to offer a novel approach to parenting education that integrates prevention for a spectrum of risks. Earlier work using a similar tailored communication approach focusing only on unintentional injuries showed that 49% of caregivers adopted a new injury behavior (Nansel et al., 2008). While it is not possible from this study to compare effect sizes of these two approaches, our results suggest that a unified approach does not compromise the potency of the unintentional injury prevention message; indeed, by focusing on the common antecedents of these parenting behaviors and commonality in prevention behaviors, the impact of an integrated approach may be greater. Moreover, using such a combined approach delivered using health information technology is responsive to the vision for the future of pediatrics (Starmer et al., 2010).

The effects of RISE Up! in promoting positive parenting practices can be compared to several existing interventions for these high-stress parenting situations. In our sample, 48% of caregivers rated crying as the situation in which it was most difficult to parent their child; issues related to sleeping were a distant second at 21%. The importance of effective parenting approaches to crying have been long noted in the literature and provide a context for these findings. As an example, to reduce risks of abusive head trauma (AHT), *The Period of PURPLE Crying* provides new parents a DVD and a booklet to give them knowledge of

infant crying and strategies for managing their crying infant. AHT in the region in which the program was implemented was shown to be 47% less than adjacent regions and the intervention significantly improved knowledge of and intention to appropriately handle infant crying (Barr et al., 2009; Bechtel et al., 2011; Riley et al., 2011), and resulted in fewer calls to a nurse advice line (Zolotor et al., 2016). In a review of interventions addressing shaken baby syndrome, Lopez and Williams note that parental education is the most promising approach for preventing AHT. (Lopes & de Williams, 2018).

5. Limitations

This study has several limitations. First, the conclusion that RISE Up! is an efficacious intervention should be regarded with some caution. The study design was a within-group, pre- post- test design with self-reported outcome measures. We enhanced the design by capturing communication mediators and revealing a clear dose-response relationship; those that engaged with RISE Up! to a greater degree were more likely to report trying the tips. We prioritized this design to first ensure that the communication approach was promising before implementing a more cumbersome evaluation design. We also cannot know for certain whether the identified high-risk parenting areas were in fact resolved, or whether a competing need became more pronounced at follow-up. Because we opted for assessments that were minimal in length, we did not reassess every unintentional parenting risk behavior at follow-up, although we did assess parenting stress scores for each topic. We also cannot quantify the threat of maturation; it is likely that some high stress parenting situations (e.g., crying) resolve over time absent intervention. Lastly, social desirability bias may have influenced these results, perhaps differentially by demographic groups.

The high attrition rate may weaken the generalizability of the results of the study. However, comparisons showed no statistically significant differences between those responding to the follow-up survey and those unable to be contacted. Additionally, there were no significant demographic predictors of RISE Up! tip utilization, suggesting a relatively constant outcome. Further, the results of the study are likely to be applicable to similar caregiver populations, but comparable results may not be found in different populations. Additional investigation is needed to determine the extent to which observed effects can be attributed to RISE Up! and the degree to which the impact of RISE Up! is sustained over time. Hybrid designs with clear attention to dissemination and implementation may be particularly useful (Breitenstein, Schoeny, Risser, & Johnson, 2016).

6. Next steps

In addition to addressing the methodological limitations of this research with more robust causal designs, further research in this area should consider several next steps. First, research should investigate the extent to which these messages can be delivered within other contexts of the clinical environments. For instance, in clinical environments with robust electronic medical records systems, can high priority messages be successfully integrated into patient materials? Can these messages be integrated in patient portals? Does the platform for message delivery affect the effectiveness of the intervention? Is adoption of this program more likely in a patient-centered medical home? The answers to these and other questions will be important to address as the field of medical informatics advances patient portal systems. Further work should also more fully develop the conceptual framework for integrating multiple types of injuries, abuse risk, and protective factors. While we have put forth a reasonable theoretical argument for integrating parenting education, identifying the common mediating pathways of intervention effects would lend further precision to the development of future parenting interventions.

Similar to unintentional injury prevention, which has been considered by previous health communication programs, approaches to address child maltreatment must target specific caregivers behaviors – behaviors that are protective and help establish a strong connected relationship between caregiver and child and are associated with decreased rates of child abuse and neglect. In order to decrease rates of child maltreatment, we must focus our interventions on addressing malleable risk factors. RISE Up! offers a tool for promoting these positive parenting behaviors known to support children and families.

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Declarations of Competing Interest

None.

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