

A Critical Analysis of the Prevalence of Technology-Facilitated Abuse in US College Students

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ABSTRACT

The ubiquitous use of technology by college students makes them vulnerable to harassment, harm, and intimidation via technological means. We evaluate the prevalence of such technology-facilitated abuse (TFA) among college students in the USA using a critical, feminist, and trauma-informed lens, which is essential to inform policymakers and advocates who support students. We surveyed 776 college students in a large R1 university located in the Midwest region of the USA to examine the prevalence of TFA faced by students marginalized by socio-economic factors, the support sought by student survivors, and the efficacy of support structures. Our findings indicate that 70% students experience TFA, but more than half of them do not seek support. Among the survivors who seek support, 93% students solely rely on informal resources like friends and family, and 6% solely seek support from formal networks such as survivor services or law enforcement. Therefore, we call on policymakers to direct attention to TFA, create tailored interventions to support marginalized students and propose campus-wide campaigns to spread awareness among college students.

CCS CONCEPTS

• **Security and privacy** → **Social aspects of security and privacy**; **Usability in security and privacy**; • **Human-centered computing** → **Empirical studies in HCI**.

KEYWORDS

critical race theory; technology abuse; domestic violence; intimate partner violence; technology-facilitated abuse; critical; college populations; trauma; trauma-informed computing; transgender; gender-based violence; computer security and privacy

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Content Warning. This paper contains descriptions of intimate partner violence, digital abuse, online harassment, racial violence, and mental health topics including trauma.

1 INTRODUCTION

Today, college students rely heavily on technology for various aspects of their lives, including learning, social collaboration, financial management, entertainment, health, and social interaction. However, the widespread use of technology also exposes students to increased safety risks and leaves them vulnerable to technology-facilitated abuse (TFA). This form of abuse encompasses behaviors such as hate speech, spying, stalking, harassment, doxxing, and bullying targeted at individuals. College students may overuse and abuse technology [72, 75], face harassment on social media [41, 80], rely on technology for dating [31], and share intimate images for “sexting” [50, 65, 106, 107, 109, 114].

College communities are complex social systems in which students are immersed in novel environments, engaging with individuals of diverse backgrounds. Various power structures manifest within these contexts, including fellow students, instructors, and staff members [8, 75]. The students may find restricted availability of family and community support with high levels of academic stress and mental health concerns that may expose them to TFA [8, 64]. Marginalized identities of students based on gender, sexual orientation, relationship status, race/ethnicity, disability, income status, graduate/undergraduate, may compound their risk of interpersonal violence [21, 94, 96, 142].

Prior studies [33, 43, 85] observed that college students experience TFA from an intimate partner (TFA-IPV). While previous studies highlight the importance of examining TFA victimization on college campuses, they have several limitations. For example, these studies predominantly select students facing TFA from an intimate partner, overlooking abusive experiences from alternative

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sources, and failing to account for crucial factors contributing to the marginalization. They have a binary perspective on Gender and sexual orientation (Male/Female) and conform to hetero-normative relationships. Moreover, they use a criminology lens using routine activity theory and lifestyle theory [49, 95, 99] to gauge pro-abuse behavior and attribute student's abuse experiences through their lifestyle instead of validating survivor experiences. Therefore, we use a critical [42, 142] and trauma-informed [39, 142] lens to center survivor experiences and value the mitigation strategies they adopt to cope with the abuse, such as support-seeking.

We investigate the following two research questions:

RQ1. How prevalent is TFA among college students, and how does it vary for students marginalized by socio-economic factors?

RQ2. Who do survivors of TFA ask for support regarding the abuse?

We conducted the first quantitative study to analyze the prevalence of TFA on college campuses and identify how marginalization such as gender, sexual orientation, relationship status, race/ethnicity, disability, income status, graduate/undergraduate, increases the risk of experiencing TFA through a Critical Race Theory (CRT) lens [42, 142]. We validate the survivor's experiences through a trauma-informed approach [39, 142] and identify the support systems students reach out to after facing TFA.

We conducted an online survey study with students in a large R1 university located in the Midwest region of the USA.¹ We found that Cis-Women are 1.8 times and LGBTQ+ students are 2.0 times more likely to face TFA than Cis-Men. Furthermore, students who reported having a disability are nearly three times (3.0x) as likely as students without a disability to face TFA. The most common TFA experience faced by 472 (60%) students was unwanted contact through calls, emails, voicemails, texts, or instant messages. In addition, 402 (51%) students faced image-based TFA experiences such as non-consensual posting or sharing unwanted messages, pictures, and videos online. However, we found that more than half (53%) of the survivors of TFA do not seek support, 93% solely seek support from informal support structures, and merely 6% seek support from formal resources. We observed that while Cis-Women and LGBTQ+ seek support from informal support structures, Cis-Men are less likely to seek any support after facing TFA.

Therefore, we discuss the findings to inform the implications for future research practices, design of technology, and college campus interventions.

2 BACKGROUND

Technology-Facilitated Abuse (TFA) includes online abuse, in-person spying, and harassment and violence. Online forms include cyber-bullying on social media or posting unwanted and intimate messages, pictures, or videos online [50, 109, 114, 130]. In-person abuse can look like tracking location without consent, unwanted contact via messages, hidden spyware and stalkerware on survivor's smartphone, re-purposed dual-use applications [9, 18, 22, 38, 53, 88, 100, 112, 116, 132, 146]. Further, an abuser could impersonate survivors' social media accounts, change passwords or recover questions to lock them out of their accounts, share intimate images or messages without their consent, repurpose shared devices

like computers, phones, iPads, cameras, smart thermostats, etc. to threaten the life or safety of their friends, family, or pets [37, 127], and control or restrict access to finances, financial services, or financial statements [20, 27, 102, 138, 139]. Finally, due to technological advancements, adoption, and increased use of smart-home technology [120, 126, 127], the prevalence of TFA has worsened, especially during the COVID-19 pandemic, showing a dire need for interventions and mitigations [12, 16, 58, 59, 82–84, 101, 121, 133, 136].

Due to the invisible nature of TFA, survivors may not be adequately equipped to confront the situation, as they may lack the necessary knowledge to mitigate the abuse [54, 88]. Several studies [52, 63, 134] proposed an intervention called Tech Clinic where technical experts address technological concerns, provide emotional support and help survivors with a safety plan [39, 123, 135]. However, college students may not have these services available on campus or might not be aware of the resources in the community as they exist only in 3 cities in the US. Moreover, students from marginalized communities are discriminated against, may face exclusionary experiences, and have more difficulty accessing support services [124].

Furthermore, prior research [40, 45, 74, 137, 142] suggests that survivors may reach out to their friends and family to receive support to cope with distress. The availability of social support reduces the adverse outcomes of abuse and helps them leave an abusive relationship [149]. However, not all survivors seek help and try to mitigate the abuse by themselves with assistance from online resources [79, 88, 142]. Therefore, it is important to understand the form of support available (or lack thereof) to design interventions, especially in the absence of tech experts.

Research gap. While previous studies highlight the importance of examining TFA victimization on college campuses, they lack in various aspects. First, these studies predominantly select female students in hetero-normative relationships and overlook online abuse from strangers. Second, prior works exclusively use a criminology lens using routine activity theory and lifestyle theory [49, 95, 99] to find justifications for student's abuse experiences through their lifestyle [33, 43, 85]. Thus we lack an inclusive understanding of TFA among college campuses and how marginalized students are affected by TFA.

We therefore center survivors' experiences through a trauma-informed lens [39, 142] and analyze the marginalization faced by students through a critical lens [42, 142].

3 METHODS

3.1 Recruitment

We conducted an online survey with students at a large R1 university located in the Midwest region of the USA. The survey² was titled "Sexual and Emotional Experiences Among University Students." An email invitation with a unique survey link was sent to a random sample of 4,000 students. A total of 844 students began the survey; however, only 802 students responded to the attention check items appropriately. We removed 14 participants because they reported that the experiences listed as TFA were not alarming

¹The university has a White-dominated student population.

²The survey is available at this link: https://drive.google.com/file/d/1p9_Kj9d_1Ahu28edyrg_OucDFHWA9b86/view

or spying-related. We acknowledge that quantitative surveys have inevitable interpretation biases, especially the way the experiences were interpreted by the participants. We plan to modify the questions in our future work to minimize erroneous interpretations of abuse (Section 5).

In total, 776 students were considered for data analysis (*mean* = 21.12, *median* = 20, *range* = [18, 36]). We report the demographic distribution of the participants in Table 1. Due to the small sample size, some categories were collapsed for analysis. Since TFA is an example of gender-based violence, we observe that the demographic distribution of our sample is representative of the demographic of a large R1 university located in the Midwest region of the USA.³ Among the sample, 27% identified as Cis-Men, 44% as Cis-Women, and 27% as LGBTQ+.⁴ Most students (40%) were single, while 36% students were in a committed monogamous relationship, and 18% students were involved in an ongoing hook-up, friends with benefits, were “talking” to someone, polyamorous, etc. (which we refer to as “non-exclusive relationship”). A small fraction of the students (4%) were married, divorced, or widowed. Among the participants, 68% identified as White, 31% identified as belonging to Black, Asian, Indian or Alaska Native, Native Hawaiian or Pacific Islander, or Multi-racial and people of color (BIPOC). In terms of ethnicity, only 11% identified as Hispanic. Most students (81%) in our survey are undergraduates, but 18% are graduate students. Furthermore, 20% students identified as first-generation college students and 15% as having a disability including intellectual disability, learning disability, sensory disability, mobility disability, mental illness, disability. Approximately 51% students self-reported being low-income (participants who (1) receive Pell Grant, (2) Financial Aid, or (3) have difficulty meeting basic needs “half the time, most of the time, or always”).

3.2 Ethical Considerations and Positionality.

Informed consent was obtained from all participants, and they could skip any question or withdraw from the study at any time. Some participants may feel distressed or uncomfortable when answering questions about prior traumatic experiences like sexual violence and intimate partner violence. The three authors of this paper are trained advocates who support survivors in various capacities by applying trauma-informed principles of care. If participants experience psychological stress or discomfort, one member is a licensed clinical psychologist who could respond to distress and provide referrals to the participants. All participants receive their contact information and confidential survivor services resources. The responses were stored in a secured Google Drive folder, accessible only to approved study personnel. We anonymize any identifiable information about the participants. The participant’s email were separately stored for payment purposes. We did not mention the study title in the payment, and the consent document given to the participant was limited to the amount necessary to achieve the research aims.

³The university has a White-dominated student population.

⁴Gender identity expressed as Non-binary, Two-spirit, Gender-Fluid and Gender-Nonconforming and Sexual Orientation expressed as Lesbian, Gay, Bisexual, Transgender, Queer, Asexual, Pansexual

3.3 Data Analysis

We analyzed the responses from the participants by exporting the CSV file responses from Qualtrics. Then, we cleaned the CSV file and removed the responses that failed the attention checks. We used Python to clean the data, and R to perform the statistical tests.

We used logistic regression to observe the association between demographics such as gender, sexual orientation, relationship status, race/ethnicity, disability, income status, graduate/undergraduate, and TFA or TFA-IPV. We measure the interaction of Gender and Race factors by controlling for other factors in multivariate models with TFA and TFA-IPV as the outcome. We report the Odds Ratio (OR) and 95% confidence interval (CI) of the logistic regression (Table 2). Using a Critical Race Theory (CRT) lens [42], we hypothesized that marginalized groups would be more likely to report TFA, therefore, across each demographic, the most privileged group served as the reference category (e.g., white, Cis-Men, non-Hispanic, single, non-low-income, non-disabled, non-first generation, etc.).

4 RESULTS

4.1 RQ1: Prevalence of Technology-Facilitated Abuse

We corroborate the prevalence of Technology-Facilitated Abuse (TFA) in college students with prior works and use a critical and trauma-informed lens for the analysis [39, 78]. In total, 545 (70%) students reported facing at least one form of TFA, while 161 (29%) students faced TFA from an intimate partner (TFA-IPV).

To validate the prevalence of TFA, we compare the associations of demographics with Sexual Violence (SV) (638 (82%)) and Sexual Violence by an intimate partner (SV-IPV) (73 (9%)). SV consists of scenarios of unwanted sexual contact, including non-consensual oral, anal, vaginal, or penetrative sex and touching, kissing, fondling, or grabbing sexually. SV-IPV consists of experiences of sexual violence from a current or former romantic partner. We observe that the prevalence rates and demographic associations with TFA and TFA-IPV are similar to those for SV and SV-IPV.

Gender: We observed that Gender has a strong association with TFA-victimization ($\chi^2 = 33.979$, $p = 0.000006$, $df = 6$). Cis-Women (*odds* = 1.833, $p = 0.0102$, $CI = [0.986, 2.680]$) are 1.833 times and LGBTQ+ students (*odds* = 1.951, $p = 0.0202$, $CI = [0.850, 3.051]$) are 1.951 times more likely to face TFA than Cis-Men. Although we did not observe a statistically significant result in the case of TFA faced from an intimate partner (TFA-IPV), 23% of LGBTQ+ participants and 23% of Cis-Women participants are susceptible to TFA-IPV, which is much higher than Cis-Men (13%). The prevalence statistics are consistent with the prior work, which shows that violence is a gendered issue [36]. Prior studies show that LGBTQ+ students are likely to face higher and more severe amounts of violence and harassment [28, 57, 96, 130, 140] as they face stigma around coming out, going through gender transition [47, 60, 104] and expressing their identity on Social media [24, 25, 35, 76, 119, 140]. Furthermore, reports suggest that “sextortion” scams on dating apps are becoming more common against LGBTQ+ communities [55]. Lack of family support [111] and a hostile political and legal environment can lead to their withdrawal from society and increase the risk of violence. Our results corroborate that Cis-Women and LGBTQ+

Table 1: Table shows: (1) the prevalence statistics of victimization to TFA and TFA-IPV grouped by the Demographic variables. Among 776 respondents, 545 reported experiencing TFA, and 161 experienced TFA from an intimate partner. (2) Help-seeking statistics of 545 students who experienced TFA, grouped by demographic variables. The percentage within parenthesis represent the percentage of participants in the column within the social demographic.

Social Demographic	Total participants (<i>n</i> = 776)	Victimization		Help-Seeking of 545 TFA survivors		
		TFA (<i>n</i> = 545)	TFA-IPV (<i>n</i> = 161)	No Help	Informal [Ⓢ]	Formal ^λ
Gender-Sexual Orientation						
Cis-Women	344 (44%)	256 (74%)	81 (23%)	121 (47%)	186 (72%)	10 (3%)
Cis-Men	216 (27%)	119 (55%)	29 (13%)	81 (68%)	35 (29%)	2 (1%)
LGBTQ+ [†]	216 (27%)	170 (78%)	51 (23%)	88 (51%)	82 (48%)	9 (5%)
Race						
White	532 (68%)	388 (72%)	117 (21%)	214 (55%)	172 (44%)	10 (2%)
BIPOC*	244 (31%)	157 (64%)	44 (18%)	76 (48%)	78 (49%)	11 (7%)
Ethnicity						
Hispanic	90 (11%)	62 (68%)	21 (23%)	35 (56%)	26 (41%)	2 (3%)
Non-Hispanic	686 (88%)	483 (70%)	140 (20%)	255 (52%)	224 (46%)	19 (3%)
Relationship Type						
Single	315 (40%)	213 (67%)	57 (18%)	120 (56%)	91 (42%)	9 (4%)
Committed monogamous relationship	281 (36%)	194 (69%)	61 (21%)	100 (51%)	94 (48%)	8 (4%)
Non-exclusive relationship*	143 (18%)	112 (78%)	32 (22%)	54 (48%)	57 (50%)	4 (3%)
Married, Divorced, or widowed	37 (4%)	26 (70%)	11 (29%)	16 (61%)	8 (30%)	0 (0%)
Graduate Student?						
Undergraduate student	632 (81%)	446 (70%)	126 (19%)	234 (52%)	210 (47%)	13 (2%)
Graduate student	144 (18%)	99 (68%)	35 (24%)	56 (56%)	40 (40%)	8 (8%)
Low Income						
Yes	401 (51%)	289 (72%)	94 (23%)	151 (52%)	137 (47%)	15 (5%)
No	375 (48%)	256 (68%)	67 (17%)	139 (54%)	113 (44%)	6 (2%)
Disability						
Yes	121 (15%)	105 (86%)	37 (30%)	54 (51%)	51 (48%)	5 (4%)
No	655 (84%)	440 (67%)	124 (18%)	236 (53%)	199 (45%)	16 (3%)
First Generation College Student						
Yes	160 (20%)	111 (69%)	38 (23%)	56 (50%)	54 (48%)	8 (7%)
No	616 (79%)	434 (70%)	123 (19%)	234 (53%)	196 (45%)	13 (2%)

[†] Gender identity expressed as Non-binary, Two-spirit, Gender-Fluid and Gender-Nonconforming and Sexual Orientation expressed as Lesbian, Gay, Bisexual, Transgender, Queer, Asexual, Pansexual * Black, Indigenous (American Indian or Alaska Native and Native Hawaiian or Pacific Islander), and People-of-Color (Asian and Multi-racial) ♣ Ongoing hookup, friends-with-benefits, “talking” to someone, or non-exclusive relationship, polyamorous
[Ⓢ] Informal support includes seeking help from close friends, roommates, family or relatives, or an intimate partner ^λ Formal survivor support service like University Health Services, a rape crisis center, a domestic violence organization, or a technology resource like the Tech Clinic or Geek Squad or law enforcement resource (e.g., Cybercrime Unit, police)

students experience significantly higher TFA rates compared to Cis-Men students.

Disability: We observe that disability (e.g., intellectual disability, learning disability, sensory disability, mobility disability, mental illness, etc.) was significantly associated with the TFA ($\chi^2 = 18.25$, $p = 0.0011$, $df = 4$). The students who reported having a disability are more than twice (2.8x) as likely as students without a disability to face TFA (*odds* = 2.778, $p = 0.005$, $CI = [0.235, 1.359]$). Previous works show that the lack of accessible technology could add additional privacy and safety risks to people with disabilities [4–6, 91, 141]. Furthermore, a “visible” vs. “invisible” disability could

affect how young adults use dating apps to reduce unnecessary connections [103, 105].

Race: Furthermore, the prevalence of TFA among BIPOC students is similar to that of white students in our sample. A possible reason could be that the majority of the students in the BIPOC group are Asian (142 (18%)), and only 25 (3%) are Black, 3 (0%) indigenous, and 74 (9%) multiracial. Since we grouped all these races into BIPOC for more statistical power, any differences between individual races may be lost. Future studies should over-sample students from these under-represented races to truly understand their marginalization, as we discuss in Section 5. Prior works show that Black women are 35% more likely to experience IPV than White women due

Table 2: The table shows odds ratio (OR) and 95% confidence intervals in brackets for the regression analysis of TFA-victimization.

	TFA	TFA-IPV	SV-IPV	SV
Year [Graduate]	0.994 (0.536, 1.452)	1.237 (0.619, 1.855)	1.598 (0.581, 2.615)	0.976 (0.445, 1.507)
Ethnicity [Hispanic]	0.870 (0.421, 1.320)	1.075 (0.479, 1.671)	0.825 (0.182, 1.468)	1.030 (0.375, 1.685)
Relationship [Married]	1.074 (0.148, 1.999)	1.528 (0.186, 2.870)	4.487 ^{***} (-0.459, 9.434)	1.123 (-0.008, 2.253)
Relationship [Monogamous]	1.030 (0.656, 1.404)	1.237 (0.722, 1.751)	2.908 ^{***} (0.936, 4.881)	1.549 [^] (0.865, 2.232)
Relationship [Non-Exclusive]	1.420 (0.734, 2.105)	1.129 (0.560, 1.697)	3.307 ^{***} (0.841, 5.774)	1.486 (0.631, 2.341)
Low Income [Yes]	1.019 (0.677, 1.362)	1.244 (0.778, 1.710)	1.345 (0.634, 2.056)	1.037 (0.620, 1.454)
First Generation [Yes]	1.051 (0.607, 1.495)	1.181 (0.652, 1.710)	1.274 (0.510, 2.038)	1.084 (0.538, 1.631)
Disability [Yes]	2.411 ^{***} (1.030, 3.793)	1.573 [^] (0.844, 2.303)	1.181 (0.420, 1.943)	2.241 ^{**} (0.593, 3.888)
Gender [Cis-Women]	1.833 ^{**} (0.986, 2.680)	1.379 (0.596, 2.162)	1.440 (0.230, 2.651)	2.673 ^{***} (1.160, 4.186)
Gender [LGBTQ+]	1.951 ^{**} (0.850, 3.051)	1.676 (0.615, 2.736)	2.167 [^] (0.198, 4.135)	2.135 ^{**} (0.705, 3.564)
Race [BIPOC]	0.617 [^] (0.271, 0.963)	0.572 (0.083, 1.060)	0.522 (-0.204, 1.247)	0.644 (0.255, 1.033)
Gender [Cis-Women]& Race [BIPOC]	1.319 (0.269, 2.368)	2.536 [^] (-0.063, 5.135)	2.019 (-1.252, 5.291)	0.878 (0.072, 1.684)
Gender [LGBTQ+] & Race [BIPOC]	1.690 (0.192, 3.188)	0.960 (-0.106, 2.025)	1.447 (-0.923, 3.817)	1.223 (-0.010, 2.455)
Constant	1.384 (0.774, 1.995)	0.137 ^{***} (0.059, 0.215)	0.023 ^{***} (0.002, 0.045)	2.129 ^{***} (1.072, 3.185)
Log Likelihood	-446.907	-382.592	-224.345	-339.148
Akaike Inf. Crit.	921.813	793.184	476.691	706.296

*P-values:** $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

to systemic racism and white supremacy rooted in American history [1, 42]. Furthermore, Indigenous peoples (84.3% women & 81.6% men) face disproportionately high rates of IPV, especially from a non-indigenous partner, due to colonial and generational trauma [16, 44, 82].

Economic Status: We did not observe a statistically significant difference in marginalization due to low economic status or first-generation status. However, prior work suggests that survivors face economic insecurity and that violence can worsen their economic status [20, 81]. In particular, violence increases women's dependence on partners or families for necessities and reduces access to resources. The survivors may face problems such as utility disconnections, housing instability, food scarcity, and difficulty accessing medical care. Voth et al. observed a negative association between social support and economic hardship [139]. A mix of financial aid, advocacy, education, and support can alleviate economic distress. Future studies should investigate the relationship between economic status and TFA. We discuss the support-seeking dynamics of survivors from different economic and educational statuses in Section 4.2.

The abuse experiences shown in Table 3 may be more severe than others in the specific context in which they were experienced. Prior research demonstrates that repeat TFA-victimization (more than three times) is more dangerous in the "cycle of violence" [146]. The most common TFA experience faced by 472 (60%) students was unwanted calls, emails, voicemails, etc. In addition, 402 (51%) students faced image-based sexual abuse experiences such as non-consensual production and sharing of unwanted messages, pictures, and videos. Prior works by Henry and Powell et al. [65–69, 106, 107] show the prevalence of image-based sexual abuse (IBSA) that causes emotional distress to the survivors of IPV and dating violence. IBSA is disproportionately high among young women [109, 115, 150]. Moreover, minority ethnic populations and LGBTQ+ students are likelier to report a more significant negative impact on their health and relationships [67].

We recognize that the intersection of socio-economic demographics compounds vulnerability to digital safety and privacy risks [91, 92, 118, 125]. Therefore, an intersectional analysis is required to observe the interlocking axes of social, political, economic, and historical reasons for marginalization [21, 78, 142]. Due to the limitation of our current dataset, we cannot fully analyze these relationships due to lack of statistical power. We further expand the limitations of our study in Section 5.

4.2 RQ2: Support-Seeking Behavior of TFA survivors

We recognize the difference between disclosure and request for support, especially in different contexts of informal or formal support structures [48, 60, 128]. In the future, we could draw parallels from disclosures of abuse from research on IPV and Sexual Violence [19, 70, 128, 143, 144]. The students may have interpreted this question either way. In the context of this paper, we consider only the support-seeking behavior of the students. We analyze demographic differences through a multivariate logistic regression model (see Table 4).

Informal Support: We observe that more than half (290 (53%)) of the students who faced TFA do not seek any support. We observed that at least 500 (91%) students reported having a positive friend support network – measured using MPSS Scale [151] – but only half (250 (50%)) of them sought any informal support, such as friends (40%), roommates (15%), family and relatives (19%), or an intimate partner (4%). We observe that Cis-Men are 64.5% and 55.9% less likely to seek support after facing TFA than Cis-Women ($odds = 0.355$, $p = 0.000494$, $CI = [0.148, 0.562]$) and LGBTQ+ survivors ($odds = 0.441$, $p = 0.012800$, $CI = [0.157, 0.725]$) respectively. Moreover, we observed that Cis-Women and LGBTQ+ are $3.0\times$ ($odds = 2.964$, $p = 0.000304$, $CI = [1.217, 4.712]$) and $2.4\times$ ($odds = 2.432$, $p = 0.007495$, $CI = [0.848, 4.016]$) more likely to seek support from friends, family, relatives, or an intimate partner

Table 3: Frequency distribution of victimization to abusive experiences (n = 776).

Item	At least Once	Once	Twice	3+ times
made unwanted phone calls, emails, voicemails, texts, or instant messages?	472 (60%)	133 (17%)	85 (10%)	254 (32%)
posted unwanted messages, pictures, or videos online?	204 (26%)	88 (11%)	54 (6%)	62 (7%)
shared intimate images or messages about you without your consent?	198 (25%)	98 (12%)	32 (4%)	68 (8%)
convinced you to share your account access, passwords, or recovery questions	88 (11%)	58 (7%)	15 (1%)	15 (1%)
Used technology to threaten the life or safety of your friends, family, or pets?	79 (10%)	52 (6%)	14 (1%)	13 (1%)
Installing spyware on your phone?	10 (1%)	7 (0%)	2 (0%)	1 (0%)
Using applications like GoogleMaps, iCloud, or Snapchat maps?	160 (20%)	50 (6%)	22 (2%)	88 (11%)
Using shared devices like computers, phones, iPads, cameras, smart-devices,	63 (8%)	26 (3%)	8 (1%)	29 (3%)
Controlled or restricted access to finances, financial services and statements	24 (3%)	14 (1%)	2 (0%)	8 (1%)

as compared to Cis-Men respectively. Ybarra et al. found that fewer men (21%) sought support from friends and family than women (43%) and LGBTQ+ (48%) [150]. Prior literature shows that 81% of adult women who face physical or sexual IPV disclose to at least one informal support, while only 57% of men disclose abuse [10]. Cis-Men may face challenges in seeking support due to social stigma [110]. Moreover, we do not observe significant differences in marginalized students seeking informal support. However, prior work found that Black, Hispanic, or younger women with low-income status who face IPV have lower disclosure rates compared to older white women with high-income status [19].

Formal Support: Merely 21 (3%) of our participants sought formal support from survivor services, tech clinics, cybercrime unit of law enforcement or organizations such as Dean of Students Office, the Police, or someone in a position of power. This shows that although formal resources are available to students, they are underutilized. Previous work shows that students (especially undergraduates) might even be unaware of the resources [93], facing a problem of service discovery [145]. Woodlock et al. note that survivors of TFA are reluctant to approach the criminal justice system and law enforcement for fear of being dismissed, with institutional betrayal compounding their grief and trauma from disenfranchisement [148]. Marginalization through social demographics can add barriers to seeking support, as participants may receive misogynistic or racist remarks and non-helpful comments from formal structures [17, 30, 82, 117]. For brevity, we leave the analysis of the association of support-seeking behavior of students belonging to different demographics, such as gender, sexual orientation, relationship status, race/ethnicity, disability, income status, graduate/undergraduate, as part of future work.

Effectiveness of Support: Among those who sought support (n = 252), 166 Students (65%) found that the support was effective in fixing the technical problem they were facing. In contrast, 80 (31%) mentioned that the support did not fix the issue. Most students 93% said that the support made them feel better. Finally, only 9 (3%) reported that they were referred to formal services such as Tech Clinic, Geek Squad, or Cybercrime Unit. Therefore, we observe that even though survivors seek support from informal support structures, it may not fix the technical concerns, make them feel better, or connect them to formal services.

5 DISCUSSION AND IMPLICATIONS OF THE STUDY

We analyze the prevalence of technology-facilitated abuse in Mid-western U.S. college students through a trauma-informed and critical lens. We observe that students belonging to marginalized social demographics like LGBTQ+, disability, and low-economic conditions have a higher chance of facing TFA. Similar to implications discussed by Klein et al., we discuss implications for research, practice and technology design, and policy interventions in campus [77]. Furthermore, we recognize that the study is not without certain limitations and discuss future directions of research.

Implication for Research: We found that Cis-Women are 1.8 times and LGBTQ+ students are 2.0 times more likely to face TFA than Cis-Men. Furthermore, students who reported having a disability are nearly three times (3.0x) as likely as students without a disability to face TFA. Socioeconomic factors amplify the risks to digital safety and privacy [91, 92, 118, 125], demanding intersectional analysis to untangle the complex web of marginalization. However, the lack of representation of intersectional identities prevented us from performing such an analysis. Oversampling underrepresented groups and a qualitative approach allows a deeper understanding of how, say, students with low-economic conditions and disabilities face challenges while interfacing with technology can help us inform the design of technology and reduce friction. Additionally, we found that more than half (53%) of the survivors of TFA do not seek support, 93% solely seek support from informal support structures, and merely 6% seek support from formal resources. Therefore, establishing a timeline and context of abuse and the survivor's support-seeking behavior will highlight the temporality and severity of the abuse and actions taken to mitigate the abuse. The sooner survivors know about the support services, the more informed they are to navigate their abusive relationship. Their lived experience will help us understand what their support-seeking interactions look like.

Lastly, this study discussed the prevalence of TFA in the US college context. Future work requires further research to understand the prevalence of technology-facilitated abuse in young adult populations outside college campuses and countries outside the US. Recently, researchers have looked at the landscape of technology-facilitated abuse in tribal Australia [30, 61], women in the Global South (India, Pakistan, Bangladesh, and Singapore) [117] and have

highlighted the context of abuse when family dynamics and technology adoption are significantly different from North America. For example, Sambasivan et al. [117], observe that a fully-clothed photo, name, or phone number released publicly will be a dangerous issue for some participants with serious societal implications that may not be the case in American society. We hypothesize that the sociotechnical challenges in Global South countries may present insights that allow us to design the study appropriately. Therefore, exploring the landscape of technology-facilitated abuse in Rural communities can challenge the applicability of lessons learned in prior literature on urban cases of TFA.

Implication for Design of Technology: The most common TFA experience faced by 472 (60%) students was unwanted contact through calls, emails, voicemails, texts, or instant messages. In addition, 402 (51%) students faced image-based TFA experiences such as non-consensual posting or sharing unwanted messages, pictures, and videos online. The rising trend of Image-based Sexual Violence (IBSV), especially nonconsensual AI-generated deepfake pornography towards women and LGBTQ+, may worsen with the ease of accessibility to AI technologies nowadays [131]. Prior works indicate the need to empower young adults with control and agency through online safety features to recognize and deal with risks of online harassment [2, 3, 7, 11, 13–15, 23, 26, 51, 73, 87, 113]. Prior works show that teens want accountability and evidence-based mechanisms [129] from social media platforms for actions like reporting and ensuring their online safety [2]. To combat online harassment at its root, prior works call for community-engaged solutions that are preventative for the perpetrator (warnings, education, blocking, and punishment) instead of reactive design interventions [2, 3], and provide intelligent guidance such as safer responses and nudges for seeking support from family [2, 51, 71, 87, 108]. Moreover, in-person TFA experiences also require careful design interventions using technology through a trauma-informed lens [39, 51]. Explicit permission usage and privacy disclaimers in dual-use applications on the mobile operating system can be enabled against non-consensual location tracking [51, 90]. Prior works also show that the survivors of violence may use technology such as social media and instant messaging platforms to form support networks and resist violence [71, 108, 145].

Campus Interventions: Campus policies can be informed to focus attention on educating the students about the dangers of TFA. We observed that while Cis-Women and LGBTQ+ seek support from informal support structures, Cis-Men are less likely to seek any support after facing TFA. Further, only 3% sought help from formal resources. This requires a case for policy decisions to provide evidence-based guidance and formal services accessible to students. The policymakers should consult with practitioners such as forensic nurses, activists, social workers, legal advocates, and law enforcement [112, 123]. Understanding the prevalence can help policymakers, advocates, and educators focus attention on interventions and inform their designs to make university campuses safer. Recently, interventions have been conducted to support survivors of IPV and sexual violence through violence awareness campaigns, bystander interventions through student organizations, residential committees, and survivor services [32, 93]. In addition, mental

health counselors, education programs, and peer networks are introduced to new students. In a similar vein, Tech Clinic could be integrated with the IT department and survivor services in colleges to support the survivors. This will enable the IT departments to provide cybersecurity advice with empathy and avoid victim blaming [122]. A push for conversation around consent in the technology realm, relevant resources on TFA, culturally-attuned and trauma-informed support, and push for educational content around safety planning through technology that will empower marginalized students and build their confidence [56]. Munro et al. suggests a one-stop-shop strategy to provide information on all services that a survivor requires to cope with abuse [98]. Further, most universities' Title IX [34] and Diversity, Equity, and Inclusion (DEI) office can provide training to faculty/staff to support marginalized students who face disproportionate violence and hardship to help provide them with appropriate resources and academic accommodations.

Therefore, appropriate interventions are required to make support resources accessible and available, and designed for marginalized groups of students such as students with disability and lower socioeconomic status with financial aid.

Limitations and Future Work We discuss how the limitations of the study may have influenced the results and suggest areas for future research. We believe that students who had prior abusive experiences may be more willing to participate in the study to share their experiences. However, the invisibility and hidden nature of TFA make it challenging to discover, acknowledge the abuse, or ask for support [89]. Therefore, the prevalence statistics that we observed could likely be an underestimate of the actual prevalence of TFA among students and therefore make quantitative studies on abuse experiences challenging to conduct and analyze.

Moreover, some participants may not have considered scenarios as abusive or in the context of violence. For example, we asked the participants if they categorized "Has someone spied on you, monitored your activities online, or tracked your location?". The students may have been interpreted as non-threatening and non-abusive and could be labeled as benign use of technology. Moreover, prior works locate how TFA resides in the spectrum and continuum of abuse and violence [46, 62, 97, 102, 147]. Although the students resonated with TFA experiences, more work is required to understand where do the students place them on a scale of aggression and harm. Moreover, we plan to include more TFA experiences (e.g., looking through devices without permission, derogatory name-calling using technology [86]), and recognize that certain experiences could happen in non-abusive scenarios as well (e.g., using Apple Map to share location).

On the other hand, due to continuous advancements in technology at such a rapid pace, it is challenging to capture *all* the experiences of technology-facilitated abuse. The current survey was primarily about emotional and sexual violence resource awareness, with a small technology component. Therefore, we propose redesigning the survey with more nuanced questions capturing the technical ability, privacy mental model, and abuse experienced through technology at the forefront. Moreover, we plan to establish an open-source standard scale for technology-facilitated abuse with year-on-year checkpoint (similar to the TAR scale by Brown et al. [29]) that keeps up with the technological advancement of the

21st century. A standardized scale would be effective in understanding technological marginalization as more and more technology is used for social good or nefarious purposes.

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A APPENDIX

Table 4: Regression Results for Support-Seeking. The number represents the Odds Ratio (OR) and 95% confidence intervals in brackets.

	No Support taken	Informal Support
Year [Graduate]	1.117 (0.556, 1.678)	0.855 (0.422, 1.288)
Ethnicity [Hispanic]	1.149 (0.498, 1.799)	0.825 (0.354, 1.297)
Relationship [Married]	1.396 (0.083, 2.708)	0.539 (0.012, 1.066)
Relationship [Monogamous]	0.847 (0.505, 1.188)	1.226 (0.729, 1.723)
Relationship [Non-Exclusive]	0.720 (0.377, 1.064)	1.372 (0.716, 2.029)
Low Income [Yes]	1.012 (0.643, 1.382)	1.023 (0.648, 1.399)
First Generation [Yes]	0.822 (0.450, 1.193)	1.241 (0.676, 1.807)
Disabled [Yes]	1.024 (0.560, 1.487)	0.994 (0.543, 1.446)
Gender [Cis-Women]	0.355*** (0.148, 0.562)	2.964*** (1.217, 4.712)
Gender [LGBTQ+]	0.441** (0.157, 0.725)	2.432*** (0.848, 4.016)
Race [BIPOC]	0.552 (0.106, 0.998)	1.601 (0.280, 2.922)
Gender [Cis-Women] & Race [BIPOC]	1.289 (-0.014, 2.592)	0.838 (-0.021, 1.697)
Gender [LGBTQ+] & Race [BIPOC]	1.356 (-0.035, 2.747)	0.837 (-0.034, 1.708)
Constant	2.994*** (1.276, 4.712)	0.307*** (0.128, 0.486)
Observations	545	545
Log Likelihood	-365.148	-361.984
Akaike Inf. Crit.	758.297	751.967

P-values: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$