

BY LINDA A. JACKSON,
ALEXANDER VON EYE,
GRETCHEN BARBATSIS,
FRANK BIOCCA,
HIRAM E. FITZGERALD,
AND YONG ZHAO

THE IMPACT OF INTERNET USE ON THE OTHER SIDE OF THE DIGITAL DIVIDE

*Exploring factors
influencing the social impact
of Internet use.*

IN 1998, RESEARCHERS AT CARNEGIE-MELLON UNIVERSITY FOUND EVIDENCE OF WHAT THEY LABELED “THE INTERNET PARADOX” [5]. GREATER INTERNET USE WAS ASSOCIATED WITH DECREASED PSYCHOLOGICAL WELL-BEING AND SOCIAL INVOLVEMENT. THESE FINDINGS WERE CONSIDERED PARADOXICAL BECAUSE INTERNET USE WAS ASSUMED TO FACILITATE SOCIAL CONNECTION AND THE PSYCHOLOGICAL AND SOCIAL BENEFITS ASSOCIATED WITH IT [1]. THE HOMENET FINDINGS CAPTURED NATIONAL ATTENTION, INSPIRING SUCH HEADLINES AS “SAD, LONELY WORLD DISCOVERED IN CYBERSPACE” (*New York Times*, AUG. 30, 1998), “HEAVY NET USE CUTS INTO REAL LIFE” (*USA Today*, FEB. 16, 2000), AND “A WEB OF WORKAHOLIC MISFITS? STUDY FINDS HEAVY INTERNET USERS ARE SOCIALLY ISOLATED” (*Washington Post*, FEB. 16, 2000).

Given the importance and visibility of the HomeNet study, it is not surprising it provoked severe criticism from other researchers. Much of the criticism focused on the measures used to assess psychological well-being and social involvement and on the representativeness of the sample [7]. HomeNet researchers responded to both criticisms in a three-year follow-up of the original study’s participants, and in a second longitudinal survey study [3]. Results of the three-year follow-up indicated that the negative psychological and social effects of Internet use had dissipated by the third year, with the exception of stress. Findings from

the survey study indicated benefits of Internet use for psychological well-being and social involvement, again with the exception of stress. However, benefits were limited to extroverts and those who had greater amounts of social support.

To explain changes in findings over time within the original HomeNet study, Kraut et al. [3] suggested that maturation of participants and changes in how they used the Internet may account for the dissipation of negative psychological and social effects. Further, discrepancies in findings between the follow-up to the original study and the longitudinal survey study may be attrib-

able to unmeasured sample differences. However, the most economical explanation, according to CMU researchers, is that changes in the Internet itself account for these differences: "Simply put, the Internet may have become a more hospitable place over time." More friends and family members are likely to be online now than previously. Services that facilitate the development of strong social ties have increased (for example AOL buddy lists and instant-messaging services). In addition, the explosion of information on the Internet may have contributed to the benefits of Internet use by providing a better integration of users' online and offline lives.

Other research examining the social impact of Internet use has produced mixed results. Some studies found Internet use contributes to psychological well-being by providing opportunities for social connection and community, as well as convenient access to information [6, 9, 10]. Other studies indicated that Internet use undermines well-being because online connections are weaker than real-life connections, or because online connections are often used to replace real-life relationships and activities [8]. Thus, the social impact of Internet use remains controversial, with a variety of explanations offered for findings of favorable or unfavorable impact.

The HomeNetToo project was based in part on the original HomeNet study [4]. As in the original study, we automatically recorded Internet use for an extended period of time (16 months) and measured psychological well-being and social involvement with multiple measures and at multiple times. However, the HomeNetToo study was designed to address questions about the digital divide, particularly the racial digital divide [2]. Our sample is unique in that it consists of low-income African-Americans and Caucasians using the Internet at home for the first time. In this article, we address the following questions:

- Does Internet use influence psychological well-being in low-income adults? If so, is its influence dependent on race or other factors known to be related to psychological well-being (such as extroversion, or common daily hassles and annoyances)?
- Does Internet use influence social involvement in low-income adults? If so, is its influence dependent on race or other factors known to be

related to social involvement (for example, extroversion)?

HomeNetToo Participants

Participants in the HomeNetToo project were 117 adults residing in a low-income, medium-sized urban community in the midwestern U.S.¹ They were primarily African-American (67%), female (80%), and never married (42%). Almost half (49%) had family incomes of less than \$15,000 annually. The majority (62%) had some college education or had earned a college degree. Average age was 38.6 years old.

Participants received free computers, Internet service and in-home technical support in exchange for allowing their Internet use to be recorded for 16 months, and for participating in home visits and completing surveys at pretrial, one month, three months, nine months, and posttrial.

Internet Use: Race Differences, Variability Among Participants, and Consistency Over Time. African-Americans used the Internet less than Caucasians during the first year of home Internet access. However, race differences disappeared during the early part of the second year. Analyses were performed to evaluate whether race differences in Internet use were attributable to race differences in other demographic characteristics (such as income). They were not. Although African-Americans had somewhat lower incomes than Caucasians, income was unrelated to Internet use. The only other demographic characteristic related to Internet use was age. Older participants used the Internet less than younger participants, but this difference also disappeared by the end of the first year.

On average, participants used the Internet 43 minutes per day, participated in one session, visited 10 domains, and sent approximately three email messages per week.² There was also considerable variability among participants in the extent of their Internet use.³ About 10% stopped using it altogether by six months, and this percentage increased to 22% by the

Time online (minutes/day)	Number of sessions (per day)	Number of domains visited (per day)	Number of email messages sent (per day)
Mean	Mean	Mean	Mean
Time 1 (1 to 3 months): n=116			
41.51	1.00	9.05	0.39
Time 2 (4 to 6 months): n=117			
43.53	0.74	10.94	0.36
Time 3 (7 to 9 months): n=122			
37.73	0.62	10.36	0.39
Time 4 (10 to 12 months): n=122			
41.51	0.62	11.12	0.40
Time 5 (11 to 16 months): n=121			
48.03	0.60	12.54	0.35

Note: All measures were automatically recorded. n=sample size.

Table 1. Mean levels of Internet use.

¹Approximately 140 children of the adult subjects also participated in the project.

²We considered the possibility that participants were using other email accounts in order to avoid monitoring. While we cannot rule out this possibility entirely, other evidence and diary reports from home visits obtained at pretrial, one-month, three months, nine months and posttrial, suggest that our findings represent the actual level of email use by participants.

³Because of the high variability and skewed distributions, log transformations of Internet use measures were used in all analyses.

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end of the trial. On the other hand, 25% of participants were online more than two hours a day.

To examine time-related changes in Internet use we divided the trial into five time periods that corresponded to the administration of surveys, plus one additional time period (Time 2) to facilitate understanding of changes during the first year: Time 1: 1–3 months; Time 2: 4–6 months; Time 3: 7–9 months; Time 4: 10–12 months; Time 5: 13–16 months. Means for the Internet use measures for each time period are presented in Table 1. Time online fluctuated but did not decrease between pretrial and posttrial, contrary to national trends [8, 10]. Consistent with national trends, people became more efficient at using the Internet, logging on less often (fewer sessions) but gathering more information during a session (more domains visited) [8, 10]. Email use remained consistently low throughout the 16-month trial.

Psychological Well-Being: Race Differences, High Levels of Well-Being, and Consistency Over Time. African-Americans were less depressed and less stressed than were Caucasians. Older participants (age 38 and above) were happier than younger participants. Means for the psychological well-being measures are presented in Table 2. Participants reported high levels of well-being, regardless of whether well-being was measured as the absence of depression, stress, and physical symptoms, or as the presence of happiness and self-esteem. Well-being changed very little over the 16-month trial, with one exception. Physical symptoms (such as anxiety or back tension)

	Pretrial	Three months	Nine months	Posttrial
	Mean	Mean	Mean	Mean
PSYCHOLOGICAL WELL-BEING				
Depression-1*	1.51	1.45	1.49	1.46
Depression-2*	1.29	1.21	1.33	1.28
Stress°	2.98	2.87	2.87	2.82
Physical symptoms*	1.77	1.70	1.73	1.57
Happiness*	3.19	3.22	3.12	3.11
Self-esteem°	4.28	4.27	4.29	4.24
SOCIAL INVOLVEMENT				
# of close friends	3.29	3.63	3.38	3.88
# of close relatives	3.92	4.31	4.46	4.18
# of groups	1.62	1.57	1.32	1.34
Time with friends ^p	X	2.18	2.12	2.13
Time with relatives ^p	X	2.09	2.14	1.96
Time with family ^p	X	1.84	1.85	1.84
Time on telephone°	X	1.89	1.89	1.94
Social support: Inclusion°	3.84	3.85	3.80	3.75
Social support: Exclusion°	2.06	2.13	2.06	2.14
Social support: Instrumental°	3.99	3.96	4.00	3.97

Note: 103<n(sample size)<117. "X" indicates that the variable was not measured at pretrial.
*4-point rating scales; higher values indicate more of the characteristic.
°5-point rating scales; higher values indicate more of the characteristic.
^p3-point rating scales; higher values indicate less time after home Internet access was available.

Table 2. Mean levels of psychological well-being and social involvement.

decreased from pretrial to posttrial.

Because hassles and uplifts may be related to psychological well-being, we examined the frequency of each in our sample. Participants averaged six hassles and 12 uplifts per week. Hassles decreased between nine months and posttrial. Uplifts increased steadily over the 16-month trial.

Social Involvement: Race Differences, High Levels of Involvement, and Stability Over Time. African-Americans were more socially

involved than were Caucasians. They had more close friends, spent more time with friends, and spent more time talking to friends and relatives on the phone than Caucasians. They were also less likely to feel socially excluded. Older participants belonged to more groups than younger participants.

Participants reported high levels of social involvement (see Table 2). On average, they had four close friends, four relatives they considered close friends, and belonged to one group. They spent the same amount of time with friends and relatives, and somewhat more time with family after having Internet access at home than they did before having it. They talked to friends and family on the phone about one to two hours each day. They felt included in their circle of family and friends, and believed they had all the instrumental support they needed. The number of close friends increased between nine months and the posttrial period. There was no change in any other measure of social involvement. Participants rated themselves as more extroverted than introverted. Demographic characteristics were unrelated to extroversion.

APPARENTLY, OUR PARTICIPANTS NEVER EMBRACED THE INTERNET AS A COMMUNICATION TOOL. RATHER, THEY VIEWED IT AS AN INFORMATION TOOL.

Modeling the Effects of Internet Use on Psychological Well-Being and Social Involvement.

Structural equations modeling was used to model the effects of Internet use (four measures) on psychological well-being (six measures) and social involvement (10 measures) after accounting for other factors that may influence these outcomes, namely, hassles, uplifts, race, age, and extroversion [3].⁴ Here, we present findings for one measure of Internet use, one measure of psychological well-being, and one measure of social involvement. The basic finding regarding the effects of Internet use was the same for all measures of Internet use and all measures of psychological well-being and social involvement.

The structural model in Figure 1 to predict depression assumes five latent factors: depression, time online, demographics (race and age), extroversion, and hassles.⁵ The model-data fit is excellent ($\chi^2(96)=91.76$, $p<0.60$, RMSEA

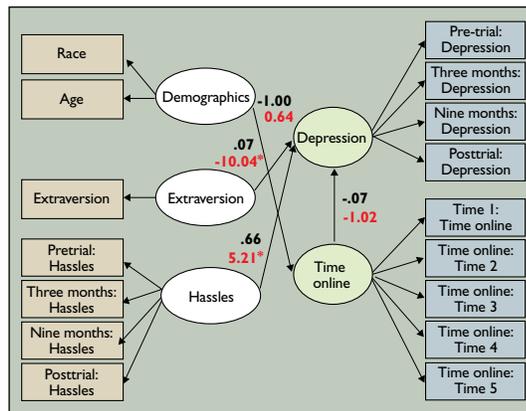


Figure 1. Structural model to predict depression.

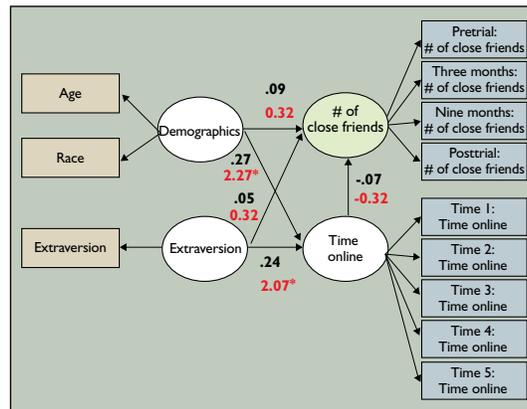


Figure 2. Model to predict number of close friends.

=0.00, AGFI =0.88, NNFI=1.00). Path coefficients and tests of significance indicated that extroversion predicts depression (negatively), as does number of hassles (positively), but time online does not, even after accounting for demographic differences in time online. Thus, more extroverted participants and those who experienced fewer hassles were less depressed than other participants. Time spent using the Internet had no influence on depression.

The model in Figure 2 to predict number of close friends assumes four latent factors: number of close friends, time online, demographics, and extroversion. The model-data fit is again excellent ($\chi^2(49)=48.15$, $p<0.51$, RMSEA=0.00, AGFI=0.90, NNFI=1.00). Path coefficients and tests of significance indicate that none of the latent factors predicted the number of

close friends. Demographic characteristics predicted Internet use, but Internet use did not predict the number of close friends.

Conclusion

Results of the HomeNetToo project indicate Internet use has no effect on the psychological well-being and social involvement of low-income African-Americans. Nor does it affect these outcomes for low-income Caucasians. The absence of social impact was found regardless of how Internet use was measured (time online, number of sessions) and

⁴Four indices of model fit were used to evaluate alternative models [8]: 1) the Chi-square test of model fit indicates whether the hypothesized model fits the data adequately, with a nonsignificant chi-square indicating adequate fit; 2) the root mean square error of approximation (RMSEA) reflects lack of fit per degree of freedom. Values under 0.05 are considered good fit while those between 0.05 and 0.10 are considered moderate fit; 3) the adjusted goodness of fit index (AGFI) and 4) the non-normed fit index (NNFI). Each have an upper limit of 1.00. Values above 0.90 are considered good fit.

⁵Error covariances between corresponding measures of Internet use were allowed to vary (for example, time online at Time 1 and time online at Time 2). In the analyses, latent variables were scaled to have unity standard deviations and observed variables remained in their original metric. Thus, standardized path coefficients may be greater than one.

regardless of how psychological well-being (depression, happiness) and social involvement were measured (number of close friends, time spent with family). Discrepancies between our findings and those of the original HomeNet study—the only other study to automatically record Internet use—are easily explained by differences in sample characteristics and changes in the Internet itself. Of greater interest is why Internet use had neither a positive nor negative social impact for our sample.

An explanation for the absence of Internet effects on psychological well-being and social involvement may lie in the low frequency of email use by HomeNetToo participants. Recall that the average number of email messages sent was only three per week, despite evidence that Internet use was nontrivial, averaging about 43 minutes per day. African-Americans, who comprised 67% of our sample, were particularly unlikely to use email. Apparently, our participants never embraced the Internet as a communication tool. Rather, they viewed it as an information tool. Ethnographic data collected by the HomeNetToo project supports this view.

Why didn't our participants take to the Internet as a communication tool? The explanation is so obvious as to be elusive. Email is a desirable communication tool only if you have people to communicate with, in particular, family and friends who have home computers and Internet access, or co-workers with whom email communication is encouraged or required. It is likely that many of our participants had family and friends on the same side of the digital divide as they were. It is unlikely that many of our participants had co-workers with whom they communicated using email. Thus, it is not surprising that they never embraced the Internet as a communication tool.

Of course, email is not the only way to communicate on the Internet. We recorded the frequency of chat and newgroup activity by HomeNetToo participants and found it to be essentially nonexistent. Some participants were particularly wary of chat rooms, which they viewed as dangerous places where predators lurk.

Evidence that Internet use has no social impact on low-income adults has implications for efforts to reduce the digital divide and suggests that concerns about a negative social impact are unwarranted. While finding a positive impact would have been more supportive of efforts to reduce the divide, it may be that a positive impact does occur in domains other than the social domain. For example, Internet use may increase learning motivation and cognitive competencies, possibilities we are examining using other measures from the HomeNetToo project.

As the digital divide narrows, the Internet may become an important communication tool for low-income families as well. A reexamination of the social impact of Internet use may be necessary as both the "typical" Internet user and the Internet itself change over time. **G**

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LINDA A. JACKSON (jackso67@msu.edu) is a professor of psychology at Michigan State University in East Lansing, MI.

ALEXANDER VON EYE (voneye@msu.edu) is a professor of Psychology at Michigan State University.

GRETCHEN BARBATSIS (barbatsi@msu.edu) is a professor of Telecommunications, Information and Media at Michigan State University.

FRANK BIOCICA (Biocca@msu.edu) is SBC Chair and Professor of Telecommunications, Information and Media at Michigan State University.

HIRAM E. FITZGERALD (fitzger9@msu.edu) is a University Distinguished Professor of Psychology and Assistant Provost for University Outreach and Engagement at Michigan State University.

YONG ZHAO (zhaoyo@msu.edu) is an associate professor and the director of the Center for Technology and Teaching at Michigan State University.

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