

# Using online surveys for health behavior research with college students: How does online recruitment method impact overall experience and sample characteristics?

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## Abstract

Online surveys are a popular way to collect data from college students for health behavior research. However, there remain gaps in understanding the usefulness, challenges, and validity threats of different online survey recruitment methods. The purpose of this paper is to compare the experiences and sample characteristics of two cross-sectional samples of undergraduate college students who took the same online survey during a global pandemic but were recruited using different methods: an online panel and online community recruitment. Students took the survey ‘COVID-19 and Digital Health Literacy in University Students’ during the summer of 2020. Sample characteristics were compared using chi-square tests of independence, *z*-tests of proportions, and *t*-tests of independent sample means. There were distinct drawbacks and benefits to each recruitment modality. Findings suggest online community recruitment is less costly, but more time intensive, and could produce a more homogenous sample. The panel-based sample was higher cost, but less time intensive, and produced a much more diverse sample of college students. It is important to consider how recruitment modalities for online surveys can impact required resources, influence study limitations, and impact the results and conclusions of health behavior research.

**Keywords:** digital health literacy, COVID-19, recruitment methods, college students, online surveys

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## Background

In 2005, “The Value of Online Surveys” was published in a time when the potential of online surveys was starting to gain attention (Evans & Mathur, 2005). Since then, advances in online technology and increasing internet access have resulted in online surveys being an easy and popular way to complete survey research (Evans & Mathur, 2018), and are often used in health behavior

research. According to the Pew Research Center (Pew Research Center, 2024a, 2024b), 93% of American adults are online regularly, and 76% use social networking sites. Meeting research participants where they already are makes internet-based research a potential time and cost saving option for many types of research, including health behavior research. Time and money spent on recruitment can be reduced, a large segment of the priority population can be reached, and

anonymity is easier to maintain (Temple & Brown, 2011). According to Wright (Wright, 2005), the internet may be the only way to reach concentrated groups of individuals with certain identities or who are members of unique or rare communities. In addition, those who have a condition or disease that may be stigmatized, (e.g., HIV, depression, etc.) or who have unpopular viewpoints, may find more comfort in an online environment.

However, internet-based survey research has its drawbacks. Concerning sampling, little is known about the characteristics of an online participant besides self-reported demographics, which have the potential to be inaccurate (e.g., social desirability bias). In addition, if you are recruiting participants from an online community, self-selection bias can occur; those who opt in to take a survey may be different than those who do not (Hlatshwako et al., 2021; Wright, 2005). The additional anonymity afforded with online surveys can threaten data quality as bots and fraudulent survey takers are common, as can people looking to take surveys only to get the compensation associated with survey completion (Konstan et al., 2005; Singh & Sagar, 2021).

Online surveys play an important role in understanding higher education institutions (Fosnacht et al., 2017) and are used to assess a variety of college student health behaviors and outcomes (Colby et al., 2017) (Windle et al., 2017). According to Pike (Pike, 2007), 60% of published research in higher education journals utilized surveys. Presently, college students spend a majority of their time online for school and personal reasons (Kwon et al., 2013). Thus, online surveying can be an effective and preferred method for data collection. Plus, this approach can reach a varied and diverse sample in a college setting (Reichel et al., 2021). However, declining survey response rates among college students threaten the use of this important data collection tool. It is

important to understand the most effective methods to recruit college students online in order to obtain high response rates and minimize biased samples in online surveys (Fosnacht et al., 2017). However, minimal studies have compared online survey recruitment methods for this important population.

### *Community based recruitment*

When using online surveys with college students, researchers can choose from different recruitment strategies. One method is online community recruitment. Online community recruitment strategies vary, but include outreach, whether through emails or posts and ads on social media, that seek to motivate qualified students to take the survey. Reichel et al. (Reichel et al., 2021) found the promotion of an online survey across multiple channels (i.e., an email sent to the entire student body, promotion from lecturers, print promotional materials around campus, and social media posts) helped produce a large sample size in the college student population. A systematic review of online survey recruitment using Facebook ads found them to be a cost-effective and feasible method to recruit study participants, particularly for hard-to-reach populations or those with a rare condition. (Thornton et al., 2016). Batterham (2014) found online survey recruitment through social media ads to be considerably more cost-effective than telephone surveys and resulted in similar representativeness of the priority population. Spahrkäs and colleagues found high potential in Facebook ads to reach qualified participants; however, they concluded this method to be very costly and produced a mostly female (92%) sample (Spahrkäs et al., 2021).

### ***Panel-based recruitment***

Another online recruitment method, panel-based recruitment, involves hiring a panel vendor like Qualtrics or SurveyMonkey. In panel-based surveys, users opt in to become panel members and provide their demographic and location information. These ‘panelists’ are sent opportunities to participate in consumer surveys for which they qualify (Poynter, n.d.). According to Craig et al, Qualtrics and other panel vendors provide a wide range of services that allow researchers to quickly secure survey respondents (Craig et al., 2013). On average, this costs researchers less than \$10 per completed survey, though costs may be higher as eligibility criteria become narrower. Online panels have filled the void left as directories, like phone books and random-digit-dialing sampling techniques have become less useful (Poynter, n.d.). While panel surveys are convenient, concerns remain around sample integrity and data quality. As in non-panel based online surveys, self-selection bias is a main concern. In addition, ‘professional survey takers’, or those who consistently take large numbers of incentive-based surveys, have been found to be inattentive, distracted, and more likely to provide inaccurate survey responses (PBS News Hour, 2015).

### ***Research comparing recruitment methods***

Previous research comparing online research recruitment modalities using the same survey has conflicting results. For example, Dworkin and colleagues compared three online recruitment strategies for an online parent technology survey: email listservs, Facebook ads, and Amazon Mechanical Turk (MTurk) -Amazon’s version of an online panel (Dworkin et al., 2016). They concluded email listservs to be the most cost-effective, but found they

produced more missing data and took the most time to reach the sample size goal; the sample also lacked diversity. Regarding Facebook ads, the per-participant cost was extremely high and resulted in mostly female participants but had a low amount of missing data. The MTurk sample was the least time intensive, had a medium-cost, and resulted in the most demographically diverse sample with the least amount of missing data. Antoun and colleagues compared recruitment strategies targeting iPhone users for an online survey (Antoun et al., 2016). They concluded ‘pull in’ methods (e.g., MTurk, Qualtrics panel, etc.) to be more cost effective, and ‘push out’ methods (e.g., Google AdWords, Facebook, etc.) to result in more demographically diverse samples.

### ***Research during a pandemic***

Finally, during the COVID-19 pandemic, survey-based research became dependent on online surveys as the safest, and sometimes only, method to reach potential survey participants amid social distancing restrictions (Hlatshwake et al., 2021) (Kumar et al., 2021). Survey fatigue is a well-known challenge in research and can be caused by over surveying groups of people (Porter et al., 2004) and has been a challenge in higher education. In addition to lower response rates, survey fatigue can present as respondents providing suboptimal responses, skipping questions, or finishing the survey prematurely (Lavrakas, P. 2013). While assessing the additional challenges the pandemic had on online surveys, Koning et al. (Koning et al., 2021) observed a spike in the number of published surveys related to neurosurgery during the pandemic, and overall, surveys had lower response rates.

No research could be found that compared online survey recruitment methods in the undergraduate college student population, a digitally dependent population that is

reporting survey fatigue and displaying lower response rates. Additionally, the COVID-19 pandemic presented a unique time in which online surveying became the preferred or only option to collect data (Hlatshwake et al., 2021). The results from this study will be important to understand the impact of different online surveying methods for health behavior research with college student samples and further beneficial when other pandemics or public health emergencies emerge. Therefore, this study compares two cross-sectional samples of college students who took the same survey 'COVID-19 and Digital Health Literacy in University Students' but were recruited with two different online recruitment methods: community-based recruitment (Study 1) through online outreach, and panel-based recruitment (Study 2). We seek to answer the following two research questions.

(1) How do research methods relate to overall experience, including time spent securing the sample, ease of administration, and cost.

(2) How do sample characteristics and missing data differ across the two samples?

### **Methods**

The current study used two recruitment methods for online survey research targeting the same population. Study 1 utilized community recruitment and targeted New York State (NYS) undergraduate college students and was approved by the University at Albany Institutional Review Board (IRB). Study 2 utilized panel-based recruitment through Qualtrics and targeted undergraduate college students across the United States (US) and was approved by the University of Hawai'i System IRB. The sample size goal for each sample was 250 participants. There was no mechanism in place to ensure no participants completed surveys in both Study #1 and Study #2. Both surveys were

disseminated through Qualtrics. Thus, some aspects of the survey delivery, design, and formatting would have been the same. The only key difference between the surveys was Study #2 was able to force responses for each question. The IRB in Study #1 would not allow forced responses.

### **Study 1**

Study 1 was administered by researchers at a large research university in the Northeast. Inclusion criteria included being 18 years of age or older and an undergraduate student in NYS. Recruitment for Survey 1 spanned two months (July to September, 2020) and was terminated when the sample size goal was reached (n=245). Online community recruitment methods included the following: On July 14<sup>th</sup>, an email was sent to administrative assistants from various departments asking them to send the screening questionnaire hyperlink to undergraduate students in their departments. The initial email was sent to 14 departments, five of which offered to send it to their undergraduate listservs. The other nine departments did not respond. A later follow up email was sent on August 5<sup>th</sup> to these nine departments and, at that time, five additional departments offered to send the recruitment email to their undergraduates and one declined the offer. We also utilized social media ads starting on July 21<sup>st</sup>. A 3-week sponsored (paid) Facebook and Instagram post was released using filters to reach undergraduate students at NYS colleges and universities. On August 5<sup>th</sup>, an email was sent to a random selection of thirteen NYS college and university Institutional Research Offices inviting them to send the survey to undergraduate students at their institution. Five contacts responded, none of which were willing to pass along to students at their university due to a lack of an affiliation with their university.

When interested participants clicked on the hyperlink provided in an email or social media post, they were directed to a screening questionnaire to assess inclusion criteria. If they met the criteria, they were asked to provide a .edu email address from a school in NYS. This requirement was added as an accuracy check for inclusion criteria. Next, a unique survey link was created for each .edu email address and sent to the participants. These techniques were used to minimize bots or fraudulent survey takers, and to eliminate potential issues of the survey being taken multiple times by the same person or being shared with individuals who did not complete the screening questionnaire. Students who took the survey were entered into a gift card drawing for five \$100 Amazon gifts cards.

## **Study 2**

Study 2 utilized and paid Qualtrics to secure a panel sample. Study 2 was completed by researchers at the University of Hawai‘i at Mānoa. Inclusion criteria included being an undergraduate student in the United States who was in the Qualtrics pool. Before survey dissemination, a Research Consultant from Qualtrics worked with the Primary Investigator to determine the requested sample pool (e.g., college undergraduate students throughout the US) and to set quotas (e.g., gender and racial/ethnic diversity). From there, a Project Manager checked the survey for technical issues before releasing the survey and monitoring respondents. Prospective participants were alerted of their eligibility for the survey based on their system profiles. Responses were collected from July 7<sup>th</sup> to July 23<sup>rd</sup>, 2020. After the first few surveys were completed, quality checks were done to determine a minimum time limit for valid responses. From there, through sequential sampling of a Qualtrics-managed research panel, 256 responses were collected. Sampling quotas were used to ensure the sample was representative of racial/ethnic

and gender diversity in the US collegiate population. Students received digital gift cards or similar incentives for their participation (Hadley et al., 2023; Patil et al., 2021).

## **Survey**

The survey instrument came from a collaboration with an existing international consortium (Global Health Literacy Research Network, n.d.). The survey contained 54 questions, some with sub-questions, and Qualtrics estimated it would take approximately 15 minutes to complete. Additional questions added to the ‘COVID-19 and Digital Health Literacy in University Students’ survey included questions focused on perceived severity of COVID-19, perceived susceptibility to COVID-19, perceived handling of the pandemic, political affiliation, health literacy level, COVID-19 vaccine intentions, and adherence to COVID-19 public health as well as extra demographic questions. While the current manuscript compares relative effectiveness of sampling methods, Hadley et al., (2023) and Patil et al., (2021) provide details of survey findings related to COVID-19 attitudes and behaviors.

## **Results**

### **Cost**

The total cost for Study 1 was \$950. This was spent on sponsored social media advertisements on Facebook and Instagram (\$450) and on five \$100 gift card incentives. At the end of the 3-week campaigns, 783 people clicked on the social media posts which sent them to the screening questionnaire. It was estimated that this contributed to very few (~10-15) participants successfully completing the screening questionnaire and receiving the survey link. With this estimation, the per-participant cost would be between \$30 - \$45. Study 2 cost a total of \$1,536 (\$6/participant) for 256 survey takers. Additionally, both studies had

a paid, part-time research assistant managing the study.

### ***Time***

In Study 1, two months passed before a lull was observed in survey completions. The sample size was close to the goal (N=245), so the survey was closed. During those two months (63 days), daily upkeep by a Research Assistant was necessary. Ongoing tasks included sending the email invitation to university contacts, creating unique survey links for those who met inclusion criteria, and managing or creating new social media posts. For Study 2, 17 days passed to reach the sample size goal (N=256). Once Qualtrics disseminated the survey, the researchers did not have to do any daily upkeep to ensure the sample size goal was reached.

### ***Missing data***

In Survey 1, IRB protocol required that responses could not be forced, thus missing data was an issue in this sample. For example, 3 items from the DHLI, one of the predictor variables assessed, had 153 surveys with missing scale items making it difficult to determine accurate DHL in this sample. Because of the missing data, in this sample, DHL was determined by averaging scores from the 9-items with higher response rates. Additionally, DHLI items were towards the bottom of the survey. Thus, not being able to force responses, plus survey fatigue likely contributed to the lack of responses. Survey 2 was able to force responses, thus missing data was not an issue.

### ***Demographics***

Demographic data (Table 1) showed Study 1 to be primarily female, Democrats, completing a degree in the social sciences (e.g., public health, psychology, communication), and had a mean age around 21 years old. The sample was racially diverse

and matched or exceeded the diversity seen at UAlbany. In Study 2, on average, respondents were 23.9 years old. This sample was more equally split by gender. This sample was also a majority Democrat (52%), but more diverse concerning school major (22% social sciences, 18% business, and 13% computer science/information technology). As designed, the sample ethnic and racial composition was generally representative of the US college student population. Comparing demographic characteristics across both samples showed statistically significant differences across all categories except race and level of DHL.

Concerning DHL, higher levels were observed in 51% of the sample in Study 1 and 57% in Study 2. This difference was not significant. In Study 1, 80.7% reported higher HL, and in Study 2, just less than half of the sample (49%) reported higher HL, this difference between the samples was statistically significant (Table 1).

## **Discussion**

Internet-based survey research has become a relatively easy and popular way for researchers to access their priority population, especially in college student populations. With online surveys increasing in popularity, and college students' reliance on digital devices, it is important to understand benefits and drawbacks of different online survey recruitment methods in this population and how they may impact sample characteristics and outcomes, especially during a global pandemic when research methods are forced online to follow social distancing protocols. The goal of this study was to compare experiences and sample characteristics of two studies that used the same survey targeting undergraduate college students in the U.S. but used different online recruitment methods during the COVID-19 pandemic. Findings suggest online community recruitment is less costly,

**Table 1: Total time, cost, incentives, missing data, sample characteristics, digital health literacy, and health literacy**

	Study 1 (N=245)	Study 2 (N=256)	<i>p</i> -value
Recruitment method	Community-based	Panel-based	
Total time	63 days	17 days	
Total cost	\$450	\$1,536	
Total cost/survey taker	\$1.84	\$6	
Incentives provided	Random drawing for 5, \$100 gift cards	\$6 to each participant	
Missing data	High number	None	
<b>Sample Characteristics</b>			
Average age	20.9 years old	23.9 years old	<i>p</i> <0.0001♣
Ethnicity †			
Non-Hispanic	208 (85%)	158 (62%)	
Hispanic	37 (15%)	98 (38%)	<i>p</i> <0.0001†
Race			
White	150 (62%)	146 57%	
Black or AA	44 (18%)	46 18%	
Asian	23 (9%)	32 13%	
Other	77 (11%)	32 13%	<i>p</i> =0.40
Sex*			
Male	43 (18%)	140 (55%)	
Female	196 (80%)	108 (42%)	
Gender variant/non-conforming	6 (2%)	8 (3%)	<i>p</i> <0.0001*
First generation status †			
Yes	78 (32%)	146 (57%)	
No	167 (68%)	110 (43%)	<i>p</i> <0.0001†
Political affiliation*			
Democrat	145 (60%)	132 (52%)	
Republican	19 (8%)	71 (28%)	
Independent/Other	77 (32%)	53 (21%)	<i>p</i> <0.0001*
DHL			
Lower	120 (49%)	110 (43%)	
Higher	124 (51%)	146 (57%)	<i>p</i> =0.197
HL †			
Lower	46 (19%)	130 (51%)	
Higher	198 (81%)	126 (49%)	<i>p</i> <0.0001†

*Note: \* =  $p < 0.05$  for chi-square test of independence; † =  $p < 0.05$  for z-test of proportions; ♣  $p < 0.05$  for t-test of independent sample means.*

but more time intensive, and similar to the findings of Spahrkäs et al. (Spahrkäs et al., 2021), produced a more homogenous sample. The panel-based sample was higher cost, but less time intensive, and produced a much more diverse sample of college students.

We agree with the findings of Reichel et al. (Reichel et al., 2021), in which community-based recruitment produced a reasonably sized college student sample that meet the goals in Study 1, however, this recruitment method was very time intensive and relied heavily on the ability of the researchers to contact and motivate colleagues with immediate access to the priority population (e.g., through a departmental email listserv) to forward their survey. Forwarding the survey link through departmental email listservs secured most of the sample and cost no money except for the paid Research Assistant's time. When recruitment was expanded using paid Facebook and Instagram ads, only 10-15 more participants were reached. One reason could be that college students may be using Facebook less than other social media sites. Similar to the findings of Spahrkäs et al. (Spahrkäs et al., 2021), but in contrast to the findings of Batterham (Batterham, 2014), paid social media ads did not seem to be a cost-effective recruitment method in our study. We estimated it cost \$30-45 per survey taker secured by the social media ads.

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Because other NYS institutions declined sending the survey to their student listservs, the sample was primarily from the university where the researchers were based. A collaborative study with researchers from multiple institutions could have alleviated some of this challenge as each researcher could have reached out to colleagues and/or departments at their institution for help with dissemination. Similar to the findings of Dworkin et al. (Dworkin et al., 2016) some questions in Survey 1 had a significant amount of missing data. Having a high amount of missing data is a threat to data integrity and should be considered before using online community recruitment. When comparing the results of both samples, Study 2 was more diverse by ethnicity, sex, first generation status, and political affiliation. Also, Study 2 reported substantially lower health literacy, one of the main predictor variables assessed.

Regarding DHL research, in order to streamline measuring and comparing DHL across research studies and in national datasets, having one measurement tool for the concept will be crucial. The concepts of eHealth literacy and DHL have a variety of measurement tool options such as the eHLS-Web3.0, eHealth literacy scale, eHealth literacy scale-extended, eHealth literacy questionnaire, transactional eHealth literacy

instrument, and the DHLI making it difficult to select the appropriate instrument or make comparisons across studies (Lee et al., 2021; Liu et al., 2021; van der Vaart & Drossaert, 2017)

### ***Limitations***

It is important to consider the limitations of this research. First, we made comparisons across two online recruitment methods. Making comparisons across more than two recruitment methods could have made the findings more relevant. For instance, having another sample take offline surveys, for example at in-person, routine medical visits, or through mall-intercept surveys, could have led to more valuable comparisons and conclusions.

As expected because of different sampling frames and methods, the samples had different results with respect to some demographic variables and health literacy. The sample in Study #1 came from the same geographic location whereas Study 2 pulled a national sample. This difference could have greatly impacted sample characteristics. Additionally, in Study 2, 29 survey takers were from NYS. Although unlikely, there was no mechanism in place to ensure one person did not participate in both studies. Finally, the incentive structures for each study varied greatly. In Study 1, there was only a 2% chance of winning a gift card. In Study 2, all participants were compensated (\$6). This difference might have attracted different types of students completing each survey.

### **Implications for Health Behavior Research**

When choosing a recruitment modality for an internet-based health behavior research study with college students, it is important to consider time constraints, funding, threats to data quality and integrity, and sample

diversity. If funds are limited, community recruitment via email listservs or free social media posts are reasonable options. However, obtaining a homogenous sample may be a risk with online community recruitment, and it will take substantially more time to secure a large sample. If the threat this poses to data quality and generalizability is a main concern, using a panel-based study could eliminate some of these challenges. Panel-based recruitment was medium-cost, low time-intensity, and produced a demographically diverse sample. Diverse samples are often easier to obtain in panel-based samples as they can ensure your panel meets certain criteria (e.g., weighted by race/ethnicity, gender, etc.) and they can more easily pull from larger geographic areas (e.g., a national sample). Online survey research has become more complicated with the growth of bots and artificial intelligence. It is critical for health behavior researchers to work together to establish best practices and recommendations for online survey research to ensure high quality health behavior study results.

### ***Discussion Questions***

- (1) What are strengths and weaknesses for online surveys from online based recruitment and panel-based recruitment studies?
- (2) Using different recruitment methods for online survey research can impact the sample characteristics. How can we move the field of health behavior research forward by developing best practices for online survey recruitment?

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### ***Conflicts of Interest***

The authors have no conflicts of interest to declare.

## References

- Antoun, C., Zhang, C., Conrad, F. G., & Schober, M. F. (2016). Comparisons of online recruitment strategies for convenience samples: Craigslist, google adwords, facebook, and amazon mechanical turk. *Field Methods*, 28(3), 231–246. <https://doi.org/10.1177/1525822X15603149>
- Batterham, P. J. (2014). Recruitment of mental health survey participants using Internet advertising: Content, characteristics and cost effectiveness. *International Journal of Methods in Psychiatric Research*, 23(2), 184–191. <https://doi.org/10.1002/mpr.1421>
- Colby, S., Wenjun, Z., Morgan, S. F., Shelnut, K., Olfert, M. D. et al., (2017). College student's health behavior clusters: Differences by sex. *American Journal of Health Behavior*, 41(4), pp. 378-389. <https://doi.org/10.5993/AJHB.41.4.2>
- Craig, B. M., Hays, R. D., Pickard, A. S., Cella, D., Revicki, D. A., & Reeve, B. B. (2013). Comparison of US panel vendors for online surveys. *Journal of Medical Internet Research*, 15(11), e260. <https://doi.org/10.2196/jmir.2903>
- Dworkin, J., Hessel, H., Gliske, K., & Rudi, J. H. (2016). A comparison of three online recruitment strategies for engaging parents. *Family Relations*, 65(4), 550–561. <https://doi.org/10.1111/fare.12206>
- Evans, J. R., & Mathur, A. (2005). The value of online surveys. *Internet Research*, 15(2), 195–219. <https://doi.org/10.1108/10662240510590360>
- Evans, J. R., & Mathur, A. (2018). The value of online surveys: A look back and a look ahead. *Internet Research*, 28(4), 854–887. <https://doi.org/10.1108/IntR-03-2018-0089>
- Fosnacht, K., Sarraf, S., Howe, E., Peck, L.K. (2017). How important are high response rates for college surveys? *The Review of Higher Education*, 40(2), pp. 245-265.
- Global Health Literacy Research Network. (n.d.). *The COVID-HL University Students Survey*. Global Health Literacy Research Network. Retrieved May 1, 2024, from <https://www.globhl.org/studien/university>
- Hadley, M., Patil, U., Colvin, K. F., Sentell, T., Massey, P. M., Gallant, M., & Manganello, J. A. (2023). Exploring the impact of digital health literacy on COVID-19 behaviors in New York state college students during the COVID-19 pandemic. *Computer Methods and Programs in Biomedicine Update*, 4, 100126. <https://doi.org/10.1016/j.cmpbup.2023.100126>
- Hlatshwako, T. G., Shah, S. J., Kosana, P., Adebayo, E., Hendriks, J., Larsson, E. C., Hensel, D. J., Erausquin, J. T., Marks, M., Michielsen, K., Saltis, H., Francis, J. M., Wouters, E., & Tucker, J. D. (2021). Online health survey research during COVID-19. *The Lancet Digital Health*, 3(2), e76–e77. [https://doi.org/10.1016/S2589-7500\(21\)00002-9](https://doi.org/10.1016/S2589-7500(21)00002-9)
- Koning, R., Egizi, A., Kotecha, J., Ciuculete, A., Zhi Yang Ooi, S., et al. (2021). Survey Fatigue During the COVID-19 Pandemic: An analysis of neurosurgery survey response rates. *Frontiers in Surgery*, 11(8). <https://doi.org/10.3389/fsurg.2021.690680>
- Konstan, J. A., Simon Rosser, B. R., Ross, M. W., Stanton, J., & Edwards, W. M. (2005). The story of subject naught: A cautionary but optimistic tale of internet survey research. *Journal of Computer-Mediated Communication*, 10(2), 00–00.

- <https://doi.org/10.1111/j.1083-6101.2005.tb00248.x>
- Kumar, A., Chandran, S., Somani, A. (2021). Conducting online web-based surveys at the time of COVID-19 pandemic. *Archives of Mental Health*, 22(2). [https://doi.org/10.4103/AMH.AMH\\_44\\_20](https://doi.org/10.4103/AMH.AMH_44_20)
- Kwon, M., Lee, J. Y., Won, J. W., Park, J. A., Min, C. et al. (2013). Development and validation of a smartphone addiction scale (SAS). *PLoS One*, 8(2). <https://dx.doi.org/10.1371/journal.pone.0056936>
- Lavrakas, P. (2013). Respondent fatigue. In: *Encyclopedia of Survey Research Methods*. Thousand Oaks, CA: United States of America: Sage Publications, Inc.
- Lee, J., Lee, E.-H., & Chae, D. (2021). Ehealth literacy instruments: Systematic review of measurement properties. *Journal of Medical Internet Research*, 23(11), e30644. <https://doi.org/10.2196/30644>
- Liu, H.-X., Chow, B.-C., Liang, W., Hassel, H., & Huang, Y. W. (2021). Measuring a broad spectrum of ehealth skills in the web 3.0 context using an ehealth literacy scale: Development and validation study. *Journal of Medical Internet Research*, 23(9), e31627. <https://doi.org/10.2196/31627>
- Patil, U., Kostareva, U., Hadley, M., Manganello, J. A., Okan, O., Dadaczynski, K., Massey, P. M., Agner, J., & Sentell, T. (2021). Health literacy, digital health literacy, and covid-19 pandemic attitudes and behaviors in u.s. college students: Implications for interventions. *International Journal of Environmental Research and Public Health*, 18(6), 3301. <https://doi.org/10.3390/ijerph18063301>
- PBS News Hour. (2015, February 12). *How professional survey-takers are shaping scientific research*. PBS NewsHour. <https://www.pbs.org/newshour/show/mec-hanical-turk>
- Pew Research Center. (2024a, January 31). Internet, Broadband Fact Sheet. *Pew Research Center*. <https://www.pewresearch.org/internet/fact-sheet/internet-broadband/>
- Pew Research Center. (2024b, April 3). Social Media Archives. *Pew Research Center*. <https://www.pewresearch.org/topic/internet-technology/platforms-services/social-media/>
- Pike, G. R. (2007). Adjusting for nonresponse in surveys. *Higher education: Handbook of theory and research*, 22, pp. 411-450. The Netherlands: Springer.
- Porter, S. R., Whitcomb, M. E., & Weitzer, W. H. (2004). Multiple surveys of students and survey fatigue. *New Directions for Institutional Research*, 121, pp. 63-73. <http://dx.doi.org/10.1002/ir.101>
- Poynter, R. (n.d.). *The Handbook of Online and Social Media Research: Tools and Techniques for Market Researchers*. Wiley.Com. Retrieved May 1, 2024, from <https://www.wiley.com/en-us/The+Handbook+of+Online+and+Social+Media+Research%3A+Tools+and+Techniques+for+Market+Researchers-p-9780470710401>
- Reichel, J. L., Rigotti, T., Tibubos, A. N., Werner, A. M., Schafer, M., et al. (2021). Challenge Accepted! A critical reflection on how to perform a health survey among university students-An example of the Healthy Campus Mainz Project. *Sec. Public Health Education and Promotion*, 9. <https://doi.org/10.3389/fpubh.2021.616437>
- Singh, S., & Sagar, R. (2021). A critical look at online survey or questionnaire-based research studies during COVID-19. *Asian*

- Journal of Psychiatry*, 65, 102850.  
<https://doi.org/10.1016/j.ajp.2021.102850>
- Spahrkäs, S. S., Looijmans, A., Sanderman, R., & Hagedoorn, M. (2021). Recruiting participants for an international mHealth study via Facebook Ads: Experiences from the Untire App RCT. *Internet Interventions*, 23, 100362.  
<https://doi.org/10.1016/j.invent.2021.100362>
- Temple, E. C., & Brown, R. F. (2011). A comparison of internet-based participant recruitment methods: Engaging the hidden population of cannabis users in research. *Journal of Research Practice*, 7(2), Article-D2.
- Thornton, L., Batterham, P. J., Fassnacht, D. B., Kay-Lambkin, F., Calear, A. L., & Hunt, S. (2016). Recruiting for health, medical or psychosocial research using Facebook: Systematic review. *Internet Interventions*, 4, 72–81.  
<https://doi.org/10.1016/j.invent.2016.02.001>
- Windle, M., Haardorfer, R., Getachew, B., Shah, J., Payne, J., Pillai, D., Berg, C. J. (2017). A multivariate analysis of adverse childhood experiences and health behaviors and outcomes among college students. *Journal of American College Health*, 66(4), pp. 246-251.  
<https://doi.org/10.1080/07448481.2018.1431892>
- Wright, K. B. (2005). Researching internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computer-Mediated Communication*, 10(3), JCMC1034.  
<https://doi.org/10.1111/j.1083-6101.2005.tb00259.x>