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Effect of provider recommendation style on the length of adolescent vaccine discussions

Anny T.H.R. Fenton[a], **Chelsea Orefice**[b], **Terresa J. Eun**[c], **Dea Biancarelli**[d], **Amresh Hanchate**[e], **Mari-Lynn Drainoni**[f,g,h], **Rebecca B. Perkins**[i,*]

[a]Maine Medical Center Research Institute, Portland, ME, USA

[b]Springfield Department of Health and Human Services, Springfield MA, USA

[c]Stanford University, Stanford, CA, USA

[d]Accenture, Boston, MA, USA

[e]Wake Forest School of Medicine, Winston-Salem, NC, USA

[f]Section of Infectious Diseases, Department of Medicine, Boston University School of Medicine, Boston, MA, USA

[g]Department of Health Law Policy & Management, Boston University School of Public Health, Boston, MA, USA

[h]Center for Implementation and Improvement Sciences, Boston University, Boston, MA, USA

[i]Department of Obstetrics and Gynecology, Boston University School of Medicine and Boston Medical Center, Boston, MA, USA

Abstract

[*]Corresponding author at: 85 E. Concord St., 6th Floor, Boston, MA 02118, USA. annyt_fenton@dfci.harvard.edu (A.T.H.R. Fenton), tjeun@stanford.edu (T.J. Eun), ahanchat@wakehealth.edu (A. Hanchate), drainoni@bu.edu (M.-L. Drainoni), rbperkin@bu.edu (R.B. Perkins).

Contributor's Statement

Dr. Fenton performed the statistical analysis and drafted, critically reviewed and revised the manuscript; Ms. Orefice performed all timing, and also critically reviewed and revised the manuscript; Ms. Eun and Biancarelli contributed to data collection and analysis; Dr. Hanchate contributed to statistical design and critically reviewed and revised the manuscript; Dr. Drainoni critically reviewed and revised the manuscript; Dr. Perkins conceptualized and designed the study, supervised data collection, and critically reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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The authors have no financial relationships relevant to this article to disclose.

Table of Contents Summary

Using an indicated (presumptive) vaccine recommendation style was associated with shorter discussions and higher vaccination rates, without negatively impacting parental satisfaction.

Data Sharing Statement

De-identified individual participant data will not be made available.

Clinical Trial Registration

The parent intervention study is registered in ClinicalTrials.gov, ID number NCT02812732. This manuscript does not report the result of the trial itself.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Objective: To determine whether providers' vaccine recommendation style affects length of the adolescent vaccine discussions.

Methods: We analyzed vaccine discussions using audio-recordings of clinical encounters where adolescents were eligible for HPV vaccines ± meningococcal vaccines. We measured length of vaccine discussions, the provider's use of an "indicated" (vaccination due at visit) or "elective" (vaccination is optional) recommendation style, and vaccine receipt. Parent and child demographics, parental vaccination intentions, and parental satisfaction with vaccine discussion were collected from pre- and post-visit surveys. We used linear and logit regressions with random effects to estimate recommendation style's association with discussion length and with vaccine receipt, respectively.

Results: We analyzed 106 vaccine discussions (82 HPV; 24 meningococcal) across 82 clinical encounters and 43 providers. Vaccine discussions were longer when providers presented vaccination as elective versus indicated (140 vs. 74 s; p-value < 0.001). Controlling for vaccine type, parental vaccination intent, and patient characteristics, an elective style was associated with 41 seconds longer vaccine discussion (p-value < 0.05). Providers used the indicated style more frequently with the meningococcal vaccine than with the HPV vaccine (96% vs. 72%; p-value < 0.05). Parents' odds of vaccinating were 9.3 times higher following an indicated versus an elective presentation (p-value < 0.05). Vaccine discussion length and presentation style were not associated with parental satisfaction.

Conclusions: Our results suggest that using an indicated recommendation improves vaccine discussions' efficiency and effectiveness, but this style is used more often with meningococcal than HPV vaccines. Increasing providers' use of indicated styles for HPV vaccines has the potential to increase vaccination rates and save time during medical visits.

Keywords

Vaccine communication; Visit duration; Patient satisfaction

1. Introduction

Vaccinations are among the most important preventative services that pediatricians provide to their patients [1], yet rising anti-vaccine sentiment has made delivering vaccines increasingly burdensome [2, 3]. Medical providers facing vaccine hesitancy cite difficulties such as time constraints and strained parent-provider relationships and want strategies to minimize the burden of vaccine hesitancy [3]. Therefore, feasible ways are needed to help pediatricians gain more time with their patients without sacrificing the quality of patient-provider interactions.

Numerous studies find that provider recommendation is crucial to vaccine receipt [4, 5, 6]. Clear, unambiguous language indicating that the provider expects the child to be vaccinated during the clinical encounter is associated with vaccination (e.g. "your child is due for the HPV vaccine today") [7, 8, 9]. This recommendation style has been described using the terms "presumptive," "announcement," and "indicated" [10, 11, 8]. In contrast, ambiguous language that does not convey a recommendation to vaccinate is associated with lower vaccination rates (e.g. "Would you like to start the HPV vaccine today?").

This recommendation style has been described as "conversation," "participatory," and "elective."[10, 11, 8] Yet, while indicated recommendations appear to be more effective than elective presentations in achieving vaccination, no studies to date examine how provider recommendation styles affect the length of vaccine discussions and data are mixed regarding the effects on patient satisfaction [8, 7]. To address this research gap, we analyzed audio-recordings of adolescent well-child visits to estimate an indicated versus an elective recommendation style's association with: (1) the time providers spent discussing meningococcal and HPV vaccines, (2) the likelihood of vaccine receipt, and (3) parental satisfaction with the vaccine discussion.

2. Methods

2.1. Intervention setting, participant recruitment, and data collection

We recruited 165 patient-parent dyads between January 2016 and March 2018 across five sites participating in DOSE-HPV, a multi-component intervention to improve HPV vaccination rates [8]. The sites consisted of pediatric and family medicine departments at three community health centers and one hospital based-practice. We recruited parent-child dyads if the child was eligible to initiate the HPV vaccine series and if the parent spoke English or Spanish. Recruitment rate was 80%. Parents filled out a pre- and post-visit survey measuring vaccine attitudes and knowledge and demographics. Recruited patients' clinical encounters were audio-recorded and all vaccine mentions and discussions were transcribed verbatim. Providers were told that eligible clinical encounters may be audio-recorded but they were not informed prior to a specific visit. Due to the observational study design, recordings were meant to capture natural patient-provider interactions. Therefore providers were not asked to alter their recommendation styles for audio recordings.

This study used a subsample of 82 of the original 143 complete audio-recorded visits that included a provider recommendation (*i.e.,* the provider, not parent, raised the subject of vaccination) and were conducted in English. We excluded 42 visits conducted in other languages or with an interpreter as these factors may affect the duration of conversations independent of the variables of interest. For similar reasons, we excluded three visits where the provider discussed the study, one visit where the provider phoned a parent, and another where the provider discussed two children's vaccine eligibility simultaneously. We excluded fifteen visits where the provider did not initiate the vaccine discussion and, therefore, we could not estimate presentation styles' association with vaccine discussion timing. In these instances, parents typically initiated the discussion by refusing or asking questions about vaccines. These parents had similar HPV vaccination uptake and parental vaccination intentions compared to the sampled group, however (HPV vaccination uptake: 87% vs. 90%) and the same mean vaccination intention score (3.4 on a scale from 1 to 5). Another three recordings were excluded because the provider failed to mention vaccines and one because the provider recommended against vaccination due to the child's needle phobia. The institutional review board of Boston University Medical Center approved this study.

2.2. Measures

2.2.1. Vaccine discussion duration—We measured the time (seconds) spent discussing HPV and meningococcal vaccines. We did not measure conversations regarding Tdap (tetanus, diphtheria, and pertussis) immunization since the vaccine is required for school attendance in the region where we collected data. Determining the time spent discussing each vaccine entailed two steps. First, we reviewed transcripts of audio-recorded clinical encounters in seconds and identified and marked for timing all meningococcal and HPV vaccine discussions among primary care providers (defined as physicians or primary care nurse practitioners), parents/guardians (hereafter referred to as parents), and adolescent patients. Second, study staff timed each marked conversation by listening to audio recordings and measuring the duration of each portion. The timing measurements were then validated by a second investigator (RBP) to ensure accuracy. We marked the beginning of HPV and meningococcal vaccine discussions based on when the provider initiated the vaccine conversation by presenting the vaccine(s). We timed and included all conversations related to vaccination where the provider, patient, and parent were present. We excluded conversations that were unrelated to vaccination (e.g. discussions of other health issues) and portions of the visit devoted to vaccine administration since our goal was to capture conversations concerning vaccine decision-making.

If a child was eligible for both vaccines, we treated the clinical encounter as containing two vaccine discussions and separately measured each vaccine's discussions. If either vaccine was mentioned at other points during the encounter, we timed each portion of those conversations separately, then added the duration of all vaccine conversations. We separated vaccine discussions to avoid biasing our results since discussing two vaccines typically takes longer than only discussing one. Each vaccine discussion was parsed out and classified as "pre-decision" or "post-decision." Pre-decision timing included all conversation that occurred before the parent accepted or declined vaccination for their child. Vaccine-related dialogue that occurred after a decision was made was classified as post-decision timing; this typically included providers explaining vaccine scheduling and answering remaining questions. We measured these phases separately to assess whether recommendation styles could have differential associations with the length of pre-versus post-decision discussions. After the selected dialogue was timed, we summed the total vaccine conversation time (pre-decision + post-decision) for further statistical analysis.

2.2.2. Vaccination receipt—We determined vaccine receipt (yes/no) for each vaccine separately based on recordings of vaccine acceptance, administration, or refusal corroborated by post-visit surveys. Like the vaccine discussion duration measure, one clinical encounter could have two measures of vaccination receipt – one for HPV and one for meningococcal – if the patient was eligible for both vaccines.

2.2.3. Parent satisfaction with vaccination discussion—To minimize recall bias, parents were asked in post-visit surveys immediately after their clinical encounter about their satisfaction with the discussion for each vaccine separately. Therefore a clinical encounter could have two measures if the patient was eligible for both vaccines. Parents could respond on a 4-point Likert scale from "very dissatisfied" to "very satisfied."

2.2.4. Provider recommendation style—
Providers' vaccine presentations were coded as "indicated" (e.g. "your child is due for the HPV vaccine") or "elective" (e.g. "are you interested in the HPV vaccine?") based on the framework discussed above (see Fenton et al. (2018) for a full discussion) [8].

2.2.5. Parent vaccination intentions—
We assessed two measures of parental intent to vaccinate their child using the pre-visit survey. One against meningitis and a second against HPV at that day's visit in the pre-visit survey via a 5-point Likert scale ranging from "very unlikely" to "very likely."

2.2.6. Child demographics—
Demographics were collected from parents' pre-visit survey. Demographics included child's race/ethnicity, gender, and age.

2.3. Analysis

We used multivariable linear regression with random effects to estimate the association of provider vaccine presentation style with time spent discussing vaccines. To adjust for unobserved factors that may vary by doctor, we treated provider assignment as a random effect. Since patient factors including race and socioeconomic status can influence how providers communicate with patients and thus the time spent discussing certain issues [12, 13, 14], we ran exploratory models including covariates measuring child and parent race, gender, age, and parental education level. Due to limited sample size and multicollinearity between demographic variables, we only included child's race/ethnicity and gender as demographics. Models that included other demographics did not produce any meaningful differences in results. To assess whether vaccine presentation style potentially influenced a certain phase of the vaccine discussion, we estimated three models that separately predicted total, pre-decision and post-decision discussion time. To estimate presentation style's association with vaccination outcome (dichotomous), we used logistic regression and controlled for parent's vaccination intention, vaccine type, and child's race/ethnicity, gender, and age and treated doctor assignment as a random effect.

3. Results

Based on parental surveys, 42% of children were Black, 18% White, 17% Hispanic, and 23% other (Table 1). Parents self-identified as the same race as their child in >95% of cases. Slightly over half of children were identified as male (56%). The average age of children was 11 years, with a range of 9–17 years. Parents' average age was 42 years, with a range of 28–69 years. Parents' educational levels were distributed as follows: less than high school degree (13%), high school degree/GED (26%), some college/associate degree (35%) and college degree or higher (26%).

Parents' HPV vaccine pre-visit intention scores were the following: 44% "very likely" or "likely," 37% "undecided," and 20% "unlikely" or "very unlikely." Intentions followed a similar distribution for meningococcal vaccine: 42% "very likely" or "likely," 42% "undecided," and 17% "unlikely" or "very unlikely." HPV and meningococcal vaccination rates were similar (90% vs. 88%, respectively). Parents' satisfaction with vaccine discussion, assessed using post-visit surveys completed at the end of the visit, was 99% “satisfied” or “very satisfied.”

3.1. Provider vaccine presentation style & duration of vaccine discussions

In most vaccine discussions (77%), providers used an indicated rather than elective presentation style to initiate vaccine discussions (Table 2). However, providers adopted an indicated style more often when presenting meningococcal vaccines than HPV vaccines (96% vs. 72%; p-value = 0.014).

Providers and parents spent, on average, 89 seconds discussing either vaccine, with approximately three-quarters of time spent in the pre-decision phase deciding whether to vaccinate (62 s). Average post-decision vaccine discussions lasted 27 s and typically involved explaining vaccine administration or follow-up dosing schedules. Length of vaccine discussion varied significantly by presentation style. Total vaccine discussions were almost twice as long when providers used an elective versus an indicated presentation (140 vs. 74 s; p-value = 0.0004). Discussions following elective presentations were significantly longer primarily due to more time spent making the decision: pre-decision vaccine discussions lasted approximately one minute longer when providers used an elective style (114 vs. 47 s; p-value = 0.0000). The difference by presentation style was only one second for post-decision discussion (p-value = 0.96). Discussion length differed significantly by which vaccine was being discussed. The average HPV vaccine discussion lasted 101 s while meningococcal discussions were only 47 s on average (p-value = 0.004).

Regression models suggest that several factors, including presentation style, affect the amount of time spent discussing a vaccine (Table 3). An elective presentation style was associated with a 41 s longer total vaccine discussion, controlling for patient and parent factors and vaccine type. The models estimating the time spent discussing vaccines pre- and post-decision suggest that this additional time is primarily due to time spent deciding whether to vaccinate during the pre-decision phase. When comparing the three models, the elective coefficient in the models estimating total and pre-decision time is of similar size and statistical significance while the coefficient is small and non-significant when estimating post-decision time.

Vaccine type was associated with time: HPV vaccine discussions were associated with a 43 s longer total time compared to meningococcal vaccines. Parent intent to vaccinate was also related to vaccine discussion length. Vaccine discussions were associated with shorter discussions when parents were “likely” or “very likely” to vaccinate compared to parents who were “unlikely” or “very unlikely.” Importantly, patients’ characteristics also appeared to affect discussion length. White children and their parents had significantly longer vaccine discussions than patients with other racial/ethnic backgrounds. This difference held for the pre-decision conversations, although the coefficient was only marginally significant for patients with race/ethnicity categorized as ‘other’ (p-value = 0.058). Child’s gender was associated with the pre-decision phase with less time devoted to male patients.

3.2. Vaccination outcome

The logit regression model predicting likelihood of vaccine receipt was estimated across a sample of 60 vaccination discussions for analysis (Table 3). The final model did not include vaccine discussions if parents reported they were likely or very likely to vaccinate against the concerned vaccine in the pre-visit survey (46 discussions) because vaccination occurred in 100% of these discussions so there was no variation to estimate an association across these intention categories. Among the 60 vaccination discussions, 49 resulted in vaccination (82%). By vaccine type, there were 46 HPV vaccine conversations and 38 vaccinations (83%) and 14 meningococcal vaccine discussions of which 11 resulted in vaccination (79%). The model indicated that an indicated recommendation is associated with an approximately nine times increase in parents' adjusted odds of vaccinating versus an elective recommendation (p-value = 0.023). Recommendation style was the largest and only variable with a statistically significant association with receipt of vaccination.

4. Discussion

Findings from this study suggest that using an indicated style to present vaccination (e.g., "your child is due for the HPV vaccine") is more effective *and* efficient than an elective presentation (e.g., "would you like to vaccinate against HPV?"). We find that using indicated vaccine presentations were associated with a savings of 40 s per vaccine discussion on average and a nine-fold increase in parents' odds of vaccinating compared to an elective recommendation. We also found no evidence that these potential benefits risk compromising parental satisfaction with vaccine conversations; almost all parents were satisfied with the conversation regardless of presentation style. Our findings also suggest that indicated presentations are the norm for provider vaccine recommendation behavior, but not for all vaccines: in nearly every clinical encounter, providers presented the meningococcal vaccination as indicated compared to only 72% of HPV vaccine discussions. This is problematic since parents look to their child's provider for vaccine guidance [15, 16], and this disparity suggests parents may not receive equally clear messaging about both vaccines. Furthermore, research indicates that use of an indicated recommendation style is associated with lower rates of cumulative underimmunization over time [17].

Other research has also found that HPV vaccine discussions last longer than other adolescent vaccine discussions but relied on providers' estimates of vaccine discussion lengths [18, 19] while a small set of studies have used audio-recordings and, like ours, found indicated and presumptive styles are associated with vaccine uptake. [7, 8, 20, 21] Our study builds on these research areas, however, by using audio-recordings to investigate how provider communication techniques affect vaccine discussion length. Our results suggest that certain techniques not only increase uptake, but also save time. Like the existing body of evidence on provider recommendations and uptake, this study suggests that parents are significantly more likely to vaccinate after receiving a clear, unambiguous recommendation from a provider [10, 11, 8, 22, 23]. Our study also suggests that using an indicated recommendation style can further benefit providers and parents by increasing the efficiency of vaccine discussions, allowing more time to discuss other health concerns. Primary care providers face enormous time pressure [24], which is often cited as a reason for not providing aspects of care [25, 26], including HPV vaccinations [27]. Therefore, elucidating potential ways to streamline conversations may benefit patients and providers by creating additional time to address other health concerns. We hypothesize that the elective style elicited longer discussions since parents must probe to learn the provider's view and if the vaccine is due at that visit. Additionally the elective style is typically phrased as a question, which naturally elicits more conversation than the closed statements typical of indicated recommendations.

We also find evidence of racial/ethnic differences; being white was associated with spending approximately 50 s longer discussing vaccinations compared to non-White children. Literature suggests medical professionals and patients shape these differences: most studies find providers are less empathic and responsive to racial and ethnic minority patients and ask them fewer questions than White patients while racial and ethnic minority patients are also less likely to raise issues than Whites [28]. Since we do not separately measure providers', parents', and patients' contributions to the conversation or providers' race, we cannot assess who may drive these differences. However, additional analyses allowing children's race/ ethnicity's coefficient to vary by provider found no differences, suggesting whatever drives the disparities does not vary by provider. These differences may be a rare instance of an unproblematic or even beneficial racial/ethnic healthcare disparity, however, since, shorter conversations may leave more time for other health concerns and we find no racial/ethnic disparities in vaccine uptake.

Study limitations include a small sample size and observational study design. Patients and providers were not randomly assigned to different recommendations styles. Therefore other unobserved variables may have affected provider, patient, and parent dialogue and produced different discussion timings. We also only sampled English conversations, so could not assess the impact of recommendation style on conversation duration in other languages. Parents were surveyed about vaccination intent prior to the visit and they and providers knew their vaccine conversations were being recorded, which could have biased behaviors and thus discussion duration. We did not include provider demographics although we attempted to account for differences between providers and their patient groups by modeling patient assignment as a random effect. Additionally only conversations with primary care providers about vaccination were analyzed and timed. Conversations with other medical staff, such as nurses or medical assistants, may have occurred and thus could have influenced the amount of time providers spent discussing vaccines. We did not routinely record these staff members' interactions with parents and patients, however, and thus could not analyze their potential effect. All but one meningococcal presentation was indicated, which makes it difficult to determine whether an elective approach would have impacted meningococcal vaccine uptake and discussion duration. Our findings' generalizability may be shaped by a northeast-based, urban sample, where HPV vaccination rates are higher than other US regions and/or non-urban areas [29].

4.1. Conclusions

Professional organizations, including the CDC and American Academy of Pediatrics, recommend using clear, unambiguous language to recommend vaccines. Studies suggest that strong recommendations increase the likelihood of HPV vaccination [7, 8, 9]. We find evidence that these communication techniques are also more efficient since they are associated with shorter vaccine discussions, potentially allowing more time to address other health issues during clinic visits. We also find, however, that that indicated presentations are used more often with meningococcal than with HPV vaccines. Our findings suggest that improving provider communication around HPV vaccines could result in higher vaccination rates *and* more efficient discussions.

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Abbreviations:

HPV	Human Papillomavirus
CDC	Centers for Disease Control and Prevention
DOSE-HPV	Development of Systems and Education to improve HPV vaccination rates
PI CME	Performance Improvement Continuing Medical Education
QI	quality improvement

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Table 1

Descriptive statistics of child and parent demographics (N = 82).

Variable	Percentage	N
Child's race/ethnicity		
Black	42%	34
Hispanic	17%	15
Other	23%	19
White	18%	14
Child's sex		
Female	44%	36
Male	56%	46
Child's age (years)	11.3 (mean)	9–17 (17range)
Parent's race/ethnicity		
Black	41%	34
Hispanic	15%	12
Other	18%	15
White	26%	21
Parent's sex		
Female	79%	65
Male	21%	17
Parent's age (years)[a]	42.0 (mean)	28–69 (range)
Parent's education		
Less than high school degree	13%	11
High school degree or GED	26%	21
Associate degree/some college	35%	29
Bachelor degree or Higher	26%	21
Parent pre-visit vaccination intention		
HPV[b]		
Very likely / Likely	44%	36
Undecided	37%	30
Unlikely / Very unlikely	20%	16
Meningococcal[b c]		
Very likely / Likely	42%	10
Undecided	42%	10
Unlikely / Very unlikely	17%	4
Child vaccinated at visit		
HPV (n = 82)	90%	74
Meningococcal[b] (n = 24)	88%	21
Parent post-visit satisfaction with vaccine discussion		
Very dissatisfied / Dissatisfied	1%	1
Satisfied / Very satisfied	99%	105

[a]Included both parents and legal guardians.

[b]Responses reported only for the 24 patients eligible for meningococcal vaccination/answering this question.

[c]Numbers sum to greater than 100% due to rounding.

Table 2

Vaccine discussions characteristics (N = 106).

	Percentage	N
Provider's vaccine presentation		
Irrespective of vaccine type (n = 106)		
Indicated	77%	82
Elective	23%	24
HPV (n = 82)		
Indicated	72%	59
Elective	28%	23
Meningococcal (n = 24)		
Indicated	96%	23
Elective	4%	1
Time spent discussing vaccination (seconds)		
By phase (n = 106)		
Total	89 (mean)	4–431 (range)
Pre-decision	62 (mean)	3–326 (range)
Post-decision	27 (mean)	0–202 (range)
By presentation style		
Indicated (n = 82)	74 (mean)	4–431 (range)
Elective (n = 24)	140 (mean)	27–362 (range)
By vaccine		
HPV	101	4–431 (range)
Meningococcal	47	4–176 (range)

Table 3

Multi-level multivariable linear regression model estimating time spent discussing vaccination (N = 106) and multi-level logit regression model estimating vaccine receipt (N = 60).

	Duration of vaccine discussion			Vaccination
	Total discussion (seconds)	**Pre-decision (seconds)**	**Post-decision (seconds)**	**(odds-ratio)**
Presentation style (ref. = Indicated)				
Elective	40.80 *	42.07 *	−3.418	0.11 *
	[2.55,79.06]	[9.29,74.85]	[−30.40,23.57]	[0.02,0.73]
Vaccine type (ref. = HPV)				
Meningococcal	−43.28 *	−31.85 *	−10.53	0.29
	[−78.54,−8.03]	[−60.84,−2.86]	[−35.40,14.33]	[0.04,2.16]
Parent vaccination intention (ref. = Very unlikely / Unlikely)				
Undecided	−23.11	−8.615	−17.26	2.031
	[−64.76,18.53]	[−44.70,27.47]	[−46.63,12.12]	[0.37,11.20]
Likely / Very likely	−45.86 *	−23.66	−22.49	–
	[−86.91,−4.809]	[−58.84,11.53]	[−51.45,6.47]	
Child’s sex (ref. = Female)	−11.35	−30.44 *	11.88	1.09
	[−40.35,17.65]	[−56.15,−4.73]	[−8.58,32.33]	[0.22,5.38]
Child’s age	−2.011	−1.804	−1.374	0.97
	[−10.64,6.62]	[−9.20,5.59]	[−7.46,4.72]	[0.64,1.46]
Child’s race/ethnicity (ref. = White)				
Black	−39.43 *	−41.60 *	3.521	1.04
	[−77.83,−1.023]	[−75.87,−7.33]	[−23.57,30.61]	[0.14,7.87]
Hispanic	−57.80 *	−43.98 *	−13.30	0.49
	[−101.8,−13.76]	[−82.58,−5.375]	[−44.37,17.76]	[0.06,4.12]
Asian / Other	−64.14 **	−38.32	−19.20	1.82
	[−108.8,−19.49]	[−77.93,1.299]	[−50.69,12.30]	[0.11,30.65]
Constant[a]	196.9 **	172.8 **	47.76	–
	[75.29,318.5]	[66.71,278.9]	[−38.03,133.5]	

95% confidence intervals in brackets. All models take into account clinician assignment as a random effect.

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* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$.

[a] Constant measures the average seconds spent on discussion when all other covariates are zero.