Parenting the TikTok algorithm: An algorithm awareness as process approach to online risks and opportunities

Samuel Hardman Taylor [a,*], Kellie St.Cyr Brisini [b]

[a] *University of Illinois Chicago, USA*
[b] *Louisiana State University, USA*

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ABSTRACT

Teens inhabit an algorithmically curated digital world. Thus, algorithm awareness has emerged as a critical digital skill for parents of teens to mitigate online risks and maximize online opportunities. This study explores how parents' algorithm awareness of the TikTok "For You" feed relates to perceived online risks and opportunities as well as parental mediation strategies. A survey of U.S. parents found that greater algorithm awareness on TikTok was associated with more negative attitudes about the TikTok algorithm via the mediator of perceived TikTok risks. Parents with negative attitudes about algorithms on TikTok were more likely to prohibit their teenager from using TikTok, but algorithm awareness and attitudes were unassociated with other parental mediation strategies. This study contributes to research on digital parenting practices, suggesting that (a) perceptions of risks, not opportunities, frame the algorithm awareness process for parents and (b) algorithm awareness may operate differently than other digital skills.

1. Introduction

Nearly every aspect of teens' digital lives intersects with data-driven algorithms, which take data collected about teenagers and transform it into personalized media feeds (Zarouali, et al., 2021). This type of algorithmic curation was identified as a risk related to teens' use of the Internet because algorithms have implications for privacy, information literacy, and user agency (Livingstone & Stoilova, 2021). In turn, these algorithms have implications for parents, as parents are often tasked with helping their teens navigate risks and opportunities of the digital frontier (Page Jeffery, 2021). Research on parenting in the digital age has focused on digital literacies and skills that parents (and teens) can develop to effectively cope with the demands of a digital world (e.g., Livingstone et al., 2017; Rodríguez-de-Dios et al., 2018). Algorithm awareness represents an emergent, yet necessary, digital skill for parents to understand their teenager's current media environment, but it has often been outside the scope of other research on parents' digital skills (Dogruel et al., 2022; Gran et al., 2021). Thus, this study fills a research deficit by examining algorithm awareness as a key digital media skill for parents of teens.

Although most social media use algorithms, the centrality of algorithms as a pressing parenting question is highlighted by the "For You"

feed of TikTok. Not only are approximately two-thirds of U.S. teens using the platform (Vogels et al., 2022), but the TikTok "For You" algorithm appears vital to why teens are flocking to the application. According to TikTok (2023, p. 2023), the "For You" feed offers a personalized short-form video stream tailored to the user's specific interests, based on a variety of factors that are weighted by their algorithmic recommendation system. Exactly what is weighted or why remains a proprietary mystery, but teens and adults report that the TikTok algorithm is more enjoyable and more central to their use of the social media platform compared to others, such as YouTube, Facebook, or Instagram (Bhandari & Bimo, 2022; Lee et al., 2022; Taylor & Choi, 2022). Studies on TikTok suggest this algorithm presents *both* opportunities, such as identity exploration or education, as well as risks, including exposure to online harassment, unrealistic body standards, and misinformation (DeVito, 2022; Karizat et al., 2021; Simpson & Semaan, 2021). These same risks and opportunities frequently drive research on digital parenting practices (e.g., Byrne et al., 2014), suggesting a particular need for research on parenting and TikTok's "For You" algorithm.

The goal of this manuscript is to understand how algorithm awareness influences parenting practices related to TikTok. In the following sections, we use the *algorithm awareness as process* approach to

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understand how algorithm awareness may influence parenting approaches to TikTok (Siles et al., 2022). Our research builds theory about algorithm awareness by (1) elaborating the mechanisms of online risks and opportunities in algorithm attitude formation, and (2) positioning parental mediation strategies of TikTok as an outcome of algorithm awareness.

2. Theoretical framework

2.1. The algorithm awareness as process approach

Algorithm awareness is a digital skill that is foundational for making sense of the current data-driven media environment (Cotter & Reisdorf, 2020), including TikTok (DeVito, 2022). The algorithm awareness as process approach was developed to explain the steps needed for algorithms to influence communication behaviors (Siles et al., 2022), and we turn to this model to explain how algorithm awareness may affect parenting decisions related to TikTok. According to this framework, the first step is for the person to understand the existence of algorithmic curation of content on the media platform (Step 1: *algorithm awareness*), after which attitudes about the platform's algorithm(s) form (Step 2: *algorithm attitude*), and the development of algorithm awareness and attitudes, in turn, affect communication behaviors on that platform (Step 3: *behavioral outcomes*). This process approach stresses the temporality of the experiences generated by algorithms, suggesting the algorithm awareness process is non-linear because people iteratively come to understand, perceive, and communicate in algorithmically curated social media (e.g., Karizat et al., 2021).

Algorithm awareness is the first step in this process, and it is conceptualized broadly as the amount of knowledge an individual has about what an algorithm does and its effects on media usage, including the use of digital traces for automated personalization of media content as well as privacy and ethical implications (Zarouali et al., 2021). However, because of the ever-changing, opaque, proprietary systems, algorithm awareness is slippery (Hargittai et al., 2020). Algorithm awareness can quickly become outdated and is rarely verifiable, making algorithm awareness as a digital skill more amorphous and contested than other digital skills, such as how to connect to Wi-Fi or unfollow an account on social media (Gran et al., 2021).

The information that generates algorithm awareness can come from outside sources, such as media outlets or conversations with friends (DeVito et al., 2018), but this type of information acquisition tends to produce meager understandings of algorithms. Swart's (2021) interviews of young people found that this third-party knowledge dissemination about algorithms was also rare. Rather, algorithm awareness is most often gleaned from experiential education: using the platform (Cotter & Reisdorf, 2020; DeVito et al., 2018). This experiential learning may include noticing similarities (or differences) in curated content across the media ecology or experimenting with different inputs (e.g., likes, following, searching) to see how outputs change (Karizat et al., 2021; Siles et al., 2022). Research has addressed the predictors of algorithm awareness, finding that algorithm awareness represents a new digital skill divide (Gran et al., 2021). For example, algorithm awareness increases with education level but decreases with age. (Cotter & Reisdorf, 2020; Dogruel et al., 2021).

Algorithm awareness on TikTok presents an especially complicated digital skill for parents of teens because (a) TikTok does not provide explicit information about what digital traces are factored into curation decisions (TikTok, 2023), (b) the experiential knowledge requires they have and experiment with TikTok, and (c) algorithm awareness is inherently temporal and personal, meaning that parent's own algorithmic idiosyncrasies may not map onto the experience of their teen (Siles et al., 2022). Consequently, algorithm awareness may erroneously be imported from experiential knowledge from other platforms (Swart, 2021) or hinge on external sources of information, including their teen.

Once some level of algorithm awareness is reached, *algorithm*

attitudes are predicted to form (Siles et al., 2022). Algorithm attitudes are the valence of the affect generated by the weighing tensions of algorithmic curation, including surveillance, commercial exploitation, or bias, against the enjoyment and efficiency provided by algorithms (Silva et al., 2022). Research on Facebook's Newsfeed algorithm suggested that when people were made aware of algorithms, they initially formed negative attitudes, but over time people came to appreciate the convenience of algorithmic curation (Eslami et al., 2015). Multiple studies across a variety of cultures and platforms have found higher algorithm awareness is associated with more positive attitudes about the algorithm (Espinoza-Rojas et al., 2022; Gran et al., 2021; Taylor & Choi, 2022).

Following the algorithm awareness process, the quality of personalization—how well the curated feed represents the individual's identity, interests, and values—is a primary component of attitude formation (Siles et al., 2022). People tend to hold more positive attitudes about social media algorithms when algorithms curate content that represents the multifaceted, dynamic aspects of their identity, rather than siloing the person into one or two identity categories (Lee et al., 2022; Simpson & Semaan, 2021). People form attitudes by comparing algorithm curation across their media ecologies to understand which platform algorithm is better at signaling personalization (Espinoza-Rojas et al., 2022). Expectancy violations, such as recommendations that are irrelevant or eerily predictive of one's motivations, may also promote negative attitudes because they violate people's sense of privacy and agency (Bucher, 2017; Siles et al., 2022; Swart, 2021). Comparisons of popular social media for adults in the U.S. found that TikTok's algorithm was considered more responsive to the user's goals and identity than algorithms on Facebook or Instagram (Taylor & Choi, 2022).

With previous work focusing on the positive association between algorithm awareness and attitudes, we explore if a similar relationship exists for parents' attitudes about teenagers using TikTok. However, digital parenting research suggests that, rather than focusing on the quality of the personalization, parents will likely interpret algorithmic curation in their teen's life through the frame of online risks and opportunities (Livingstone & Helsper, 2008). *Online risks* represent activities that expose teens to potential harms (Byrne et al., 2014). These risks fall into four primary categories: aggressive (e.g., cyberbullying, violent content), sexual (e.g., pornography or unrealistic body standards), values (e.g., age-inappropriate content or misinformation), and cross-cutting (e.g., privacy or well-being; Livingstone & Stoilova, 2021). In contrast, *online opportunities* are potentially beneficial online content or activities for teens, including education, socializing, and political participation (Rodríguez-de-Dios et al., 2018; Stoilova et al., 2021). Online risks and opportunities vary by context factors, including developmental stage of the child, family values, culture, etc., which makes a definitive list difficult to innumerate (Byrne et al., 2014; Page Jeffery, 2021). Research on TikTok suggests the "For You" feed algorithm promotes both risk and opportunities for individuals. For example, it generates new avenues for online harassment of marginalized groups and can create information silos (DeVito, 2022; Simpson & Semaan, 2021), but it also presents opportunities to find new communities and learn new skills (Lee et al., 2022).

Research suggests the risks and opportunities provided by new media are salient for parents because one of parents' primary goals is to reduce online risk and maximize online opportunities for their teens (Byrne et al., 2014; Livingstone et al., 2017; Sciacca et al., 2022). For instance, Page Jeffery (2021) found that parents interpreted technological affordances through a risk frame. In her interviews, the accessibility afforded by the mobile phone was considered a tool for cyberbullies to contact their teen anytime, anywhere. Thus, we argue a similar approach to maximizing opportunities and minimizing risks may guide parents' attitudes of algorithms on TikTok. To extend the algorithm awareness as process model, we ask if algorithm awareness among parents is associated with the perceived risks and opportunities of TikTok. Second, we investigate if TikTok algorithm awareness and attitudes are associated

with one another because of perceived TikTok risks and opportunities.

RQ1. For parents of teens, does TikTok algorithm awareness predict (a) more perceived risks and (b) more perceived opportunities of TikTok use?

RQ2. What is the relationship between TikTok algorithm awareness and algorithm attitude for parents of teens?

2.2. Parental mediation as an outcome of algorithm awareness

The third step in the algorithm awareness as process approach suggests that a person's algorithm awareness and attitudes will influence their communication behaviors on the medium (Siles et al., 2022). Outside of parenting, there is ample evidence that behavior on social media is influenced by algorithm awareness and attitudes. A longitudinal study of college students found that positive evaluations of the algorithm personalization on Instagram predicted more commenting, liking, and browsing of posts on the platform (Taylor & Choi, 2023). College students' folk theories about how Facebook's algorithm works altered their self-presentational strategies on the platform (DeVito et al., 2018). In addition, algorithm dissatisfaction may promote people to engage with the algorithm more, by unfollowing certain individuals or clicking the "like" button to improve the content the algorithm prioritizes (Karizat et al., 2021). Ultimately though, algorithmic dissatisfaction may lead to leaving the platform (DeVito et al., 2017; Siles et al., 2022).

For parenting on TikTok, parental mediation strategies represent important communication behaviors that may be associated with algorithm awareness and attitudes. Parental mediation refers to how parents communicate with their teen about media use (Chen & Shi, 2019). Livingstone et al. (2017) identified two overarching approaches to online parental mediation. *Enabling parental mediation* strategies construct a scaffolding for teens to use digital media safely. These strategies are a conglomerate of parent-child communication about usage and safety, implementation of technical controls to block certain types of content or interactions, and monitoring their teen's internet use. For TikTok, enabling mediation strategies could include discussing the commercial interests of TikTok with the teen or setting technologically imposed time restrictions on the application.

A second mediation option is to limit the use of certain technologies or online activities, referred to as *restrictive mediation*. Restrictive mediation takes two forms on TikTok: (1) banning teens from having a TikTok account or (2) allowing teens to have a TikTok account but limiting their TikTok activities (e.g., posting videos). A meta-analysis of adolescent's general media use (i.e., internet, TV, gaming, social media) found that enabling mediation strategies had a small negative relationship with exposure to media-related risks, but it was only slightly better at reducing exposure to risks than restrictive strategies (Chen & Shi, 2019). Research on parental mediation of the Internet suggests the most efficient way of reducing exposure to online risks is via restrictive mediation (Livingstone & Helsper, 2008). Restrictive mediation, however, will also restrict opportunities and hinder teens' digital skills (Sciacca et al., 2022). In contrast, enabling mediation provides teens with more opportunities *and* more risks, suggesting that there is likely not a magical parental mediation potion for simultaneously reducing risks and increasing benefits (Livingstone et al., 2017).

Parenting mediation decisions depend upon a host of factors including age, gender, concerns about online risks, socioeconomic status, and parenting style (Byrne et al., 2014; Sciacca et al., 2022; Zhao et al., 2023), but there is growing emphasis on digital skills, for both parents and teens, as a predictor of parental mediation (Cabello-Hutt et al., 2018). Parent digital skills were negatively associated with restrictive mediation but positively associated with enabling mediation—as parents gain more skill, they tend to prefer enabling over restrictive mediation (Livingstone et al., 2017). Enabling mediation strategies may be preferred over restrictive for digitally skilled parents

because these parents feel more confident navigating both online risks and opportunities. However, there is less known about how the digital skill of algorithm awareness influences parental mediation. Given that the algorithm awareness process suggests that algorithm awareness and attitudes change communication behaviors, we explore the following research questions investigating parental mediation as a behavioral outcome of the algorithm awareness process.

RQ3. Does (a) algorithm awareness and (b) algorithm attitude predict enabling TikTok parental mediation?

RQ4. Does (a) algorithm awareness and (b) algorithm attitude predict restrictive TikTok parental mediation?

3. Method

3.1. Participants and procedures

Parents of teens were recruited via Prolific. Individuals in Prolific's system who were (a) over the age of 18, (b) located in the United States, (c) married or similarly committed, and (d) a parent to at least one child were invited to complete a brief pre-screen survey about the ages of their children. Participants who listed that they had children between the ages of 12 and 18 were invited to participate in the study. A total of 949 participants completed the pre-screen survey, and 427 parents met the screening criteria. A total of 367 completed the final survey, and 18 participants were removed due to incomplete responses or failed attention checks. Thus, our final sample size was 349 U.S. parents of teenagers. Table 1 contains demographic information for parents and their teenage child. A power simulation suggested that we had 85%

Table 1
Parent and teen demographic information.

Parent Demographic Information			
	%	*M*	*SD*
Age		43.61	7.40
Gender (%)			
Man	45.1		
Woman	54.0		
Non-binary or Other Gender	0.9		
Race/Ethnicity			
White/European American	80.2		
Black/African American	10.6		
Latina/o or Hispanic	6.0		
Asian	5.7		
Native American	1.7		
Pacific Islander or Native Hawaiian	0.03		
Other	0.09		
Number of Children		2.56	1.31
Relationship Length		16.87	7.34
Relationship Type			
Same-Sex	4.9		
Opposite-Sex	94.2		
Other	0.9		
TikTok Account			
Parent has a TikTok	42.1		
Parent does not have a TikTok	57.9		
Teen Demographic Information			
Age		14.39	1.80
Gender			
Boy	55.0		
Girl	42.7		
Non-Binary or Other Gender	2.3		
Teens with Smartphone	93.1		
TikTok Account			
Teen has a TikTok	61.0		
Teen does not have TikTok	31.2		
Does not know	7.7		

Note. One participant did not disclose gender. Participants were able to select more than one race/ethnicity. All teen demographic information was reported by the parent.

power to detect effects of $f = 0.05$. Before starting the study, participants first consented to participate in this IRB approved study. Next, participants answered demographic questions, and then were instructed to answer questions about their child between the ages of 12–18. If they had more than one teenager, they were asked to nominate one for this study. The first question asked was an open-ended item prompting parents to explain, as well as they could, how the TikTok "For You" feed works. To prevent demand effects on algorithm awareness, these responses were qualitatively reviewed as part of our descriptive analysis to understand the extent to which parents demonstrated algorithm awareness prior to reading the term in the survey. After, parents reported their TikTok algorithm awareness and TikTok algorithm attitude on close-ended scales. Parents also reported perceived risks and opportunities related to their teen using TikTok. Only parents with a teen who had TikTok answered measures about parental mediation of TikTok. Measures of enabling mediation and restrictive TikTok behaviors inquired about parent-teen interactions regarding the teen's TikTok use, making these questions only suitable to parents of teens with TikTok. All research questions, survey items, and data analysis plans were preregistered on OSF: https://osf.io/uk3te/.

3.2. Measures

3.2.1. Algorithm awareness

As typical for studies of algorithm awareness (e.g., Gran et al., 2021), we asked parents to self-report their algorithm awareness. The algorithmic media content awareness (AMCA) scale was adapted to the parenting TikTok context (Zarouali et al., 2021). This measure covers four areas of algorithm literacy: content filtering (e.g., "Algorithms are used to recommend videos to children on TikTok"), automated-decision making (e.g., "Algorithms are used to show children videos on TikTok based on automated decisions."), human-algorithm interplay (e.g., "The videos that algorithms recommend to children on TikTok depend on their online behavior on that platform."), and ethical issues (e.g., "Algorithms use children's data to recommend videos on TikTok, and that has consequences for their online privacy."). All items were summarized into an index, which were reported on a 5-point Likert-type scale of (1) not at all aware to (5) completely aware ($\alpha = 0.94$).

3.2.2. TikTok risks and opportunities

Parents were asked about the likelihood of their teen engaging in risks and opportunities associated with using TikTok. We derived our risks and opportunity scales based on previously identified categories of online risks and opportunities (see Livingstone & Stoilova, 2021; Stoilova et al., 2021). Risks included (1) violent or graphic content, (2) extremist or hateful information, (3) cyberbullying or online harassment, (4) pornographic content, (5) sexualized content, (6) unrealistic body image standards, (7) misinformation, disinformation, and other fake news, (8) unhealthy online communities, (9) age-inappropriate content ($\alpha = 0.93$). Opportunities included (1) socializing with offline or online friends, (2) learning new ideas or information, (3) learning new skills, (4) entertainment, (5) expressing or exploring their identity, and (6) civic or political participation ($\alpha = 0.70$). Answers were collected on a 5-point Likert scale (1 = *extremely unlikely*, 5 = *extremely likely*).

3.2.3. Algorithm attitude

Participant's algorithm attitudes for TikTok were measured using an established 9-item measure of social media algorithm attitudes (1 = *strongly disagree*, 7 = *strongly agree*; Silva et al., 2022). Example items include "The TikTok algorithm is helpful" and "The TikTok algorithm is invasive." Higher scores indicated more positive attitudes, $\alpha = 0.82$.

3.2.4. Parental mediation on TikTok

We used Livingstone et al. (2017)'s established scales of online parental mediation with alterations consistent with TikTok's

affordances. Enabling mediation was a composite score of *active mediation of TikTok use* (e.g., "Talk to your child about what they do on TikTok?", $\alpha = 0.83$), a*ctive mediation for TikTok safety* (e.g., "Suggest ways to use TikTok safely", $\alpha = 0.92$), *parental monitoring* (e.g., "Which videos your child watched on TikTok", $\alpha = 0.93$) on a 5-point Likert-type scale of 1 (*never*) to 5 (*very often*), and *technical controls* (e.g., "Parental controls or other means that limit the amount of time your child can spend on TikTok", 1 = *yes*, 0 = *no*, $\alpha = 0.96$). We used two indicators of restrictive mediation. First, parents were asked if their teen had a TikTok account. If parents reported their teen did not have TikTok (n = 109), then they were asked if this was because they (or another caregiver) do not allow the teen to have TikTok (n = 72). Second, parents of teens with TikTok were asked to report if they currently let their teen perform various TikTok behaviors, such as "Post a video on TikTok," with or without their permission. Permission answers ranged from (1) can do this anytime, (2) can only do this with my permission, or (3) can never do this, $\alpha = 0.80$.

3.2.5. Covariates

We included three covariates related to parent's use and familiarity of TikTok. For TikTok use, we included a dichotomous variable of whether or not the parent had their own TikTok account: 42.1% (n = 147) of parents used TikTok. For TikTok familiarity, parents were asked how familiar they were with TikTok (1 = *extremely unfamiliar*, 7 = *extremely familiar*). Following other research on parental mediation (e. g., Livingstone et al., 2017), we also included the covariate of concerns about risks. Parents reported on the extent to which they were worried about each of the nine online risks identified above (1 = *not at all concerned*, 7 = *very concerned*, $\alpha = 0.94$).

4. Results

4.1. Preliminary analysis

To explore the range of algorithm awareness in our sample, we first reviewed parents' open-ended responses to the question about how the TikTok "For You" feed works. As suggested by Hargittai et al. (2020), this question took place before we primed parents with the word "algorithm" in the close-ended survey questions. Our review of their responses focused on detecting if parents, in their own words, demonstrated awareness of algorithms on TikTok's "For You" feed. We considered algorithm awareness on a spectrum, from expressing no awareness to parents' mentioning algorithms and/or describing any functionality of algorithms (e.g., personalization, use of data to predict interests). Table 2 explains the different types of algorithm awareness discovered in response to this question and gives examples of parent's responses to this question. Notably, 25.9% of responses explicitly used the word "algorithm" and correctly described algorithms. More often parents showcased awareness of algorithms by describing one or more functions of algorithms without directly calling out algorithms (42.5%). Approximately 3 in 10 parents (31.6%) stated that they did not know how the "For You" feed works or described TikTok as a video sharing platform without mentioning any data-driven personalization. These responses showcase the range of algorithm awareness in our sample: from explicit awareness to no awareness of TikTok's "For You" algorithm at all.

We also probed the associations between algorithm awareness and demographic characteristics of our sample. Using linear regression, we predicted algorithm awareness with the following variables: parent age, teen age, parent gender, parent's having their own TikTok account, and teens having a TikTok account. Although teen's age was not associated with parents' algorithm awareness, $B = 0.02$, $SE = 0.03$, $p = .43$, parent age was negatively associated with algorithm awareness, $B = -0.02$, $SE = 0.01$, $p = .02$. Fathers ($M = 4.00$, $SE = 0.12$) reported more algorithm awareness than mothers ($M = 3.70$, $SE = 0.12$), $F (2, 337) = 4.07$, $p = .02$, but teen's gender was not associated with algorithm awareness, F

Table 2
Parental explanations/understanding of TikTok's "For You" feed.

	Description	Example Responses
Explicit algorithm awareness (25.9%)	Parents explicitly mentioned the algorithm and correctly described some functions.	• "The TikTok algorithms pick videos that would be popular with a person's demographics in order to increase their time engagement on the platform and increase TikTok's revenue." (P292) • "It uses the algorithm to find TikToks that are personally catered to what you like." (P185) • "What the algorithm thinks I like based on videos I look for/saved." (P95)
Awareness algorithm functionality (42.5%)	Parents described functions of algorithms, such as personalization, data-driven selection, predicting interests, recommendations, etc., without explicit mention an algorithm.	• "The "For You" feed provides similar videos to those you've previously watched, and/or, liked." (P36) • "This stream of videos is curated to your specific interests, making it convenient to find videos and creators you love." (P109) • "The system recommends content by ranking videos based on a combination of factors." (P118)
No algorithm awareness (31.6%)	Parent indicated that they did not know how the "For You" feed works or do not mention any algorithmic functionality.	• "I have no idea" (P78) • "I don't know" (P60) • "TikTok is a popular video sharing platform that allows users to create and share short videos on any topic" (P268) • "I think there are a lot of videos of kids dancing with different music, but I think now the videos are more than just dancing" (P91).

$(2, 337) = 1.15$, $p = .32$. Neither the teen ($B = 0.04$, $SE = 0.11$, $p = .74$) nor the parent ($B = -0.00$, $SE = 0.11$, $p = .99$) having a TikTok account was associated with algorithm awareness. Factors explained a small amount of the variance in algorithm awareness, $R^2 = 0.05$. Table 3 displays all other descriptive statistics and bivariate correlations for study variables.

4.2. Predicting TikTok risks and opportunities

RQ1 asked if algorithm awareness was associated with (a) perceived TikTok risks and (b) perceived TikTok opportunities. Research questions were investigated with a series of regressions using the PROCESS macro (v. 4.0.1) in R (Hayes, 2013). We used 10,000 bootstrapped resamples to generate bias corrected 95% confidence intervals for regression coefficients. We included the covariates of parent age, teen age, parent TikTok familiarity, parental concern about TikTok risks, and parent TikTok use. Covariates are reported when significant. Parent and teen gender were non-significant in all analyses and were removed from the models for parsimony.

Parents' algorithm awareness positively predicted the perceived likelihood of teen engaging in risky behaviors on TikTok, see Fig. 1. Perceived TikTok opportunities, on the other hand, were unassociated with algorithm awareness (Fig. 1). Regarding covariates, parents who did not have a TikTok account perceived greater TikTok risks for their teen, B = 0.22 [95%$_{CI}$ 0.02, 0.42], SE = 0.10, p = .03, and fewer TikTok opportunities, B = −0.32 [95%$_{CI}$ -0.47, −0.16], SE = 0.08, p < .001. Level of concern about TikTok risks was positively associated with perceived TikTok risks, B = 0.28 [95%$_{CI}$ 0.21, 0.35], SE = 0.03, p < .001.

4.3. Predicting algorithm attitude

RQ2 asked if algorithm awareness was associated with algorithm attitude because of the perceived risks and opportunities of TikTok. We explored this question using the prior model specifications, but in this analysis, perceived risks and opportunities were added as predictor variables. As displayed in Fig. 1, there was no direct relationship between algorithm awareness and attitudes after controlling for perceived risks and opportunities. However, perceived TikTok risks were negatively associated with TikTok algorithm attitude, and perceived TikTok opportunities were positively associated with algorithm attitudes. Thus, parents who perceived more risks had more negative attitudes towards TikTok algorithmic curation, whereas more perceived TikTok opportunities predicted positive attitudes. The covariate of concerns about TikTok risks had a significant negative relationship with attitude, $B = -.08$ [95%$_{CI}$ -0.15, −0.01], $SE = 0.04$, $p = .03$.

We conducted a parallel mediation analysis using PROCESS model 4 for R (see Fig. 1, Hayes, 2013) to determine if there was a relationship between algorithm awareness and algorithm attitudes that was explained by perceived TikTok risks and perceived TikTok opportunities. Results suggest that there was a negative indirect effect from algorithm awareness to algorithm attitude via perceived TikTok risk, $B = -.04$, [95%$_{CI}$ -0.08, −0.01], $SE = 0.02$. As algorithm awareness was unassociated with perceived TikTok opportunities, there was no indirect effect, $B = 0.01$, 95% CI = [-0.01, 0.03], $SE = 0.01$.

4.4. Predicting TikTok parental mediation

To understand how the TikTok algorithm was associated with

Table 3
Descriptive statistics and correlations for study variables.

	M(SD)	1	2	3	4	5	6	7	8	9
1 Algorithm Awareness	3.75(.94)	–								
2 Algorithm Attitude	3.85(.94)	−.07	–							
3 TikTok Risks	3.63(.96)	.16**	−.31***	–						
4 TikTok Opportunities	3.57(.70)	.08	.20***	.01	–					
5 Enabling Mediation	2.37(1.05)	.07	.11	−.05	.16*	–				
6 Restrictive Mediation	1.36(.46)	−.03	−.07	−.06	−.09	.43***	–			
7 Parent Age	43.61(7.40)	−.11*	−.08	−.06	−.09	−.28***	−.20**	–		
8 Teen Age	14.39(1.80)	−.02	.08	−.02	.02	−.33***	−.36***	.36***	–	
9 TikTok Concerns	5.38(1.49)	−.02	−.25***	.44***	.02	.20**	.21**	.00	−.17**	–
10 TikTok Familiarity	3.48(1.02)	.18***	.15**	−.02	.14**	.32***	.11	−.19***	−.04	−.10

Note. Risks and opportunity correlations are for all parents in sample (n = 349). Restrictive mediation refers to the restrictions on TikTok activities. Mediation strategy correlations are only for parents of teens with TikTok (n = 213).
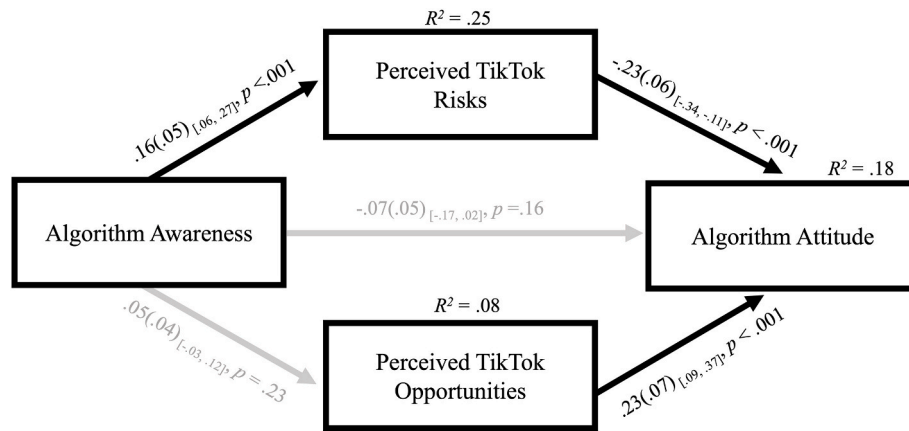*p < .05, **p < .01, ***p < .001.

Fig. 1. Indirect Effect of Algorithm Awareness on Algorithm Attitude via Perceived Risks and Opportunities
Note. 95% bootstrapped confidence intervals generated from 10,000 resamples. Non-significant paths are presented in gray.

parenting, we asked if algorithm awareness and algorithm attitudes were associated with TikTok enabling (RQ3) and restrictive parental mediation strategies (RQ4). This analysis had three outcome variables: enabling mediation strategies, restrictive mediation via banning TikTok, and restrictive mediation via limiting TikTok activities. The boot-strapped regression with enabling mediation and restrictions of TikTok behaviors included only parents who reported that their teen had a TikTok (n = 215). We analyzed the restrictive mediation strategy of banning TikTok using logistic regression (bootstrapped 10,000 resamples) predicting the odds of prohibiting TikTok (vs. allowing TikTok). We included four predictor variables from the algorithm as process approach: algorithm awareness, perceived risks, perceived opportunities, and algorithm attitude as well as previously identified covariates.

In response to RQ3, we detected no association between algorithm awareness or attitudes and enabling mediation (See Table 4). Yet, there were many covariate predictors of enabling mediation. Both parent age and teen age were negatively associated with enabling mediation. In contrast, the parents' use of, familiarity with, and concerns about Tik-Tok each predicted more enabling mediation strategies.

To address RQ4, we first analyzed the likelihood of parents allowing their teen to have a TikTok account versus prohibiting TikTok (See Table 4). Restricting teens from having a TikTok was not associated with algorithm awareness. Algorithm attitude was negatively associated with the odds of restricting teens from having a TikTok account—as parental algorithm attitudes increased, the likelihood of the parent restricting their teen from having a TikTok account decreased. Perceived TikTok risks were positively associated with likelihood of restricting TikTok

access. Several covariates remained significant predictors of this restrictive mediation, after accounting for the algorithm awareness process. Older teens were less likely to have TikTok prohibited than younger teens. Parental concerns about TikTok predicted greater odds of restricting their teen from TikTok. Finally, parents were more likely to restrict their teen's access to TikTok if the parent did not have a TikTok account themselves compared to parents with TikTok.

Next, we looked at restrictions placed on teens using TikTok (Table 4). Parental restriction of TikTok activities (i.e., restricting the types of interactions on TikTok) was unrelated to either algorithm awareness or attitude. More perceived risks of TikTok use predicted less restrictions on teen's behaviors, whereas concerns about TikTok harms predicted more restrictions. Parental restrictions on TikTok activities decreased as teens got older.

5. Discussion

Our driving research question asked how the contemporary digital skill of algorithm awareness is related to parenting practices in the digital age. Using the algorithm awareness as process approach to understand the potential influence of algorithms on parenting teens, we explored the relationship between parents' algorithm awareness for TikTok and their algorithm attitudes. Rather than accurate personalization, we surmised that parents may emphasize the perceived risks and opportunities of TikTok when forming algorithm attitudes. As the behavioral outcome of the algorithm awareness process, we investigated the extent to which TikTok algorithm awareness and attitudes predicted

Table 4
Algorithm awareness and attitudes predicting enabling and restrictive TikTok parental mediation.

	Enabling Mediation		Restriction of TikTok Use		Restriction of TikTok Activities	
	B(SE)[95% CI]	*p*	*B(SE)*[95% CI]	*p*	*B(SE)*[95% CI]	*p*
Intercept	3.64(.83)[1.93, 5.42]	<.001	2.83(2.69)[-2.86, 9.76]	.29	2.90(.38)[2.00, 3.79]	<.001
Algorithm Awareness	.08(.08)[-.09, .23]	.26	.10(.19)[-.32, .63]	.59	-.01(.04)[-.09, .05]	.67
Algorithm Attitude	.03(.07)[-.14, .18]	.72	-.53(.21)[-1.08, -.11]	.01	-.03(.03)[-.10, .03]	.35
Risks	-.11(.07)[-.27, .06]	.13	.63(.26)[.13, 1.45]	.01	-.08(.03)[-.15, -.01]	.02
Opportunities	.02(.10)[-.17, .21]	.82	-.31(.28)[-.96, .24]	.27	-.09(.05)[-.19, .01]	.044
Covariates						
Parent Age	-.02(.01)[-.04, -.00]	.046	.03(.03)[-.05, .10]	.40	-.01(.00)[-.01, .00]	.10
Teen Age	-.13(.04)[-.20, -.05]	.001	-.82(.15)[-1.30, -.59]	<.001	-.07(.02)[-.11, -.03]	<.001
TikTok Familiarity	.16(.07)[.03, .30]	.02	.05(.21)[-.40, .51]	.80	.05(.03)[-.00, .11]	.12
Parent No TikTok	-.51(.14)[-.80, -.22]	<.001	1.00(.42)[.18, 2.16]	.02	.01(.07)[-.13, .14]	.90
Concerns	.19(.05)[.09, .28]	<.001	.95(.23)[.53, 1.60]	<.001	.08(.02)[.04, .12]	<.001
R²	.32		.42		.22	

Note. 95% bootstrapped confidence intervals generated from 10,000 resamples. Only confidence intervals that did not cross 0 were reported as significant. Parent No TikTok is coded as 1 = does not have TikTok Account, 0 = has TikTok account. Restriction of TikTok Use was coded as 1 = restriction, 0 = no restriction. Logistic regression R^2 is McFadden.

parental mediation strategies. Because algorithm awareness is a digital skill, we speculated that it would influence choices parents make about enabling or restricting their teen's use of TikTok.

The findings of our cross-sectional survey extend the algorithm awareness as process approach and inform research on algorithm awareness as a digital skill. First, algorithm awareness was negatively associated with algorithm attitude, and this negative association was explained by parents' perceptions of TikTok risks. Second, algorithm attitude predicted the restrictive mediation practice of banning teens from having a TikTok account, although algorithm attitude was unassociated with any other parental mediation strategy. Algorithm awareness of TikTok did not predict parental mediation. Our project suggests that algorithm awareness as a process informs parenting on TikTok. We elaborate how these findings build research and theory about parenting in the age of data-driven algorithms.

5.1. Parenting and algorithm awareness as a process

The algorithm awareness as process approach suggests that once people are aware of algorithms, they will start to develop attitudes about them as curators of their everyday media use (Siles et al., 2022). Our first contribution was probing whether this relationship existed for parents of teens on TikTok and exploring online risks and opportunities as potential mechanisms. Previous research on algorithm awareness and attitudes found that people with more algorithm awareness also tend to report more positive attitudes about the algorithm (Espinoza-Rojas et al., 2022; Gran et al., 2021; Taylor & Choi, 2022). Our results were contrary to previous research; our data suggested a small negative relationship for algorithm awareness and attitudes for parents of teens. Importantly, this negative relationship was explained by the mechanism of perceived TikTok risks, meaning that parents with more awareness thought there was greater likelihood that their teen would engage in risky behaviors on TikTok. This perception of more risk was, in turn, linked with negative attitudes about TikTok's algorithm. Algorithm awareness, on the other hand, shared no relationship with the perceived likelihood of their teens engaging in opportunities via TikTok. These findings introduce questions about algorithm awareness as a digital parenting skill.

Algorithm awareness is discussed as a baseline skill for living in a world of algorithmic governance (Cotter & Reisdorf, 2020), as such this idea extends into discourses about parenting teens on social media (Livingstone & Stoilova, 2021). Although a headline takeaway from this study is that parents who know more about TikTok algorithms also perceive more risks about TikTok, our findings differ from previous research on digital skills and parenting, which have found that more digital skills among parents tend to be associated with teens engaging in *both* more risks and more opportunities (Livingstone et al., 2017). Thus, our findings invite questions about what is different about algorithm awareness as a digital skill for parents. One answer is in how algorithm awareness is obtained. Although parents may turn to external sources of information to learn about algorithms, external information is often incomplete and may not be representative of their teen's experience (Swart, 2021). For instance, mass media coverage of new technologies tends to create moral panics about risks without balancing opportunities (Orben, 2020). Research has suggested experiential learning is vital for algorithm awareness, especially through noticing how different inputs into the algorithm create different outputs (Cotter & Reisdorf, 2020; DeVito et al., 2018). As most parents in our sample did not even have their own TikTok account, this experiential education was likely quite limited. Even if parents had their own TikTok account, their experiential education is limited to the algorithm personalizing to them, rather than their teen. If external information is the primary source parents have to understand TikTok's algorithms, then what appears different about algorithm awareness as a digital parenting skill is the elusive but necessary algorithmic experiential education. On a practical level, these findings suggest that overcoming the complications of experiential education

may serve as a critical intervention for advancing algorithmic literacy for parents and teens. Our finding suggests that interventions should bridge the experiences parents and teens have with these hidden, proprietary algorithmic systems. An initial solution to start such bridges are through interventions that provide strategies to reduce the threat of conversations about algorithmic risks, as difficulty talking about online risks tends to create more gaps in parent-teen understanding (Byrne et al., 2014).

More broadly, for theory on algorithm awareness as process, our findings suggest an opportunity to build theory about what happens between the steps of algorithm awareness and attitudes. Numerous studies have noted a relationship between algorithm awareness and attitudes (Espinoza-Rojas et al., 2022; Hargittai et al., 2020), and our data suggest that answering why this relationship exists is a pressing question. Previous research has focused on algorithm awareness of personalization for oneself (e.g., Gran et al., 2021). Thus, the positive relationship between awareness and attitude stems from individuals' acknowledgement that algorithms offer them ease and enjoyment via personalized content (Eslami et al., 2015; Taylor & Choi, 2022). However, in our study, parents were asked to think about algorithm curation for their teenager, rather than themselves. This switch in the locus of algorithmic personalization may have triggered parents in our sample to frame algorithms outside of ease and enjoyment, focusing instead on the likelihood TikTok algorithmic curation will expose and encourage risks for teens. Hence, the locus of algorithm personalization offers one explanation for why our results are inconsistent with previous findings, suggesting a potential boundary condition to previous work—thinking about the self versus others. Outside of parenting, other work has suggested that there are individual differences in how algorithm awareness promotes attitudes (Silva et al., 2022). We see two pressing directions about algorithm attitude formation: (1) mechanisms explaining why awareness of algorithms cause positive or negative attitudes formation and (2) boundary conditions of those mechanisms.

5.2. Parental mediation and algorithm awareness

Our study of the algorithm awareness process for parents of teens also considered parental mediation as a possible behavioral outcome of this model. Our results suggest that parents with negative attitudes about algorithmic filtering on TikTok are more likely to employ the restrictive mediation strategy of not allowing their teen to use TikTok. However, algorithm awareness alone was unassociated with parental mediation. This finding is consistent with other work that suggests negative attitudes towards a social media platform's algorithm(s) encourages people to stop using the platform. Whether the platform is TikTok, Spotify, or Facebook, if people perceive the algorithm poorly, then they are likely to stop using that platform (DeVito et al., 2017; Siles et al., 2022; Taylor & Choi, 2022). In parenting TikTok, platform exodus may take the form of never actually entering—banning teens from using the social media platform.

There is growing scholarly interest in the effects of algorithms on people's online behaviors, such as self-presentation and identity exploration (Lee et al., 2022), and, consistent with the theorized steps in the algorithm awareness process, our data suggest that attitudes about algorithm curation appear to be a more proximal predictor of algorithmic effects than mere awareness. Future work on algorithmic awareness as a digital skill should consider the role of attitudes as a mechanism that could explain such algorithmic effects. Furthermore, this finding has practical implications for parents and technology policies. Although there are considerable risks that banning TikTok use would help teens avoid (Livingstone & Stoilova, 2021), this finding suggests that interventions at the family, school, or government-level emphasize both risks and opportunities of TikTok and other algorithmic media. Interventions emphasizing risk without opportunities will likely lead to restrictive mediation, but research has repeatedly demonstrated this will limit the development of digital skills (e.g., Cabello-Hutt et al., 2018).

Our findings also contribute to conversations about digital skills as a predictor of enabling and restrictive parental mediation (Cabello-Hutt et al., 2018). Previous work has highlighted digital skills as a predictor of parental mediation decisions, with less skilled parents using restrictive mediation and more skilled parents using enabling mediation (Livingstone et al., 2017). Because algorithm awareness is an emergent digital skill that teens and parents both need to effectively navigate TikTok and the Internet more broadly (Cotter & Reisdorf, 2020), we investigated if a similar trend emerged for algorithm awareness. However, our data suggest that it was unassociated with parental mediation, indicating that algorithm awareness as a skill may inform parental mediation differently than other digital skills. This deviation from previous research may be due to the opaque, ever-changing nature of TikTok's algorithm. Awareness includes knowing about the "black box" nature of these systems, which may make awareness a less actionable skill for parents than other forms of digital skills (e.g., cookies, private vs. public profiles; Hargittai et al., 2020). Outside of algorithms, our data show that enabling and restrictive mediation on TikTok follow similar patterns as previous research—such as less mediation with age and more mediation when parents are concerned about the harms (e.g., Livingstone et al., 2017; Zhao et al., 2023). Thus, parental mediation theories appear to extend into parental mediation on TikTok.

5.3. Limitations

Our results and conclusions have limitations. First, these data are cross-sectional with small effect sizes, and our sample size may have further limited us from detecting other small effects. Importantly, we are unable to make causal claims about the effects of algorithm awareness and attitudes. With cross-sectional data, the temporal ordering of variables in our data is unknown, making conclusions of mediation tenuous (Fairchild & McDaniel, 2017). Future work on the algorithm awareness process should consider longitudinal models or experiments to understand the ordering of this process. Second, our data only came from parents, which meant our data was well-suited to answer questions about parents' understanding of algorithms and attitudes of TikTok. A survey of parents without input from the teen is inherently limited. Future research should use parent-teen matched samples to help bridge the gap between what parents say and what teens experience (Byrne et al., 2014). Similarly, our sample is a non-random U.S. sample of parents in committed romantic relationships, posing a threat to external validity. There may be characteristics of parents on Prolific that make them more or less aware of algorithms than the general population of American parents. Our sample was also predominately white, cisgender, and heterosexual. This sampling limitation has particular implications for our findings because algorithmic awareness represents a new digital skill divide and algorithms are biased against marginalized groups (DeVito, 2022; Simpson & Semaan, 2021). We advocate for future research about algorithm awareness and parenting to take intersectional approaches, such as race, sexuality, and socioeconomic status, to address this limitation. Third, our measures of online risks and opportunities collapsed all risks and opportunities, rather than considering that parents might be particularly concerned about some risks over others, such as extremist views rather than pornography. Connecting algorithms to more nuanced understandings of online risks and opportunities warrants future investigation.

6. Conclusion

The algorithmically curated media landscape introduces new questions about parenting digital teens. These questions pivot previous conversations about digital skills towards algorithms (Dogruel et al., 2021; Gran et al., 2021; Hargittai et al., 2020). Investigating algorithm awareness on TikTok as a process, our data suggest algorithm awareness is part of the digital skills portfolio parents may need to help their teens navigate the inevitable online risks and opportunities of living in a data-driven society. However, the influence of algorithm awareness differed from other digital skills, as algorithm awareness was only significantly associated with perceiving TikTok as a riskier place for their teen. Because algorithm awareness is a process, given their secrecy and unverifiability, understanding the role of algorithms in teenagers' daily use of TikTok, and other social media, represents a critical area of future research and social media literacy interventions.

Credit author statement

Taylor: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Brisini**: Methodology, Writing - Reviewing and Editing.

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.

Data availability

Data will be made available on request.

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