

Using Social Media to Disseminate Injury Prevention Content: Is a Picture Worth a Thousand Words?

Rebecca J. McAdams, MA, MPH*
Kristin J. Roberts, MS, MPH
Elizabeth G. Klein, PhD, MPH
Jennifer A. Manganello, PhD, MPH
Lara B. McKenzie, PhD, MA

Abstract

Social media (SM) offers an opportunity for injury professionals to disseminate reliable safety recommendations to parents, yet little is known about the reach and impact of SM messages on parental safety knowledge and safety behavior adoption. It is also unclear whether electronic health (eHealth) literacy level is associated with understanding of messages. Parents of children (< 7 years) were recruited from a nationally representative consumer panel to complete an online survey assessing their Internet and SM usage and eHealth literacy level using the eHealth Literacy Scale (eHEALS). Participants were shown three safety SM posts where images and text matched or did not match. A post-exposure survey captured participant understanding of SM post message. Five-hundred eighty parents completed the survey. A majority of participants were female (58.6%) with high eHealth literacy (84.5%). Compared to low eHealth literate parents, a larger proportion of high eHealth literate parents correctly identified the message in mismatched posts (safe sleep: $p = .0081$; poison prevention: $p = .0052$), while similar proportions of parents with high and low eHealth literacy correctly identified a matched post for bike safety ($p = .7022$). Within each eHealth literacy level, high eHealth literate parents were more often able to correctly identify SM post messaging when the photo and text matched. Parents are using SM to acquire safety, health, and parenting information; therefore, it is incumbent upon disseminators to create content with clear messages. SM posts should utilize matching text with imagery that illustrates the recommended safety behavior to facilitate parental understanding of safety recommendations, regardless of audience eHealth literacy level.

*Corresponding author can be reached at: rebecca.mcadams@nationwidechildrens.org

Millions of individuals in the United States use the Internet and social media (SM) daily and not just for social engagement. SM users gain immediate access to a range of information on nearly any topic, and are able to engage and interact with various health-related organizations (Hopkinson, 2014; Moorhead et al., 2013). In 2019, 90% of U.S. adults were Internet users (Pew Research Center, 2019a) and 72% of U.S. adults were users of at least one SM site (Pew Research Center, 2019b). The Internet and SM serve as efficient and cost-effective mediums to disseminate information to large populations

(Costa-Font et al., 2009; Korda & Itani, 2013). As such, health information and public health messages, including injury prevention recommendations, are being created and regularly shared by disseminators (health organizations sharing health information) on Internet and SM sites (Gough et al., 2017; Li et al., 2015; Manganello et al., 2016). For example, the Centers for Disease Control and Prevention (CDC) and other health organizations, including those with a focus on injury prevention and child safety, actively use SM to share important and helpful health

information, such as research findings, safety messages, seasonal safety reminders, and documentation of dangerous or recalled products (Gough et al., 2017). Simultaneously, the public is actively searching for health-related information on these platforms (Kearney et al., 2013; Li et al., 2015; Manganello et al., 2016) including Facebook, Instagram, Twitter, and Pinterest. In particular, parents frequently use the Internet and SM as preferred sources to find health-related information regarding their children (Kearney et al., 2013; Li et al., 2015; Manganello et al., 2016).

Past studies have examined whether this health information seeking activity on the Internet and SM can lead to increased knowledge (Gough et al., 2017; Lemire et al., 2008) and behavior change (Elaheebocus et al., 2018; Frost & Massagli, 2008; Webb et al., 2010). Research has demonstrated that Internet and SM campaigns (i.e., a strategically coordinated online marketing effort designed to reinforce information or raise awareness on a specific topic) (Baskerville et al., 2016) have positively impacted various health behaviors such as smoking cessation (Baskerville et al., 2016), alcohol consumption (Lehto & Oinas-Kukkonen, 2011), skin cancer prevention (Gough et al., 2017), weight loss (Merchant et al., 2014; Merchant et al., 2017; Patrick et al., 2014), and physical activity (Maher et al., 2015). However, the effects of Internet and SM posts on pediatric injury prevention behaviors is not well understood (Drake et al., 2017). If Internet and SM campaigns have positively affected other health behaviors, then presumably these same strategies should lead to adoption of injury prevention behaviors as well. To date, only one previously published study has focused on the influence of SM posts to prevent pediatric injuries (Drake et al., 2017). As such, little is known about the reach and impact of a single SM post on knowledge and behavior

adoption, especially for pediatric injury prevention recommendations (Thackeray et al., 2012). Additionally, while past literature suggests SM posts work best when the content is engaging, with a clear call to action (Chou et al., 2013; Freeman et al., 2015), the SM post format that will best facilitate learning is unknown. In a 2012 guideline, the CDC shared its recommendations for crafting effective SM public health messages (CDC, 2012a; 2012b), sharing best practices regarding the SM post text, but did not provide any recommendations for the SM post image (photo). Thus, questions remain on the role of images, which are often used in SM posts to attract attention and enhance engagement. For instance, it is unclear whether a SM post image illustrating the correct or recommended safety behavior would better aid the viewer to learn the SM post message compared to an image showing the hazard or risky behavior (e.g., an image of a recalled product, a child reaching for a TV that will tip over).

Formatting SM posts for optimal viewer understanding is imperative because most (72%) Americans trust the health information on the Internet and SM and 75% accept the information at face value (Ahmed et al., 2016). If this information is inaccurate or misinterpreted by the viewer it may lead to a lack of correct knowledge and the potential for individuals or their children to engage in unsafe behaviors (Drake et al., 2017; Elaheebocus et al., 2018; George et al., 2013; Lemire et al., 2008). Parents searching the Internet and SM for health information such as safety recommendations about their child are not without these risks, as parents' lack of knowledge about injury hazards and prevention practices for their children often leads to failure to implement recommended safety behaviors (Manganello et al., 2016; Simpson et al., 2002). Therefore, it is imperative for the SM post to be formatted in such a way that it is easy for the viewer to

understand, learn from, and correctly interpret the message.

While the content and format of SM posts and accuracy of information provided is critical, a parent's eHealth literacy (eHealth) may also play a role in how information is interpreted and applied. eHealth literacy is defined as the ability to seek, understand, and learn health information, as well as apply recommendations, such as safety recommendations viewed on the Internet and SM (Berkman et al., 2010). To our knowledge, it is unknown how these two factors, SM post format and eHealth literacy level, combine to ensure the most effective results. This study seeks to fill this gap and help disseminators, with an overall objective of determining how to best develop SM posts to make sure parents understand the safety message. This is the first study to analyze the impact of SM posts on parental knowledge of safety recommendations, determine which SM post format best enables uptake of the recommended behavior, and examine whether eHealth literacy level affects parental understanding of safety messages presented in SM.

Methods

The survey sample was drawn from GfK KnowledgePanel® using their probability-based, nationally representative, web panel. To be eligible for this study, individuals (≥ 18 years of age) were required to be the parent or legal guardian of at least one child < 7 years of age who lives with them most of the time, and have used a personal SM account (Facebook, Twitter, or Instagram) at least once within the last 30 days. These eligibility criteria were examined at two points in the study. First, GfK identified those panelists who met this study's eligibility criteria to identify a population from which the sample would be drawn. Second, eligibility criteria were confirmed prior to initiating the online

survey. Each participant gave written informed consent.

The survey was fielded from March 22, 2018 to April 15, 2018. Eligible panelists ($n = 2311$) were invited via email to complete the online survey. Email reminders were sent to complete the survey three and seven days after the invitation email. Most of those who initiated the survey ($852/932 = 91.4\%$) completed the pre-screener; 591 participants were confirmed in the second confirmation for all eligibility criteria. An additional $n = 11$ participants were removed from the final sample because although their GfK's demographic information indicated they have a child < 7 years of age, they did not indicate this information on the survey; it was possible that a child could turn 7 years between the time GfK collected the demographic information for their panel and the time of study survey participation. The final sample of $n = 580$ participants were included in the analysis. To thank participants for completing the survey, participants were compensated \$5 by GfK's incentive program for completion (the equivalent of \$5 or points to be used toward prizes). This study was approved by the Institutional Review Board at Nationwide Children's Hospital, Columbus, Ohio.

Social Media Posts

All three SM posts were actual posts collected from SM platforms after being shared by the posting organization (Figure 1). They addressed common injury prevention topics relevant among children < 7 years of age. Safe sleep addresses the younger age group, bike safety primarily addresses older children, and poison prevention addresses all ages within this study's selected age group. The safe sleep and poison prevention SM posts displayed an image mismatched to the recommended safety behavior in the text, whereas the bike safety SM post showed an

image matched with the recommended safety behavior in the text. The safe sleep post contains an image with an infant in a crib containing bumpers while the text in the post recommends, "...parents stop using crib bumpers." The poison prevention SM post has an image that shows a young child reaching for medicine, discordant from the recommendation in the text, which

recommends parents store "all medicines up and away." The bike safety post features an image of a young child, wearing a helmet while riding a bike on a sidewalk with the help of a parent. This image is matched to the recommendation in the text which states that "young children should bike on sidewalks, bike paths or in parks."



Figure 1. Social media posts viewed by parents. Left: Safe sleep (mismatching), Middle: Poison prevention (mismatching), Right: Bike safety (matching)

Measures

Internet and social media use. Participants were asked to report their average daily personal use of the Internet (searches and websites) and SM (i.e., Facebook, Twitter, Instagram, and Pinterest) over the past three months. Participants were asked how often (amount of times per day, week, or month) they used the Internet and SM sites to gather child health-related, parenting-related, and child safety or child injury prevention information. Parents were asked if they had seen (yes/no) SM posts on Facebook, Twitter, Instagram, and Pinterest on any of the following injury prevention topics: 1) bike safety, 2) concussions, 3) motor vehicle crashes, 4) poison prevention, 5) water safety, 6) safe infant sleep, and 7) fire prevention.

SM post knowledge. As part of the survey, participants viewed one SM post for each of the three injury prevention topics and then were asked four follow-up questions after viewing each post: 1) "What was the topic of this post?"; 2) "What did the text recommend in this post?"; 3) "What did the photo show?"; and 4) "Did the photo show the recommended safety behavior, or not?" Responses were categorized as either correct or incorrect.

eHealth literacy. Parents' electronic health (eHealth) literacy was measured using the eHealth Literacy Scale (eHEALS) (Norman & Skinner, 2006). Parents answered eight questions measuring their "knowledge, comfort, and perceived skills at finding, evaluating, and applying electronic health

information to health problems” (Norman & Skinner, 2006, p. 1). Response choices for all questions used a five-point Likert scale ($1=$ *Strongly Disagree*, $2=$ *Disagree*, $3=$ *Undecided*, $4=$ *Agree*, $5=$ *Strongly Agree*) that were then totaled, yielding an eHEALS score that ranged from 8 through 40, where a higher score indicated greater eHealth literacy. The eHEALS scores were dichotomized into low eHealth, score < 26 , or high eHealth, score ≥ 26 (Richtering et al., 2017). The Cronbach’s alpha coefficient for the eHEALS in this study was 0.92.

Demographics. Participant demographics that were collected included age, sex, race/ethnicity, marital status, employment, home ownership, income, whether the household was a single or dual parent household as well as age and gender of the children (< 18 years) living in the home.

Analysis

Data were analyzed by using SAS 9.4 (SAS Institute Inc., Cary, NC) and SPSS version 25 (IBM SPSS Statistics, Armonk, NY: IBM Corp). A survey design weight supplied by GfK was applied for analysis. Chi-square tests were used to compare eHealth literacy groups. Mann-Whitney U tests were used to compare the means of Internet and SM use between high and low eHealth literacy groups. McNemar’s test was used to compare differences in proportions of parents who correctly identified whether the image showed the recommended safety behavior within low and high eHealth literacy groups. Multivariate logistic regression models were used to estimate the odds ratios (OR) and 95% confidence intervals (CIs) for the association between parental eHealth literacy level, correctly identifying whether an image showed the recommended safety behavior, adjusting for knowledge of the topic, text, or

image, as well as parent education level, for each post. Statistical significance was assessed by using $\alpha = 0.05$.

Results

Demographics

Participants had a mean age of 34.7 years ($SE = 0.33$), with the largest age group being 25-34 years (47.1%). Most parents were female (58.6%), non-Hispanic white (62.2%), worked as a paid employee or self-employed (72.9%), had a bachelor’s degree or higher (39.7%), and were highly eHealth literate (84.5%) (Table 1). On average, each participant had approximately 2 children (mean = 2.28; $SE = 0.06$), with a mean age of 5.6 years. Approximately 73% ($n = 424$) of participants had multiple (> 1) children.

Internet Use

Participants reported spending an average 175 minutes ($SE = 11.7$) using the Internet for personal use on a typical day. Parents most frequently used the Internet to obtain health-related information for their child (81.2%), followed by parenting-related information (60.5%), while about one-third (33.5%) of parents searched the Internet for child safety or child injury prevention information. The average number of times parents searched the Internet for health-related, parenting-related, and child safety or child injury prevention information was 14.9, 12.5, and 13.8 times per month, respectively.

Compared to parents with a high eHealth literacy score, parents with a low eHealth literacy score more frequently searched the Internet for health-related information for their child (low = 25.2 times per month vs. high = 13.5 times per month; $p = 0.713$) and child safety or child injury prevention information (low = 16.7 times per month vs.

Table 1

Characteristics of Survey Participants and Comparison of eHealth Literacy Level

	Overall				eHealth Literacy Level ^c		
	Actual Cases	National Estimate ^a	95% CI	% ^b	Low %	High %	p-value ^d
Total	580	580.0	550.5-609.9	100.0	15.5	84.5	<0.0001
Sex							0.4606
Female	366	340.0	309.4-371.1	58.6	54.1	59.5	
Male	214	240.0	208.1-272.9	41.4	45.9	40.5	
Age (years)							0.8737
18-24	13	20.0	7.0-33.0	3.4	1.8	3.7	
25-34	254	273.1	239.9-306.3	47.1	44	47.6	
35-44	267	244.0	216.8-271.2	42.1	45.3	41.5	
45-54	41	38.1	24.4-51.8	6.6	8	6.3	
55-74	5	5.0	0.5-9.5	0.8	0.8	0.9	
Race/ Ethnicity							0.6279
White, non-Hispanic	446	361.0	336.7-385.3	62.2	60.2	62.6	
Hispanic	52	109.2	78.5-139.9	18.8	23	18	
Black, non-Hispanic	35	54.2	35.6-72.8	9.3	5.6	10	
Other and 2+ races, non-Hispanic	47	55.9	39.8-71.9	9.6	11.2	9.3	
Education							0.0360
Less than high school	14	46.3	21.9-70.7	8.0	16.3	6.5	
High school	117	150.7	122.9-178.5	26.0	33.3	24.6	
Some college	140	153.2	127.6-178.9	26.4	17.9	28	
Bachelors degree or higher	309	229.9	209.4-250.5	39.6	32.4	41	
Employment							0.7106
Working	439	423.0	392.6-453.3	72.9	70.7	73.3	
Not working	141	157.2	128.2-186.3	27.1	29.3	26.7	

Table 1 (Continued)

Characteristics of Survey Participants and Comparison of eHealth Literacy Level

	Overall				eHealth Literacy Level ^c		
	Actual Cases	National Estimate ^a	95% CI	% ^b	Low %	High %	<i>p</i> -value ^d
Total	580	580.0	550.5-609.9	100.0	15.5	84.5	<0.0001
Marital Status							0.6692
Married	480	454.8	424.8-484.7	78.4	81.5	77.8	
Living with partner	49	72.2	49.3-95.2	12.4	12.7	12.4	
Never married	24	31.6	17.3-46.0	5.4	2.2	6.0	
Divorced/separated	27	21.6	13.1-30.1	3.7	3.6	3.7	
Financial ability to make ends meet							0.3447
Very easily	99	84.5	67.6-101.3	14.6	13.9	14.7	
Easily	218	195.6	170.7-220.5	33.7	28.7	34.6	
Just get by	208	226.8	195.4-258.3	39.1	38.0	39.3	
With difficulty	25	27.8	14.1-41.5	4.8	9.4	4.0	
With great difficulty	19	29.9	13.5-46.4	5.2	9.0	4.5	
Prefer not to answer	11	15.5	4.9-26.2	2.7	1.1	3.0	
Number of children <18 years in household							0.9717
1	155	146.3	122.7-169.9	25.2	22.5	25.7	
2	243	235.4	205.9-264.9	40.6	43.6	40.0	
3	120	126.4	101.9-150.9	21.8	22.9	21.6	
4	41	46.2	29.3-63.0	8.0	7.4	8.1	
≥5	21	25.9	12.7-39.1	4.5	3.6	4.6	

Table 1 (Continued)

Characteristics of Survey Participants and Comparison of eHealth Literacy Level

	Overall				eHealth Literacy Level ^c		
	Actual Cases	National Estimate ^a	95% CI	% ^b	Low %	High %	<i>p</i> -value ^d
Total	580	580.0	550.5-609.9	100.0	15.5	84.5	<0.0001
Child(ren) Age Group ^e							0.3470
Young only	22	219.2	190.6-247.7	37.8	30.1	39.2	
Both young and old	231	242.6	210.3-274.8	41.8	44.3	41.3	
Old only	127	118.5	96.9-140.0	20.4	25.6	19.5	

Note.

^aSome categories do not total 580.0 because of rounding.

^bPercentage of national estimate.

^ceHealth literacy levels were defined as low (< 26 eHeals score) and high (≥ 26 eHeals score).

^d*p*-values were calculated by chi-square tests. Statistically significant *p*-values (*p* < 0.05) are bolded.

^eChild(ren) age group describes the age(s) of all children < 18 years in the household. "Young only" is selected if all children are < 5 years of age. "Old only" is selected if all children are ≥ 5 years of age. "Both young and old" is selected if the ages of all children in the house include both < 5 years and ≥ 5 years of age.

high = 13.5 times per month; $p = 0.738$) than parents with a high eHealth literacy score. Those with high eHealth literacy (13.1 times per month) searched the Internet for parenting-related information more often than those with low eHealth literacy (7.8 times per month; $p = 0.053$).

Social Media Use

Most parents reported owning a smartphone (97.4%). Facebook was used most frequently by parents (93.6%). Approximately 78% (77.8%) of parents reported using Facebook daily, averaging 3.8 times per day. Following Facebook, parents most often had a profile on Pinterest (45.7%), Instagram (45.5%), and Twitter (30.2%). Parents reported an average use of 1.9 times per day, 1.3 times per day, and 0.6 times per day for Instagram, Twitter, and Pinterest, respectively. When asked about which safety topics were viewed in their SM feed in the past three months, parents indicated seeing SM posts for all safety topics on each SM platform. Motor vehicle crashes represented the most frequently viewed topic on Facebook (34.3%), Twitter (8.4%), and Instagram (5.1%), while safe infant sleep was the most commonly viewed topic on Pinterest (13.2%).

Parents most frequently used SM to obtain parenting-related information (34.7%), followed by health-related information for their child (29.0%) and child safety or child injury prevention information (24.0%). On average, parents used SM for parenting-related, health-related, and child safety or child injury prevention information 17.6, 19.9, and 10.6 times per month. Compared to parents with high eHealth literacy, parents with low eHealth literacy searched SM more frequently for health-related (35.5 vs. 17.8 times per month; $p = 0.068$), parenting-related (25.4 vs. 16.4 times per month; $p = 0.022$), and child safety or child injury

prevention (27.2 vs. 8.5 times per month; $p = 0.032$) information.

Ability to Identify Post Topic, Recommendation, and Image Match by eHealth Literacy Level

For all three SM posts shown in the survey, most participants ($\geq 86.9\%$) correctly identified the post topic, the recommended action, what the image showed, and whether the image depicted the correct safety behavior (Table 2). Nearly all participants recognized the topic of the SM post (poison prevention: 97.4%; safe sleep: 98.2%; bike safety: 99.4%). A smaller proportion of parents knew whether the SM post image showed the recommended safety behavior for SM posts with mismatching information (safe sleep: 86.9%; poison: 89.9%) compared to the SM post with matching information (bike safety: 93.2%).

The percentages of parents who responded correctly to the SM post knowledge questions differed by parental eHealth literacy level (Table 2). Compared to low eHealth literate parents, a significantly larger proportion of high eHealth literate parents recognized that the photo did not illustrate the recommended safety behavior for SM posts with mismatching text and image (i.e., the safe sleep (89.0% vs. 75.4%; $p = .0081$) and poison prevention (92.0% vs. 78.2%; $p = .0052$) topics. A larger, but not significant, proportion of high eHealth literate parents recognized that the photo showed the recommended safety behavior for the SM post with matching text and image (i.e., bike safety; 93.3% vs. 92.2%; $p = .7022$). Within each eHealth literacy group, the proportion of parents who knew whether the SM post image showed the recommended safety behavior was largest for the bike safety SM post with matching image and text, compared to the mismatching safe sleep and poison prevention posts (low: bike = 92.2%, sleep

Table 2

Percentage of Participants Who Responded Correctly to Social Media Post Questions, Overall and Stratified by eHealth Literacy Level

Social Media Post ^a	Overall	Low eHealth ^b	High eHealth ^b	<i>p</i> -value ^c
Bike Safety				
Knows post topic	99.4	95.9	100.0	n/a ^d
Knows text recommendation	94.2	88.9	95.1	0.0594
Knows what image showed	89.5	83.5	90.6	0.1075
Knows if image showed recommended safety behavior	93.2	92.2	93.3	0.7022
Safe Sleep				
Knows post topic	98.2	97.5	98.3	0.6875
Knows text recommendation	88.3	81.8	89.5	n/a
Knows what image showed	91.4	87.7	92.0	0.0066
Knows if image showed recommended safety behavior	86.9	75.4	89.0	0.0081
Poison Prevention				
Knows post topic	97.4	95.2	97.8	n/a
Knows text recommendation	96.7	89.7	98.0	0.001
Knows what image showed	99.9	99.2	100.0	n/a
Knows if image showed recommended safety behavior	89.9	78.2	92.0	0.0052

Note.

^aThe bike safety post had matching image and text. The safe sleep and poison prevention posts had mismatching images and texts.

^beHealth literacy levels were defined as low (< 26 eHeals score) and high (≥ 26 eHeals score).

^c*p*-values were calculated by chi-square tests. Statistically significant *p*-values (*p* < 0.05) are bolded.

^dn/a = not applicable; Chi-square test not available because 1 or more cells had 0 observations.

= 75.4%, poison = 78.2%; high: bike = 93.3%, sleep = 89.0%, poison = 92.0%). The difference in the percentage of parents who knew whether the image showed the recommended safety behavior between matching and mismatching SM posts was

larger for low eHealth literate parents (matching: 92.2% vs. mismatching: 76.8% average; *p* = 0.698) than for high eHealth literate parents (matching: 93.3% vs. mismatching 90.5% average; *p* = 0.943; Figure 2).

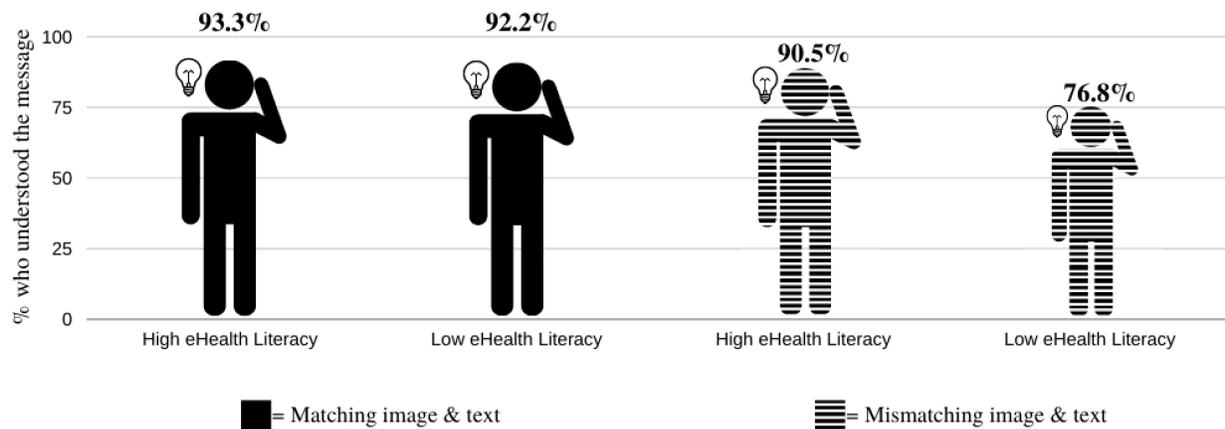


Figure 2. Percentage of participants who understood the social media message, stratified by matching and mismatching social media posts and eHealth literacy level.

For the bike safety SM post with matching image and text, parents with high and low eHealth literacy level had similar odds in recognizing whether the image showed the recommended safety behavior (OR = 1.06; 95% CI: 0.31-3.60; $p = 0.487$; Table 3), after adjusting for knowing the topic, the text, and the image of the SM post, as well as education level. For the safe sleep SM post with mismatching image and text, parents with high eHealth literacy had significantly larger odds of knowing whether the image showed the recommended safety behavior (OR = 2.62; 95% CI: 1.06-6.48; $p = 0.037$) than parents with low eHealth literacy, adjusting for knowing the topic, the text, and the image of the SM post, as well as education level. After adjusting for similar covariates, parental eHealth literacy level was marginally associated with the odds of knowing whether the image showed the recommended safety behavior (OR = 2.34; 95% CI: 0.97-5.69; $p = 0.059$) for the mismatching poison prevention post. Knowing the image for all three topics (bike safety: $p < 0.0001$; safe sleep: $p < 0.0001$; poison prevention: $p = 0.003$) and recognizing what the photo showed (bike safety: $p = 0.001$; safe sleep: $p < 0.0001$;

poison prevention: p -value not available because covariate predicts success perfectly) were significantly associated with correctly knowing if the image showed the recommended safety behavior.

Discussion

Our findings illustrate whether and how U.S. parents of young children are using the Internet and SM to garner information related to child health, parenting, and child safety or child injury prevention information. These results are also a foray into illustrating how elements of a SM post are understood and interpreted by parents with high and low eHealth literacy levels. Parents were highly engaged in the Internet, using it for nearly three hours per day for personal use, and often participated in SM, using their accounts daily for personal use. This information is not surprising, as 100% and 97% of people in the United States aged 18-29 and 30-49 years, respectively, are Internet users (Pew Research Center, 2019a). Similar to other research, parents used these platforms less frequently (10.6-19.9 times per month) to seek child health-related, parenting-related, and child safety or child injury prevention

Table 3

Odds Ratios (OR) for Associations between Parental eHealth Literacy Level^a and Knowing whether the Image Showed the Recommended Safety Behavior

Social Media Post Topic^b		Adjusted OR^c	95% CI
Bike Safety	Knows text recommendation	0.07	0.01-0.65 75.68-
	Knows what image showed eHealth literacy level	637.76 1.06	5374.28 0.31-3.60
Safe Sleep	Knows text recommendation	6.02	2.18-16.63
	Knows what image showed eHealth literacy level	7.79 2.62	2.47-24.54 1.06-6.48
	Knows text recommendation	8.28	2.07-33.14
Poison Prevention	Knows what image showed ^d eHealth literacy level	omitted 2.34	omitted 0.97-5.69

Note.

^aHigh eHealth literacy level (≥ 26 eHeals score) was compared to low eHealth literacy level (< 26 eHeals score).

^bThe bike safety post had matching image and text. The safe sleep and poison prevention posts had mismatching images and texts.

^cModels adjusted for knowledge of the topic, text, or image, as well as parental education level, for each social media post topic.

^dData were omitted because covariate predicted success perfectly.

information, despite being a common injury resource (Manganello et al., 2016).

Moreover, more parents indicated using the Internet compared to SM to obtain information on these topics, with the largest percentage of parents seeking child health-related information on the Internet (70%), and the smallest percentage (24%) of parents searching for child safety information on SM. Although parents are using the Internet and SM to search for child health-related, parenting-related, and child safety or child injury prevention information less frequently than for their personal use, they are seeking this information multiple times per month,

placing utmost importance on the necessity that information shared through SM posts is accurate and will be interpreted correctly.

We found that parental seeking of child health-related, parenting-related, and child safety information differs by eHealth literacy level, where parents with low eHealth literacy use the Internet and SM more than parents with high eHealth literacy to obtain this information. Our findings differ from a previous study on pediatric injury information seeking, which found that the Internet was less likely to be used as a health-information seeking tool among low eHealth literate mothers compared to high eHealth

literate mothers (Manganello et al., 2016). This discrepancy may be because of the time elapsed between studies, the difference in eHealth literacy classification, and the sample consisting of mothers only (Manganello et al., 2016).

What is not fully understood is whether a SM post with matching or mismatching image and text best enables the viewer to understand the SM post's safety message. A scarce amount of research exists on how to implement those recommendations and what elements and traits of SM posts are most effective to ensure viewer uptake of the SM post message (Manganello et al., 2016). The CDC recommends that SM posts should be easy to understand and share, should have a friendly, conversational, and engaging tone, should contain action-orientation messages, and can include images (CDC, 2012a), but has not provided guidance on the format of those images. The CDC also emphasizes the use of plain language given that approximately 1 in 3 adults has below basic health literacy skills (CDC, 2012a). These recommendations do not include recommendations on how to create SM post content for various eHealth literacy levels, which may be an important and crucial aspect of SM messaging and comprehension (Manganello et al., 2016; Richtering et al., 2017). Our results indicate that for both high and low eHealth literate parents, a larger percentage of parents recognized whether the image reflected the recommended safety behavior for matching versus mismatching posts. This information indicates that a SM post format illustrating the recommended safety behavior might better assist parents of all eHealth literacy levels in understanding the main message of the post. Furthermore, our study's findings indicate that a significantly larger proportion of high eHealth literate parents compared to low eHealth literate parents correctly knew whether the image showed the recommended safety behavior in SM

posts where the image and text were mismatched. When the SM post image and text were matching, there was no difference in the percentage of parents who correctly identified the image showed as the recommended safety behavior. Our regression findings suggest that SM posts with mismatching image-text may be detrimental to parents with low eHealth literacy, as they are less likely to know whether the image showed the recommended safety behavior than parents with high eHealth literacy. This disadvantage to low eHealth literate parents does not exist when the SM has matching image and text because both low and eHealth literate parents have similar odds of knowing whether the image showed the recommended safety behavior in this context.

Consequently, we recommend that SM posts shared by disseminators should have an image that illustrates the recommended safety behavior and is matched with the provided text. If the SM post image and text are mismatching, and if the image is not illustrative of the recommended safety behavior, parents with low eHealth literacy are more disadvantaged than parents with high eHealth literacy because they are at greater risk for not understanding the SM post message. Since eHealth literacy is correlated with health literacy level (Neter et al., 2015), it may be that low eHealth literate parents do not have the ability to accurately read the text on the SM post, thus they cannot glean the correct recommendation from the image or the text. Disseminators should not sacrifice understanding of the accurate information for attention-seeking posts or shock value. These recommendations should be added to the CDC's existing SM guidelines and toolkit (CDC, 2012b).

Despite our study results providing novel information, this study has some limitations. First, participants were sampled from a consumer survey panel to complete an online survey. Participants typically accessed the

Internet, which may introduce bias into the eHealth literacy distribution. Future studies that sample parents in alternate ways may prevent this particular bias. Second, we did not assess parents' prior knowledge on the three injury topics featured in the SM posts. Parents may have had prior knowledge about the three safety topics, for example they may have already known that a SM post image illustrated the recommended safety behavior without having to read the text in the post. Determination of parents' prior knowledge of the injury topic may help address this bias. Third, only three SM posts were shown, thus potentially yielding data that could differ if other topics were used. Fourth, SM posts were not displayed to parents in an organic manner, as if they are scrolling through a newsfeed. Fifth, the injury topics displayed on the SM posts may not be currently relevant to all parents; for example, it could be that their children no longer sleep in a crib and thus crib safety is not applicable, increasing the likelihood of parents not knowing the recommended safety behavior. Future research using unedited posts in an organic setting, with parents looking at only relevant topics should be developed. Despite these limitations, data from this study illustrate important preliminary information on the significance SM post formatting has on parental understanding and uptake of accurate information.

The Internet and SM are promising tools for injury professionals and other disseminators to share important child health and safety information. Health agencies and organizations should format SM posts with matching imagery and text, with the image illustrating the recommended safety behavior, to facilitate parental understanding of recommendations. Future research is needed to examine parental visual attention to SM posts and their consequential recognition and learning of the suggested safety behavior. Given the attention and time

being paid to SM, health agencies and organizations have an opportunity to ensure their reach to parents, providing information that can promote injury prevention through safety recommendations to this priority population.

Implication for Health Behavior Theory

SM is a mechanism for observational learning, and our findings underscore the importance of the match between image and text content. Electronic health literacy appears to serve as a moderator of a parent's ability to recognize the proper behavioral action within a SM post. Interventions in the form of SM campaigns may lead to the uptake of correct knowledge of safety messaging and safety behavior among parents. The data from this study provide important information regarding the formatting of the SM posts within those campaigns, encouraging additional work grounded in health behavior theory to ensure parents are understanding the messages. Our study findings indicate that when using SM to communicate with parents, health professionals, and others, SM campaigns should consider the role of electronic health literacy in the development of message-based interventions, and theoretical frameworks informing injury prevention messaging.

Discussion Questions

1. Our findings indicate that in order to best facilitate parental understanding of safety recommendations, social media posts should be formatted with matching imagery and text, where the image illustrates the recommended safety behavior. Social media can reach a broad range of populations. How can we create a database of images that best reflect the messages we are trying to convey and are available for widespread use?

2. Social media can reach a broad range of populations. How can agencies consider the diverse needs of their followers when creating injury prevention, and any public education-oriented, messages?

Aknowledgements

This study was supported by Grant Number R49CE00216 from the Centers for Disease Control and Prevention awarded to the Abigail Wexner Research Institute at Nationwide Children's Hospital. The authors have no conflicts of interest to report, financial or otherwise.

References

- Ahmed, O. H., Lee, H., & Struik, L. L. (2016). A picture tells a thousand words: A content analysis of concussion-related images online. *Physical Therapy in Sport, 21*, 82-86.
<https://doi.org/10.1016/j.ptsp.2016.03.001>
- Baskerville, N. B., Azagba, S., Norman, C., McKeown, K., & Brown, K. S. (2016). Effect of a digital social media campaign on young adult smoking cessation. *Nicotine & Tobacco Research, 18*(3), 351-360. <https://doi.org/10.1093/ntr/ntv119>
- Berkman, N. D., Davis, T. C., & McCormack, L. (2010). Health literacy: What is it? *Journal of Health Communication, 15 Suppl 2*, 9-19.
<https://doi.org/10.1080/10810730.2010.499985>
- Centers for Disease Control and Prevention (CDC). (2012a). CDC's guide to writing for social media.
<https://www.cdc.gov/socialmedia/tools/guidelines/pdf/GuidetoWritingforSocialMedia.pdf>
- Centers for Disease Control and Prevention (CDC). (2012b). Social media guidelines and best practices.
<https://www.cdc.gov/SocialMedia/Tools/guidelines/pdf/FacebookGuidelines.pdf>
- Chou, W. S., Prestin, A., Lyons, C., & Wen, K. Y. (2013). Web 2.0 for health promotion: Reviewing the current evidence. *American Journal of Public Health, 103*(1), e9-18.
<https://doi.org/10.2105/AJPH.2012.301071>
- Costa-Font, J., Mossialos, E., & Rudisill, C. (2009). When is the Internet a valued communication device for health information in Europe? *Economics of Innovation and New Technology, 18*(5), 429-445.
<https://doi.org/10.1080/10438590802547159>
- Drake, S. A., Zhang, N., Applewhite, C., Fowler, K., & Holcomb, J. B. (2017). A social media program to increase adolescent seat belt use. *Public Health Nursing, 34*(5), 500-504.
<https://doi.org/10.1111/phn.12342>
- Elaheebocus, S. M. R. A., Weal, M., Morrison, L., & Yardley, L. (2018). Peer-based social media features in behavior change interventions: Systematic review. *Journal of Medical Internet Research, 20*(2), e20.
<https://www.doi.org/10.2196/jmir.8342>
- Freeman, B., Potente, S., Rock, V., & McIver, J. (2015). Social media campaigns that make a difference: What can public health learn from the corporate sector and other social change marketers? *Public Health Research & Practice, 25*(2), e2521517.
<http://dx.doi.org/10.17061/phrp2521517>

- Frost, J. H., & Massagli, M. P. (2008). Social uses of personal health information within PatientsLikeMe, an online patient community: What can happen when patients have access to one another's data. *Journal of Medical Internet Research*, *10*(3), e15.
<https://doi.org/10.2196/jmir.1053>
- George, D. R., Rovniak, L. S., & Kraschnewski, J. L. (2013). Dangers and opportunities for social media in medicine. *Clinical Obstetrics and Gynecology*, *56*(3), 453-462.
<https://doi.org/10.1097/GRF.0b013e318297dc38>
- Gough, A., Hunter, R. F., Ajao, O., Jurek, A., McKeown, G., Hong, J., Barrett, E., Ferguson, M., McElwee, G., McCarthy, M., & Kee, F. (2017). Tweet for behavior change: Using social media for the dissemination of public health messages. *JMIR Public Health and Surveillance*, *3*(1), e14.
<https://doi.org/10.2196/publichealth.6313>
- Hopkinson, N. S. (2014). Social media as a source of information for patients with chronic obstructive pulmonary disease. *Chronic Respiratory Disease*, *11*(2), 59-60.
<https://doi.org/10.1177%2F1479972314528959>
- Kearney, T. E., Lieu, D., Singer, N., Tsutaoka, B., Ho, R., & Olson, K. (2013). Investigating the reliability of substance toxicity information found on the Internet in pediatric poisonings. *Pediatric Emergency Care*, *29*(12), 1249-1254.
<https://doi.org/10.1097/PEC.00000000000000022>
- Korda, H., & Itani, Z. (2013). Harnessing social media for health promotion and behavior change. *Health Promotion Practice*, *14*(1), 15-23.
<https://doi.org/10.1177%2F1524839911405850>
- Lehto, T., & Oinas-Kukkonen, H. (2011). Persuasive features in web-based alcohol and smoking interventions: A systematic review of the literature. *Journal of Medical Internet Research*, *13*(3), e46.
<https://doi.org/10.2196/jmir.1559>
- Lemire, M., Paré, G., Sicotte, C., & Harvey, C. (2008). Determinants of Internet use as a preferred source of information on personal health. *International Journal of Medical Informatics*, *77*(11), 723-734.
<https://doi.org/10.1016/j.ijmedinf.2008.03.002>
- Li, F., Li, M., Guan, P., Ma, S., & Cui, L. (2015). Mapping publication trends and identifying hot spots of research on Internet health information seeking behavior: A quantitative and co-word biclustering analysis. *Journal of Medical Internet Research*, *17*(3), e81.
<https://doi.org/10.2196/jmir.3326>
- Maher, C., Ferguson, M., Vandelandotte, C., Plotnikoff, R., De Bourdeaudhuij, I., Thomas, S., Nelson-Field, K., & Olds, T. (2015). A web-based, social networking physical activity intervention for insufficiently active adults delivered via Facebook app: Randomized controlled trial. *Journal of Medical Internet Research*, *17*(7), e174.
<https://doi.org/10.2196/jmir.4086>
- Manganello, J. A., Falisi, A. L., Roberts, K. J., Smith, K. C., & McKenzie, L. B. (2016). Pediatric injury information seeking for mothers with young children: The role of health literacy and ehealth literacy. *Journal of Communication in Healthcare*, *9*(3), 223-231.

<https://doi.org/10.1080/17538068.2016.1192757>

Merchant, G., Weibel, N., Patrick, K., Fowler, J. H., Norman, G. J., Gupta, A., Servetas, C., Calfas, K., Raste, K., Pina, L., Donohue, M., Griswold, W. G., & Marshall, S. (2014). Click "like" to change your behavior: A mixed methods study of college students' exposure to and engagement with Facebook content designed for weight loss. *Journal of Medical Internet Research*, *16*(6), e158.
<https://doi.org/10.2196/jmir.3267>

Merchant, G., Weibel, N., Pina, L., Griswold, W. G., Fowler, J. H., Ayala, G. X., Gallo, L. C., Hollan, J., & Patrick, K. (2017). Face-to-face and online networks: College students' experiences in a weight-loss trial. *Journal of Health Communications*, *22*(1), 75-83.
<https://doi.org/10.1080/10810730.2016.1250847>

Moorhead, S. A., Hazlett, D. E., Harrison, L., Carroll, J. K., Irwin, A., & Hoving, C. (2013). A new dimension of health care: Systematic review of the uses, benefits, and limitations of social media for health communication. *Journal of Medical Internet Research*, *15*(4), e85.
<https://doi.org/10.2196/jmir.1933>

Neter, E., Brainin, E., & Baron-Epel, O. (2015). The dimensionality of health literacy and eHealth literacy. *The European Health Psychologist*, *17*(6), 275-280.

Norman, C. D., & Skinner, H. A. (2006). eHEALS: The eHealth Literacy Scale. *Journal of Medical Internet Research*, *8*(4), e27.
<https://doi.org/10.2196/jmir.8.4.e27>

Patrick, K., Marshall, S. J., Davila, E. P., Kolodziejczyk, J. K., Fowler, J. H., Calfas, K. J., Huang, J. S., Rock, C. L., Griswold, W. G., Gupta, A., Merchant, G., Norman, G. J., Donohue, M. C., Fogg, B. J., & Robinson, T. N. (2014). Design and implementation of a randomized controlled social and mobile weight loss trial for young adults (project SMART). *Contemporary Clinical Trials*, *37*(1), 10-18.
<https://doi.org/10.1016/j.cct.2013.11.001>

Pew Research Center. (2019a). Internet/broadband fact sheet.
<https://www.pewresearch.org/internet/fact-sheet/internet-broadband/>

Pew Research Center. (2019b). Social media fact sheet.
<https://www.pewresearch.org/internet/fact-sheet/social-media/>

Richtering, S. S., Hyun, K., Neubeck, L., Coorey, G., Chalmers, J., Usherwood, T., Peiris, D., Chow, C. K., & Redfern, J. (2017). eHealth literacy: Predictors in a population with moderate-to-high cardiovascular risk. *JMIR Human Factors*, *4*(1), e4.
<https://doi.org/10.2196/humanfactors.6217>

Simpson, E. M., Moll, E. K., Kassam-Adams, N., Miller, G. J., & Winston, F. K. (2002). Barriers to booster seat use and strategies to increase their use. *Pediatrics*, *110*(4), 729-736.
<https://doi.org/10.1542/peds.110.4.729>

Thackeray, R., Neiger, B. L., Smith, A. K., & Van Wagenen, S. B. (2012). Adoption and use of social media among public health departments. *BMC Public Health*, *12*, 242.
<https://doi.org/10.1186/1471-2458-12-242>

Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research*, *12*(1), e4.
<https://doi.org/10.2196/jmir.1376>