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10 Prevalence of Generative Artificial Intelligence Sexualized Image Usage by Adolescents in the
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Abstract

The prevalence of generative artificial intelligence (GenAI) usage related to sexualized images amongst adolescents is a critical emerging research area. In this exploratory study, a nationally representative online survey of 557 English-speaking individuals aged 13 - 17 was conducted. Participants were asked about their consensual and non-consensual usage and interactions with sexualized GenAI images. The survey included questions on images created with nudification software as well as content creation software, and asked participants about their creation, sharing, and viewing of this content, as well as that of their peers. Use of nudification tools was widespread, with 55.3% (n=308) of participants reporting having created and 54.4% (n=303) having received at least one image. Reported victimization levels of participants was substantial, with 36.3% (n=202) of individuals reporting having a non-consensual image created and 33.2% (n=185) of individuals having had at least one image non-consensually shared. Usage was similar across demographic categories, though male participants had higher degrees of regular GenAI sexual image creation and distribution, both consensual and non-consensual. Policymakers need to consider the extensive usage and its normalization and consider educational interventions, and practitioners need to be aware of the high degree and nature of victimization occurring.

Introduction

Recent advances in generative artificial intelligence (GenAI) have ushered in a paradigm shift in image generation and manipulation. Tools such as Stable Diffusion, DALL-E and Midjourney allow users to create images from text prompts, leveraging large language models (LLMs), through web-based services. This expands artistic possibilities and allows individuals to express

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57   their creativity in new and imaginative ways [1,2]. Similarly, locally installed applications on

58   smartphones and computers allow users to create their own visual content and modify existing

59   visual content (for example, placing real individuals into generated or existing photographs

60   seamlessly) using techniques such as inpainting [3]. These techniques have been applied to

61   many legitimate, novel uses, ranging from artificially aging photographs for forensic purposes

62   [4] to enabling smartphone applications that allow individuals to virtually "try on" clothing

63   before buying it [5].

64   As with many new technologies, GenAI can also be used for maladaptive purposes. For child

65   sexual exploitation material (CSEM) offending, there are new affordances available using these

66   tools. Some of these affordances involve the creation of toolsets (e.g., training models

67   specifically with CSEM content), but the key uses for most individuals engaged with GenAI for

68   CSEM offending mirror the legitimate uses of the technology. These include the generation of

69   CSEM content directly using text prompts and common diffusion models [6], the use of

70   nudification tools to visualize what individuals might look like without clothing [7,8], and the

71   alteration of adult sexual exploitation material to include the faces of minors [9].

72   One area of particular concern is the increase in the creation and distribution of self-generated

73   sexualized images by minors.   These images are now a substantial portion of the images found

74   in CSEM reports, with the Internet Watch Foundation (IWF) reporting that 44% of CSEM shared

75   online was self-produced [10]. Initial estimates of sexting amongst adolescents in the United

76   States found 2.5% created (or had created) sexualized images of themselves, and 7.1% received

77   these images [11]. More recent work identified higher rates of creation and receipt of these

78   images, with usage increasing over time [12], and a meta-analysis found creation and receipt

79   rates of 14.8% and 27.4%, respectively [13]. Additionally, the creation of these images has

80   shown some normalization within the attitudes of adolescents towards these activities [14], and

81   they have become a routine part of adolescent sexual exploration. The IWF reporting at the time

82   and the more recent statistics on sexting, however, did not differentiate between GenAI and non-

83   GenAI images, due both to methodological (the protocols did not look for GenAI images) and

84   technological (the difficulty in differentiating GenAI from other images) reasons.

85   In addition to the increase in self-generated, sexual images through sexting, the adoption of

86   GenAI technologies by adolescents is expected to continue to grow. In November 2024, Ofcom

87   reported that 54% of British children aged 8-15 had used GenAI in the past year [15].

88   Smartphone applications that utilize augmented reality (using similar technology to nudification

89   apps) for the purposes of trying on virtual clothing are also more accepted by younger users [16].

90   With nudification apps becoming easier to find and use [17], familiarization with and

91   normalization from the usage of similar GenAI applications may increase adoption amongst

92   adolescents.

93   Adolescents are already exposed to sexualized GenAI images in the form of deep fakes. In 2024,

94   14% of British adolescents under 16 had come across a sexualized image or video created with

95   GenAI in the prior year over social media, video sharing platforms, or email [15]. Deep fakes in

96   general have been found to be met with negative sentiments [18], but age-related differences

97   have not been well studied. Teens in particular may exhibit different behaviors in the creation

98   and distribution of sexualized GenAI images, consistent with the normalization of self-generated

99   sexually explicit images [14].

100   In addition to general exposure, the harms of deep fakes on victims are just starting to be

101   explored. Victims of GenAI-based sexual exploitation reported issues consistent with other

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102 forms of CSEM victimization, including fears of who may have seen the images when in public

103 (hypervigilance) and general avoidance of social media usage, as well as a sense of

104 powerlessness to prevent it and general dehumanization, resulting in permanent life disruptions

105 [19,20]. Limitations based on current laws further constrain the resources available to victims of

106 malicious deep fakes, particularly those of a sexualized nature [21].

107 The production, viewing, and distribution of pornographic GenAI images of individuals under 18

108 is illegal in the United States under federal law (18 U.S.Code § 1466A), and does not require that

109 a real individual be depicted [22]. In both the United States and most of Europe, there are gaps

110 in the current laws related to GenAI CSEM, including the legality surrounding the possession

111 and training of tools to produce content [23]. Additionally, while there are no safe harbor

112 provisions in United States law for consensually produced adolescent content, in practice

113 prosecutorial discretion is used to allow for education and administrative remedies in lieu of

114 criminal charges. A full review of the legal issues surrounding GenAI CSEM can be found at

115 [24].

116 While there has been an increase in individual reports of GenAI misuse by adolescents [25–27],

117 overall prevalence rates are unknown. This research is the first large-scale exploratory effort to

118 measure the usage of GenAI tools to create sexualized images, including nudification tools and

119 image creation tools (based on text prompts or inpainting of existing images), by adolescents.

120 Both consensual and non-consensual use cases are evaluated, including creation and distribution

121 by both participants and by their peers, using an anonymous, online survey.

Materials and Methods

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123   This study consisted of an anonymous, cross-sectional, Internet-based survey targeting

124   adolescents and their interaction with GenAI sexual imagery.

Participants and Setting

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126   This research obtained data through an online, anonymous survey hosted by Qualtrics. The

127   survey consisted of multiple questions related to the interactions of participants with sexualized

128   images created using GenAI. The population of the survey was English-speaking adolescent

129   teens living in the United States between the ages of 13 and 17, inclusive. A target sample of

130   500 individuals was solicited, based on the ability to identify a medium effect size (.3) for in-

131   group demography variations, between January 11 and January 24, 2025. A pilot distribution of

132   50 responses was solicited prior to the full launch to ensure survey flow, response controls, and

133   timing were performing as expected. The researchers had no direct involvement in the selection

134   of participants, who were drawn by the providers from a group of individuals whose parents pre-

135   identified them as potential candidates as part of a panel service offered by Qualtrics. The

136   sample was designed to be representative and used a non-probability quota-based methodology

137   based on demographic data previously provided by the participants [28]. No direct

138   compensation was provided to participants by the research team, however Qualtrics provides

139   compensation to panel members ranging from gift cards to airline miles based on proprietary

140   algorithms.

141   Due to the age of the participants, a two-stage process of informed consent was utilized. First,

142   the parents of potential participants were provided a link to take a survey by Qualtrics. Those

143   parents who clicked the link were provided details on the survey's nature, including a copy of the

144   questions as well as a detailed consent form outlining the risks and benefits of the study. The

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145   information provided to the parents confirmed the results of the study would be anonymous and

146   the anonymized data available to future institutional review board approved studies, and that they

147   would not have access to their child's responses. Parents were requested to allow their children

148   privacy to fill out the questions but encouraged to discuss the questions and the topic with their

149   children afterward. Of the 9098 parents who were presented the form, 967 agreed to their child's

150   participation. The children of parents who provided consent were then presented with a detailed

151   assent form containing age-appropriate language and detailing the same information as the

152   consent form. Of the 967 adolescents presented the form, 936 agreed to continue with the

153   survey. Following their completion of the survey, adolescents were encouraged to voluntarily

154   discuss the issues addressed in the survey with their parents.

155   The surveys were anonymous, and no identifying information, including network information

156   (e.g., IP addresses), was retained. The parents were provided an anonymous link to the consent,

157   and, if they chose to consent, their child was provided a separate, unrelated anonymous link to

158   the survey. The specific demographic information collected was limited to avoid unintentionally

159   allowing ex post facto identification of a specific participant through aggregate demographic

160   details (e.g., no zip codes were collected). The survey was additionally designed to avoid any

161   free-text entry boxes through which participants may inadvertently self-identify. Due to the

162   anonymous nature of the study, no direct debriefings were possible, but links to counseling

163   resources were provided to both the participants and their parents if they wanted to discuss any

164   reported victimization or the topic area in general. Additionally, law enforcement contacts were

165   provided to both participants and parents for voluntary reporting of any related events. Finally,

166   contacts were provided for both the research team and the institutional review board to both

167   parents and participants should they have any detailed questions or concerns about the research.

168   The adolescents were permitted to cease their participation in the survey at any point up until

169   submission but following submission their data was no longer identifiable, and only anonymized

170   data was available to the research team.

171   There were multiple levels of quality assurance built into the process. Qualtrics used browser

172   fingerprinting to avoid duplicate entries, anti-botnet features such as CAPTCHAs, and IP

173   geolocation to ensure respondents were within the United States. They additionally included a

174   timing check, and any responses below half the median time were discarded as "speeders".

175   Finally, they included straight-line and Christmas-tree checks (any that were consistently

176   answered across three separate matrices) to ensure answer integrity [29]. In addition to integrity

177   checks built-in by Qualtrics, two additional checks were provided by the researchers. First, a

178   question confirming the ages of the participants was asked. Those identifying an age outside of

179   the 13 - 17-year-old range were excluded from continuing with the survey. Second, an attention

180   check was built into the survey to improve response quality. A total of 115 participants failed to

181   complete the survey and integrity checks, and 264 were identified as outside of the target age

182   group, resulting in n=557 total surveys available for analysis.

183   ## Questionnaire

184   Demographic questions on race, gender (participants were asked how they describe themselves),

185   sexual orientation, region and age were collected from all participants. For the purposes of this

186   study sexualized GenAI images were operationally defined as naked, still images or videos,

187   either of their peers ("other individuals between the **ages of 13 and 17** years old") or of adults

188   ("any other individuals who are 18 years of age or older"). The primary questions were related

189   to participants' interactions with relevant content, and specific questions were asked about both

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190 consensual and non-consensual creation and distribution of naked GenAI images. Questions

191 were focused on four areas:

192 ● Use of nudification tools by participants

193 ● Use of nudification tools by others in their peer group

194 ● Use of general GenAI image creation/alteration tools by participants

195 ● Use of general GenAI image creation/alteration tools by others in their peer group

196 Participants were asked about their own creation of images (of themselves or others), their

197 distribution of images, and their receipt of naked images of both adults and their peers. For each

198 question, a five-point, custom Likert scale was used with the following values:

199 ● I have never done this

200 ● I have only done this once or twice

201 ● I have done this infrequently

202 ● I have done this frequently

203 ● I have done this on a regular basis

204 The questions were specifically worded based on prior research questions related to CSEM

205 activities to minimize the impact of social desirability bias on responses [30].

206 Participants were provided age-appropriate, plain text operational definitions and directions for

207 each of the sections. For example, nudification tools were defined as follows:

208 The following questions are about the use of nudification tools. These are smartphone

209 apps, websites, or other software that shows what individuals might look like without

210 clothing.

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211 AI image creation tools were operationally defined as those that "use text prompts or existing

212 images as inputs… [creating] new images from scratch or using existing images and altering

213 them with AI" to create naked content.

214 Finally, respondents were asked to confirm if they filled out the questions in private, with a

215 parent present, or with another individual present to allow researchers to identify any potential

216 observer influence on responses.

Analysis

218 The results were collected and stored on the university file share, and all analysis was performed

219 in R (4.5) using R Studio. Wilcoxon rank-sum tests for two category comparisons and chi-

220 squared tests for multi-category comparisons were utilized for the ordinal and categorical

221 comparisons, and Spearman correlation for age comparisons. An additional chi-squared test was

222 performed for age comparisons as well to identify potential non-linear effects. A statistical

223 significance level of .01 was used where p values were reported, with Bonferroni corrections

224 applied.

Ethics

226 The study design and protocols, including an analysis of the potential risks and benefits, was

227 approved by the George Mason University Institutional Review Board on 19 December 2024.

Results

229 The research sample consisted of a representative, demographically diverse group of English-

230 speaking, United States teens. The survey was completed by 557 individuals (51.0% male,

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231   48.3% female, 0.5% non-binary, 0.2% not specified; 73.2% Caucasian, 15.6% African

232   American, 2.3% Asian, 1.4% Native American, 4.7% with two or more races; 89.2% identified

233   as heterosexual, 6.5% as bisexual, and 3.2% as homosexual). With respect to privacy when

234   taking the survey, 70.6% reported taking it alone, 20% with a parent present, 0.5% with another

235   individual present, and 9% chose not to answer. Table 1 shows the overall sample

236   characteristics.

237   **Table 1. Sample Demographics.**

Characteristic	n	Percentage	95% CI
Age			
13	97	17.4%	(14.3 - 20.6)
14	92	16.5%	(13.4 - 19.6)
15	109	19.6%	(16.3 - 22.9)
16	105	18.9%	(15.6 - 22.1)
17	154	27.6%	(23.9 - 31.4)
Race			
American Indian/Native American or Alaska Native	8	1.4%	(0.4 - 2.4)
Asian	13	2.3%	(1.1 - 3.6)
Black or African American	87	15.6%	(12.6 - 18.6)
Multiple Races	26	4.7%	(2.9 - 6.4)
Native Hawaiian or Other Pacific Islander	2	0.4%	(-0.1 - 0.9)
Other	12	2.2%	(0.9 - 3.4)
Prefer not to say	1	0.2%	(-0.2 - 0.5)
White or Caucasian	408	73.2%	(69.6 - 76.9)
Spanish, Hispanic, or Latino Origin			
Yes	94	16.9%	(13.8 - 20)
No	463	83.1%	(80 - 86.2)
Gender			
Female	269	48.3%	(44.1 - 52.4)
Male	284	51.0%	(46.8 - 55.1)
Non-binary / third gender	3	0.5%	(-0.1 - 1.1)
Prefer not to say	1	0.2%	(-0.2 - 0.5)
Sexual Orientation			
Bisexual	36	6.5%	(4.4 - 8.5)

Heterosexual	497	89.2%	(86.7 - 91.8)
Homosexual	18	3.2%	(1.8 - 4.7)
Other	1	0.2%	(-0.2 - 0.5)
Prefer not to say	5	0.9%	(0.1 - 1.7)
Region			
Midwest	125	22.4%	(19 - 25.9)
Northeast	102	18.3%	(15.1 - 21.5)
South	145	26.0%	(22.4 - 29.7)
West	181	32.5%	(28.6 - 36.4)
Other	4	0.7%	(0 - 1.4)

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239   Overall, usage of GenAI tools to create naked images was widespread. Self-generation of

240   nudified images (use of a nudification tool to create an image of oneself) was the highest

241   modality, with 55% of participants having done this at least once, 44% having shared a self-

242   image created with nudification tools, and with 54% of recipients having received a self-

243   generated image from a nudification tool. Content creation and sharing appeared to be generally

244   focused on peer group images and not adult images, with only 35% having created and 33%

245   having shared naked images of adults. Additionally, the usage of nudification tools was

246   significantly higher than the usage of GenAI creation tools ($z=-3.66$, $p<.001$) comparing any

247   nudification image interaction with any traditional GenAI image interaction, indicating a higher

248   impact of victimization (for the purposes of this research, creation or distribution of images

249   without their permission) as nudification tools require an actual photo of a real individual as a

250   basis image. Overall details by activity are available in the online supplemental material (S1

251   Table).

252   Only male and female gender identities were analyzed for differences as insufficient numbers of

253   non-binary gender identities were present in the sample to evaluate them effectively. There was

254   an overall similar usage between genders, but seven categories of usage had higher usage by

255   males, including the creation of peer images with nudification tools both with ($W= 31967$,

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256 p<.001) and without (W=32592, p<.001) their permission; having received re-distributed images

257 of their peers (W=31953, p<.001); using image creation tools to create images of adults

258 (W=32521, p<.001); sharing naked images of themselves (W=31588, p<.001) and of others in

259 their peer group (W=32496, p<.001) created with image creation tools; and having had images of

260 adults (W=32278, p<.001) and other peers (W=30863, p<.001) shared with them by their peer

261 group (S2 Table).

262 There were no statistically significant differences in usage based on age across any of the

263 activities, either through a linear fit based on age or categorically (S3 Table). When comparing

264 prevalence rates across sexual orientation, only sharing of AI-generated images of adults differed

265 significantly across orientations, $X^2(16)=42.47$, p<.001 (S4 Table). A post-hoc analysis of the

266 results with Bonferroni correction identified individuals who identified as "Other" having a

267 significantly higher residual (4.823, p<.001) (S5 Table). No statically significant prevalence

268 differences were identified associated with race (S6 Table).

269 No statistically significant differences were identified based on the presence of a parent or other

270 individual when taking the survey in the responses (S7 Table).

271
272 # Discussion

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274 Better education is needed on the healthy and safe usage of GenAI technology, which has been

275 previously believed to disproportionately impact women [20] and was borne out in this research,

276 though both genders were found to be substantially impacted in this study as both users and

277 victims. While only a few questions showed statistically significant distributions by gender, both

278 self and peer creation and distribution were higher for males in terms of regular use and for

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279   having experimented (engaged at least one time) with the technologies. The lack of significant

280   gender differences with a large effect size for most of the actions asked about is consistent with

281   Madigan et al.'s work on youth sexting, and may be a continuation of that trend reflecting

282   technological advances [13]. The one differentiator related to sexual orientation was a higher

283   incidence of "Never" within those who identified as "Other". This may be due to individuals

284   who self-identify as asexual being included in this category, but additional research with a larger

285   dataset and more detailed categorization is needed to verify this hypothesis.

286   Education interventions additionally need to be multimodal and need to occur at a younjg enough

287   age to address the issue before it occurs [31]. Since there was no statistically significant age

288   difference in either usage or victimization across the age groups (though as with gender, smaller

289   effect sizes may be identified with higher powered studies), the education should occur prior to

290   age 13 to be most impactful. Prior work on rape myth acceptance, particularly that targeting

291   bystanders (in this context, individuals receiving or being shown unsolicited images) and how

292   they should respond, as well as impact education to prevent perpetration are warranted and can

293   potentially inform effective approaches [32].

294   In terms of victimization, the usage of and sharing of content from nudification tools was higher

295   than that of general GenAI creation tools, portending a higher degree of direct victimization as

296   nudification tools generally involve a known/direct child victim. These results represent a lower

297   bound in victimization statistics, as perpetration by adults (use of these tools on minors or

298   sending images to minors) was not incorporated into this study. Secondary victimization through

299   the further distribution of images without consent is likewise a lower bound as participants may

300   not know the extent of onward transmission. Further research, particularly longitudinal research,

301   on the long-term impacts of creating sexualized images (particularly self-images) using these

302   tools is needed.

303   Most of the activities surveyed represent the creation of CSEM, a violation of federal law in the

304   United States. Because many of the actions were consensual and involving peers, policymakers

305   need to consider if these activities, which may be considered part of normal sexual exploration,

306   warrant specific legal exceptions beyond current discretionary prosecution. Specifically, carve-

307   outs for consensual generation and sending between individuals in the same age group warrant

308   consideration. Better controls on the usage of nudification and other GenAI applications to

309   detect CSEM production is also needed. While calling for application makers to provide better

310   controls to limit their use by minors is necessary, many of the applications are gray market tools

311   and age restriction controls are not likely to be fully successful [17] unless coupled with an

312   education strategy.

313   The long-term impacts on CSEM distribution additionally need to be considered in light of these

314   findings, assuming they remain stable over time. GenAI detection tools need to specifically

315   target modified images to ensure victim identification given the significant use of nudification

316   applications. Finally, the prevalence of GenAI nudification and creation tool usage by adults,

317   both legally and illegally (to produce CSEM or non-consensual explicit images) needs to be

318   studied [33].

319   ## Limitations

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321   This research was an exploratory study conducted on English-speaking teens 13 - 17 years of age

322   within the United States, and additional work would be required for generalizability to other

323   populations. Because of the relatively recent introduction of the latest generation GenAI

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324   technologies, these results only represent a point-in-time analysis and future research once the

325   technologies mature, as well as longitudinal research, are needed before drawing any broad

326   conclusions. Although controls were put in place both by Qualtrics and the research team to

327   obtain accurate survey results through attention checks, timing issues, and verification of

328   privacy, there are general issues with Internet surveys that will always be present in this type of

329   research. Specific to this research, the IRB-approved protocol provided parents the ability to

330   review the full questionnaire before allowing their children to participate. This introduces a

331   potential selection bias, where parents who opt out of participation for social, religious, cultural,

332   or other reasons may have adolescents that differ in their GenAI usage from those whose parents

333   opted in. The number of respondents was selected to have sufficient power to perform larger

334   subgroup analyses but was not sufficient to draw conclusions about smaller subgroups (e.g., non-

335   binary teens) or to identify small effect sizes. Participants were asked about their use of GenAI

336   and interactions with sexualized images of others in their peer group and of adults, however no

337   questions were asked of their use of these tools to create images of those younger than 13, so the

338   numbers represent an upper bound of individuals in this group using GenAI to interact with

339   CSEM imagery. Finally, the questions asked about the generation and sharing of naked images -

340   other sexualized imagery with no nudity is possible, and some naked images may not be

341   sexualized, however this language was chosen for ease of understanding and interpretation.

342

Conclusions

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345   A significant percentage of adolescents in this national survey were found to engage in the use of

346   GenAI applications to create sexualized images, including nudification applications. This

347   represents a potentially significant source of CSEM creation and distribution, and shows that, to

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348   some degree, risky engagement with GenAI is widespread in this population. The normalization

349   of these activities, and the harm to victims for non-consensual creation and/or distribution needs

350   further study for its impact on prevention, treatment and deterrence efforts. While the usage was

351   widespread across demographic categories, most of the usage appears to have been exploratory

352   rather than habitual based on the frequencies reported, providing an opportunity for positive

353   intervention. Because there were no age-related differences in GenAI usage, age-appropriate

354   education-based intervention efforts on the risks associated with AI tools and sharing of images

355   need to start prior to the age of 13. Additional training for law enforcement on handling both

356   offenders and victims, as well as digital forensics specialists on the identification of GenAI

357   images, is needed. Finally, decision makers need to consider the prevalence and nature of these

358   use cases in developing new legislation related to GenAI CSEM.

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Supporting Information

463   **S1 Table. Descriptive Statistics of Individual AI Activities.**

464   **S2 Table. Gender Differences in Sexualized Generative AI Usage.**

465   **S3 Table. Age Differences in Sexualized Generative AI Usage.**

466   **S4 Table. Summary of Sexual Orientation-Related Differences in Sexualized Generative**

467   **AI Usage.**

468   **S5 Table. Post-hoc Analysis of Sexual Orientation.**

469   **S6 Table. Summary of Race-related Differences in Sexualized Generative AI Usage.**

470   **S7 Table. Summary of the Impact of Other Individuals Presence During Survey Taking.**

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