

Routine Patterns of Internet Use & Psychological Well-being: A Complex Interaction

Irina Shklovski
Carnegie Mellon University
Pittsburgh, PA
Irinias@cs.cmu.edu

Robert E. Kraut
Carnegie Mellon University
Pittsburgh, PA
robert.kraut@cmu.edu

Jonathon Cummings
Duke University
Chapel Hill, NC
jonathon.cummings@duke.edu

ABSTRACT

In this paper we examine how routine uses of the Internet for particular purposes may serve as indicators of overall levels of psychological well-being. Although particular patterns of Internet use seem to mitigate the level of stress response to a major life event, such as a residential move, this effect is marginal. However, changes in psychological well-being, motivated by a residential move, can drive changes in routine uses of the Internet, indicating Internet-based coping strategies. We discuss implications of these findings for our understanding of the role of the Internet in everyday behavior and instances of coping with unusual situations.

Author Keywords

Internet use, everyday life, residential mobility, stress, loneliness, depressive affect, social support

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

For a large proportion of Americans the Internet has become an integral part of everyday life [11]. According to a recent tracking survey by Pew Internet & American Life, nearly 70% of the US population reports using the Internet at least occasionally. The Internet is a plastic technology, amenable to many uses. Recent surveys of its daily uses indicate that services such as information seeking, consumption of news and media, shopping, entertainment and interpersonal communication are among the most popular of the myriad services available to users [28]. Although there has been much speculation as to what impact Internet use may have on its consumers, effects of using a medium are likely to depend on the users' needs,

goals and purposes.

Rhetoric surrounding the Internet tends to focus on potential grand changes it could bring about. While these discussions are certainly worthy of attention, integration of Internet use as a set of routine activities in daily life of a large proportion of population in the US, may be the most dramatic change yet [11]. Recognition that the breadth of functionality offered by the Internet begets different patterns of use, has prompted a number of researchers to study daily use of the Internet [15]. However, what motivates people to use the Internet the way they do, has remained unexplored.

In this paper we propose that differences in psychological well-being, such as feelings of loneliness and depressive affect, may motivate changes in routine Internet use behaviors. We argue that such motivations are more likely to be evident when routines are disrupted by a stressful event that affects psychological well-being. We use a residential move as such a stressful event. Stress reactions to residential mobility have been found to prompt increases in loneliness and depressive affect and reductions in perceived social support due to loss of geographically proximal relationships [19].

In the context of residential mobility, some types of routine Internet use could potentially reduce some of the stressful aspects of the move. For example, use of the Internet for social purposes could help limit the damage to social relationships due to the move by providing a cheap and easy way to stay in touch. After the move, however, changes in psychological well-being could potentially disrupt or transform routine behaviors as people adjust to the major changes in their lives [33]. In this paper we present evidence from a longitudinal national study of residential movers. Our analyses are reported in two parts. Part one examines whether habitual Internet use prior to the move can reduce the negative impact of a residential move on psychological well-being of the movers 3-4 months after the move. Part two examines whether psychological well-being of the movers shortly after the move would drive changes in habitual uses of the Internet 9-12 months after the move.

BACKGROUND

Although moving rates have declined somewhat over the past 50 years, according to the US Census, 14% (over 40 million people) of the country's population moved in the year 2002-2003 [26]. Any move is a hassle, but long distance moving is a commitment to a significant change of place and, in some cases, life style [8]. It may be more of a shock to the system than movers expect, or it may be far easier and smoother than they predicted [6].

A residential move is a common stressful major life event that can have a negative effect on psychological well-being [19]. While causes of residential mobility have an impact on the kinds of issues movers encounter, research suggests that any residential move is a stressful and emotionally taxing event [29]. Residential mobility has been implicated in increases in depression and feelings of loneliness, especially in women [19, 29] and elderly [9]. Exposure to stressful events prompts individuals to use coping strategies to reduce the discomfort they experience due to stress [17]. Although coping strategies are highly context-dependent, stress researchers have identified two major stress reactions: problem-focused coping and emotion-focused coping, and a combination of the two depending on context [17]. There are many activities that can fall under the rubric of coping strategies. However, we will focus on sociability and escapism as two main emotion-focused coping strategies. These two strategies have been described in the literature as important to coping with stress.

Sociability as a coping strategy

Stress researchers have found that social relationships are important in the process of coping with stress [2, 17]. In particular, it has been established that social relationships help people deal with major life events and provide social support that can buffer them from negative effects of stress [2]. In fact, if people think they can obtain necessary social support from their ties at a moment's notice, they are likely to adjust better to stressful events [2]. However, the kind of support available to individuals depends on the physical distance of their social network [18] and the ease with which they can contact appropriate ties. In the event of a long distance move to an unfamiliar location, movers may be restricted in access to their friends and family, by distance or cost. Thus long distance residential mobility may adversely affect perceived social support by increasing costs of accessing support from existing, yet newly distant social ties.

Use of the Internet for communication with family and friends could drastically decrease financial costs of long distance communication. This in turn would allow movers to communicate more frequently and to invest more time into communication episodes. These changes would enable users to maintain more long distance relationships and to access these relationships as needed. Movers that already have experience in using the Internet for communication may be more proficient at contacting their family and friends via the Internet after the move.

H1. We hypothesize that use of the Internet for communication with family and friends prior to the move, is likely to be positively related to perceived social support shortly after the move.

Social relationships, that are perceived to offer social support, can serve as a buffer against adverse effects of stress [2] such as increases in feelings of loneliness or depressive affect. A long distance residential move often endangers movers' social relationships by introducing physical distance [24]. This in turn could limit the buffering effects of perceived social support on stress induced by a residential move, making effects of such stress more damaging. Recent advances in information and communication technologies may play a significant role in reducing loss of social relationships due to residential mobility [10]. For example, it is possible that some social relationships can survive substitution of communication modalities from face-to-face interaction to Internet-based interaction. However, experience in using the Internet for social purposes is an important factor. Movers who lack skills in using the Internet for social purposes may be less likely to migrate many of their relationships from face-to-face to Internet-based interactions. This suggests that movers who are more experienced in using the Internet for communication would be less likely to feel lonely and unhappy after a residential move, because they could rely on more social ties to help them cope.

H2. We hypothesize that the movers who used the Internet for communication with family and friends prior to the move, were likely report fewer feelings of loneliness and depressive affect shortly after the move.

One of the reasons why residential mobility can be stressful is because the new location may initially feel unfamiliar and alien. Weiss [32] conceptualizes the mobility process as a loss of social bonds with people and places left behind and a subsequent recovery from such loss through cognitive and emotional acceptance and identity change – forms of emotional adjustment to the new location. The purpose of the acceptance process is to associate positive thoughts and feelings about the new location and integrating the new location as part of identity. Although many of the habitual physical spaces will change in the event of a move, favorite Internet-based spaces and processes are less likely to be affected. Meeting new people in the new location is another way to make the new location feel more familiar. The Internet provides many opportunities to meet new people regardless of distance. Movers who use the Internet to meet new people are likely to feel more comfortable doing so after the move. They are also more likely to have developed online relationships that may be impervious to changes in distance due to the move.

H3. Using the Internet to meet new people prior to the move will predict higher levels of emotional adjustment to the new location shortly after the move.

As movers adjust to the new location, they are likely to turn their attention to social contacts in geographically proximal

areas. Feeling better about the move may also reduce the need for social support, leading to a reduction in frequency of communication with long distance contacts.

H4. Higher levels of emotional adjustment after the move will predict a decrease in frequency of using the Internet for communicating with family and friends and for meeting new people.

Escape through entertainment as a coping strategy

Although individuals can draw on social relationships to help them cope with the stress of a residential move, many may seek other forms of coping as well. One type of emotion-focused coping is distancing or escape [17]. People often focus on hobbies, favorite activities, or other things as ways to avoid thinking about the source of stress for a period of time. In the event of intense or prolonged stress and fatigue, some individuals resort to entertainment as a form of escape. Gambling [27] and TV watching [16] have been explored as common means of escape. These forms of coping can be effective as a means of controlling effects of psychological stress, sometimes even allowing individuals to distance themselves from stressful events long enough to be able to re-appraise them in non-threatening terms [17].

Over the last several decades, computer games became a leisure phenomenon [3]. Recent growth of the Internet expanded the range of available entertainment options, adding both passive and active entertainment activities from watching videos and listening to music to online gaming and content production. In a preliminary overview of the impact of technology on leisure, Bryce [3] suggested that the Internet provides multiple services that support a variety of leisure and goal oriented activity. For example, recent studies of massively multiplayer online games (MMORPGs) suggest that some of the participants use the game as a way to relax and maybe even escape daily hassles of corporeal life [34]. Other types of online gaming, using chat rooms or even simply browsing the web have all been cited as forms of escape for some individuals. In a study of low income families, Jackson and colleagues [12] reported that single mothers often used browsing the web as a form of escaping their stressful environment and experiencing something different for a change.

Movers who have a hard time with the move itself and subsequent integration into the new location may use the Internet for entertainment in order to relax and disengage from their worries. In the short term, doing so may be beneficial in combating effects of stress and feelings of loneliness or depression. In the long term, however, investing time and energy into escape may become detrimental, as healthy forms of escape may transform into a refusal to face pressing issues. High frequency of using the Internet for entertainment prior to the move may be an alarming indicator, suggesting pre-existing high levels of loneliness and depressive affect.

H5. Using the Internet for entertainment more frequently prior to the move will predict higher levels of loneliness and depressive affect shortly after the move.

It is also possible that high levels of loneliness and depressive affect after the move will motivate movers to rely on escape as a coping strategy more heavily. Eventual refusal to face necessary issues may reduce more productive forms of coping such as social interaction.

H6. Higher levels of loneliness and depressive affect shortly after the move will predict an increase in the frequency of using the Internet for entertainment 9-12 months after the move.

H7. Higher levels of loneliness and depressive affect shortly after the move will predict a decrease in the frequency of using the Internet for communicating with family and friends 9-12 months after the move.

METHODS

Participants

The residential mobility survey was conducted between January 2004 and December 2004. The initial sample of approximately 6000 recent movers was obtained from the United States Postal Service's National Change of Address database (USPS NCOA). Due to the nature of the database, we were able to make initial contact with respondents approximately 2-6 months after their move. The majority of annual moves in the US are local [26]. We intentionally over-sampled on long distance movers in order to have similarly-sized groups for comparison. This was done because we felt that distance is an important factor in determining the extent of impact of residential move on an individual. The initial sample consisted of approximately 1/3 local movers and 2/3 long distance movers (more than 100 miles). We expected a lower response rate from long distance movers due to the fact that long distance moves tend to be more stressful.

Approximately 32% of the initial sample completed the first survey (1779 respondents after the first wave data collection). As expected, long distance movers were less likely to respond than local movers. The median move distance was 97 miles. Prior research suggests that long-distance movers tend to be on average more educated [26] and, thus, more likely to be using the Internet. Due to our initial over sampling on long-distance movers, our sample was accordingly over sampled on education and Internet use; 85% of our sample used the Internet.

Research suggests that it takes approximately 6-18 months for initial adjustment to the move [6]. Nine months after the first survey, a follow up survey was conducted among those who answered the first time. Of the 1779 respondents in the first survey sample, 65% (1156 respondents) completed the second survey. Recent movers are more likely to move again within a year [6], and we expected them to be difficult to track down for a follow up.

Logic of survey construction

Due to the nature of the USPS NCOA database, we were not able to contact our respondents before their initial move. However, a residential move tends to be a very specific stressful event that can have dramatic effects on

habitual behaviors. In order to attain some base-line measures of habitual behavior, we asked a set of questions where respondents reported on their behavior during the 6 months prior to the move. Although self-report of behavior frequency is fraught with recall errors, use of major events and life transitions as cues can aid in recall of event occurrence and estimation of their frequency [31]. A residential move can then be used as a natural marker for comparison of life “before” the move to life “after” the move. We used a logarithmic response choice frequency scale for measures of habitual behavior, with a frequency of 1-2 days a week as an average measure. These response alternatives were designed to provide contextual clues for recall of behaviors, making it easier to recall and estimate frequencies of irregular as well as regular behavior. Thus, we expected our respondents to be able to report frequency of habitual behavior, such as frequency of Internet use for a variety of purposes before the move, with reasonable accuracy.

While habitual behaviors are relatively easy to accurately recall for a specific time period punctuated by a memorable event, memories of emotional states are far less certain. Thus we asked our respondents to report their emotional states such as emotional adjustment to the move, perceived social support, loneliness and depressive affect at the time of filling out the survey. This design allowed us to conduct short-term prospective analyses with just the Time 1 (T1) questionnaire, using habitual behaviors before the move as predictors of emotional states 3-4 months after the move. The Time 2 (T2) questionnaire asked about habitual behaviors and emotional state at the time of the questionnaire, 9-12 months after the move.

Key variables:

Emotional adjustment to the move: “Emotional adjustment to the move” scale consisted of 5 items that assessed the immediate perception of adjustment to the move. Questions ranged from “so far, I am adapting very well to my new home” to “I am very satisfied with my decision to move to my new location” (Cronbach $\alpha = .82$ – averaged T1 & T2).

Perceived social support: Perceived social support was measured using the ISEL-12 [5]. This self-report scale measured participants’ perceptions of whether they would receive or fail to receive types of social support such as practical help (“If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my dwelling”), advice (“When I need suggestions on how to deal with personal problems, I can turn to someone”), and companionship (“If I decide that I would like to go to a movie one evening, I could easily find someone to go with me”). Cronbach $\alpha = .86$

Loneliness: Loneliness was measured using a subset of the revised UCLA Loneliness scale [25]. In this scale participants reported how much they agreed or disagreed with six statements, including “I feel part of a group of friends”, “I feel isolated from others” and “I feel there is no one I can turn to”. We selected six items that did not

explicitly require geographically proximal social relations, thus potentially disaggregating the ratings of this scale from the direct of impact of distance and measuring only emotional loneliness. Cronbach $\alpha = .90$

Depressive Affect: Depressive affect was measured using a 12-item version of the CES-D [23]. This scale is usually used to measure dysphoria in the general population. In this scale, participants reported how frequently in the past week they had experienced several symptoms of depression, including “I felt that everything I did was an effort,” “My sleep was restless,” and “I had trouble keeping my mind on what I was doing.” Cronbach $\alpha = .86$

Internet uses: The Internet use scale was based on previous work by Kraut, Kiesler and colleagues [14], who showed that one can differentiate Internet use into components. Exploratory factor analysis of a similar list of 28 online activities collected in a sample of 446 respondents in the Pittsburgh area suggested that it is possible to break Internet use into at least 5 components: communication with friends and family, meeting new people online, acquiring information, use for commerce, and use for entertainment. In the current study, respondents’ described the frequency with which they use the Internet at home over the previous 6 months for 28 different purposes. Responses were on a 7-point, Likert-scale, with a logarithmic response choice frequency scale with “1-2 days a week” as an average measure. We expanded the number of items assessing respondents’ use of the Internet to meet new people and contribute information online. These new items made up the meeting new people component of Internet use [15].

Control variables and demographics: The movers survey also included a number of control variables as follows: satisfaction with life, measured using a 5-item version of the SWLS [7] (Cronbach $\alpha = .90$), extraversion, measured using 8 items from The Big Five Inventory [13] (Cronbach $\alpha = .85$), and family environment, measured using 6 items from the family environment scale [20] (Cronbach $\alpha = .86$).

Prior research suggests that reasons for moving are an important predictor of the process of adjustment. For example, people who move for family reasons are less likely to be social and meet new people in the new location and are less likely to be involved in the community. We created three dummy variables – moving for household, family or work reasons, keeping the “other” category as a reference point.

Distance is a critical concept in the study of residential mobility as it allows us to make a distinction between local and long distance moves. The movers’ survey asked respondents for their origin and destination zip codes.

Distance was then calculated from zip codes and log-transformed to normalize the distribution of scores.

Adjustment to a new location may be easier if there is a pre-existing social network in place at the new location. In fact, many moves are made to places where relatives or friends reside [8]. The movers’ survey included one question

Variable name	Mean	Std Dev	N	a ¹	r ²	
Perceived social support	2.95	0.75	882	0.86	0.59	
Emotional adj. to the move	3.05	0.81	907	0.82	0.47	
Depressive affect	0.74	0.52	884	0.86	0.60	
Loneliness	1.19	0.81	883	0.90	0.65	
Internet use for	communication with family and friends	2.17	1.34	898	0.75	0.51
	entertainment	2.23	1.57	899	0.85	0.66
	meeting new people	0.57	0.94	899	0.88	0.65
	information	2.47	1.31	900	0.83	0.67
	commerce	1.65	1.01	900	0.68	0.55
Satisfaction with life	2.42	0.95	884	0.90	0.70	
Informal social involvement	12.74	4.72	907	0.77	0.50	
Extraversion	2.33	0.78	886	0.85		
Family environment	3.26	0.78	897	0.86		
Friends in new location	1.14	1.23	903		0.31	
Move motive	work	0.41	0.49	905		
	housing	0.25	0.43	905		
	family	0.15	0.36	905		
Internet connection (broadband)	0.38	0.48	894			
Distance of the move	4.44	2.27	899			
Tenure at current location	4.42	2.45	905			
Male	0.52	0.50	908			
Age	41.23	14.83	905			
Employed	0.67	0.47	908			
Married	0.56	0.50	908			
Education	8.15	1.87	883			

Table 1. Table presents the demographic profile of the final dataset as well as the means and standard deviations of all variables of interest. ¹Cronbach a (measure of internal consistency for scales); ²Stability coefficient (correlation between T 1 & T 2)

assessing the number of close friends participants knew in the new location prior to the move.

Adjustment to a new location may be more difficult when relationships and community bonds left behind were strong, indicating strong commitment to prior location. The movers' survey asked about levels of informal social involvement such as going out with friends, attending dinner parties, playing a team sport and others, 6 months prior to the move. Responses were standardized and questions were combined into a 10-question informal social involvement scale (Cronbach a = .77).

Frequency of Internet use heavily depends on the type of Internet connection. The movers' survey asked respondents to indicate the type of connection they had to the Internet at home. We used a dummy variable to distinguish slow dialup connections from high speed broadband connections.

The movers' survey used questions from the Census Bureau national population survey to assess movers' gender, age, level of education, employment, student status, income and marital status.

RESULTS

1,156 individuals of the original sample (64% response rate) completed questionnaires both at Time 1 (T1) and Time 2 (T2). 908 of the respondents indicated that they used the Internet before and after the move. We used this sample in all subsequent analyses, because our analyses focus on the relationship between social uses of the Internet and psychological well-being. Such an analysis is irrelevant for those who do not use the Internet. The average age of the respondents was 41 years old, ranging from 16 to 86. Of those who completed the surveys, 52% were men, 56% were married and 67% were employed either part-time or full-time. Education level ranged from 5-8th grade to doctoral degree, with the average education of Associate degree. The median distance of the move was 90 miles, ranging from 0 to over 1000 miles. At Time 1, the average mover has lived approximately 4.4 months in their new location.

Analysis Part I

The first set of analyses was designed to test the relationship between different types of Internet use prior to the move and psychological outcomes 4 months after the move. We conducted a set of Ordinary Least Squares (OLS) multiple regressions using the T1 dataset. Each model regressed emotional adjustment to the new location, perceived social support, depressive affect and feelings of loneliness immediately 4 months after the move on a set of demographic and control variables, reasons for moving, level of informal social involvement prior to the move, number of friends in the new location known prior to the move, distance of the move, tenure at the new location and five components of frequency of Internet use prior to the move. Table 2 presents results from these analyses.

Emotional adjustment 4 months after the move:
($R^2 = .18, F_{(24,812)} = 9.08, p < 0.01$)

Results indicate that longer distance moves predict lower levels of emotional adjustment shortly after the move. This is not surprising, because long distance moves are likely to cause substantial changes in movers' physical and social environments. Adjustment to a long distance move is likely to take longer and be more challenging. We also found that males, those who were single, those who were satisfied with life and those who knew more friends in the new location prior to the move reported higher levels of emotional adjustment soon after the move. None of the Internet Uses prior to the move predicted emotional adjustment shortly after the move, thus rejecting hypothesis H3. It is possible that hypothesized effects of using the Internet to meet new people were present for a very small proportion of Internet users. However, analyses of our sample indicate that in the general population of Internet users, using the Internet to meet new people is a really low frequency behavior, even when education and age are controlled. However, as social networking software gains momentum and becomes more useful for the general population and as dating sites lose some of their stigma, we may see more effects of this kind in the future.

Predictors	Emotional adjust. to the move			Perceived Social Support			Feelings of Loneliness			Depressive Affect		
	Std. β	Std. Error	p	Std. β	Std. Error	p	Std. β	Std. Error	p	Std. β	Std. Error	p
Intercept	3.039	0.026	**	2.938	0.023	**	1.203	0.023	**	0.746	0.017	**
entertainment	0.002	0.059		-0.149	0.053	**	0.194	0.053	**	0.212	0.038	**
Internet use for communication w/ family & friends	0.020	0.066		0.126	0.059	*	-0.146	0.059	*	-0.144	0.043	**
information	-0.072	0.080		-0.016	0.072		0.014	0.073		0.006	0.052	
commerce	0.098	0.092		-0.101	0.083		0.033	0.083		0.090	0.059	
meeting new people	-0.023	0.028		-0.031	0.025		0.041	0.025		0.006	0.018	
Distance of the move	-0.201	0.061	**	-0.108	0.054	*	0.107	0.055	*	0.000	0.039	
Distance * luse new people	-0.039	0.055		0.043	0.048		-0.007	0.049		0.009	0.035	
Distance * luse communication	0.086	0.128		0.072	0.115		-0.040	0.115		-0.054	0.083	
Male * luse communication	-0.058	0.059		0.080	0.055		-0.007	0.054		0.001	0.039	
Age * luse new p.	0.087	0.062		0.013	0.056		-0.014	0.055		0.007	0.040	

Table 2. OLS regressions for Wave 1 analyses. Each model also included demographics – gender, age, education, employment, marital status as well as extraversion, family environment, social involvement prior to the move and number of friends known in the new location prior to the move and motives for moving. Results were removed for space considerations. Results removed for space considerations conformed to evidence from prior research. ** $p < .01$ * $p < .05$

We were surprised to find that none of the other uses of the Internet had an impact on emotional adjustment shortly after the move. However, it is possible that effects of Internet use prior to the move were too minor in comparison with effects of distance, pre-existing social ties in the new location and environmental factors of the new location. The movers' survey also failed to measure levels of satisfaction with living arrangements prior to the move, which could have a relationship with how people feel about their new location after the move.

Perceived social support 4 months after the move:
($R^2 = .22$, $F_{(23,810)} = 11.47$, $p < 0.01$)

Longer distance moves predicted lower levels of perceived social support shortly after the move as was expected based on prior literature. Indeed it seems that longer distance moves have a substantial impact on movers' perceptions of support availability from pre-existing social contacts. Results also indicate that such social characteristics as extraversion, levels of habitual social involvement prior to the move and knowing people in the new location prior to the move were important to perceptions of social support shortly after the move. We found that those who were younger, more extraverted, married, employed, those who knew friends in the new location prior to the move, had a better family environment, and were more socially involved prior to the move reported higher levels of perceived social support soon after the move. All of these traits and indicators suggest that having access to people through work, family or friends has a positive impact on perceptions of social support. People who were generally more social were also more likely to report greater perceptions of social support shortly after the move.

Our results also illustrate that using the Internet for communicating with family and friends more frequently prior to the move was also associated with higher levels of perceived social support shortly after the move, supporting

hypothesis H1. Although this data set did not allow us to control for baseline levels of perceived social support prior to the move, our results firmly indicate a strong reinforcing relationship between use of the Internet for communication with friends and family and perceptions of social support availability. Social psychologists have long speculated that perceptions of accessibility of social ties are related to perceptions of social support availability. Internet-based communication modalities are fast and cheap, potentially contributing to the sense of connectedness with ones social ties, thus increasing perceptions of social support even when distance becomes an issue.

More frequent use of the Internet for entertainment prior to the move however, was associated with lower levels of perceived social support shortly after the move. This result is somewhat puzzling and unexpected. One explanation for this finding is that habitual behaviors are often indicators of psychological well-being. High levels of media use for entertainment have been implicated as potential escape mechanisms of people who are trying to cope with feelings of loneliness and depression. Feelings of loneliness and perceptions of social support tend to be highly negatively correlated. One of the major aspects of loneliness is feeling as if there is no one to turn to for support or companionship. Thus this result may be an artifact of the relationship between coping behavior and aspects of psychological well-being. We confirm this assertion with a look at the antecedents of feelings of loneliness shortly after the move.

Loneliness 4 months after the move:
($R^2 = .32$, $F_{(23,812)} = 17.86$, $p < 0.01$)

Longer distance moves predicted higher levels of loneliness shortly after the move as was expected based on prior research. Results also indicate that those who were single and less extraverted, those who had fewer friends in the new location prior to the move and reported a worse family environment also reported higher levels of loneliness soon

after the move. The movers' survey did not have the capability to control for base levels of loneliness prior to the move. Our results show that lower levels of social involvement prior to the move also predicted higher levels of loneliness after the move. This association suggests that feelings of loneliness, measured soon after the move, may not have been caused directly by the move, but may have persisted to some extent from before the move. Residential mobility is likely to exacerbate feelings of loneliness. In fact people who moved further reported higher levels of loneliness. However, it seems that many of our movers may have been lonely before the move and these feelings persisted after the move.

Using the Internet for entertainment and escape more frequently prior to the move predicted higher levels of loneliness, suggesting that a need for a certain amount of escape must have existed prior to the move. These results partially confirmed hypothesis H5. Using the Internet for communicating with family and friends less frequently prior to the move also predicted higher levels of loneliness, suggesting that feelings of loneliness may have been present prior to the move. These results partially confirmed hypothesis H2.

The pattern of results above is an inverse of results from regressing perceptions of social support after the move. Although the two concepts are certainly measuring different constructs, they seem to be very much related. This suggests that the two regressions may not be independent. The two equations were subsequently analyzed as a system of equations, accounting for non-independence of their

error structures. However, because results did not change, these analyses are not reported.

Depressive affect 4 months after the move:
($R^2=.18$, $F_{(23,813)}=8.93$, $p<0.01$)

While distance of the move was not related to levels of depressive affect, being young, female and less extraverted predicted higher levels of depressive affect. Results also indicate that those who reported having fewer friends in the new location prior to the move and a worse family environment were more likely to report higher levels of depressive affect. Using the Internet for escape more frequently prior to the move was related to higher levels of depressive affect, confirming hypothesis H5. Using the Internet for communicating with family and friends less frequently prior to the move also predicted higher levels of depressive affect, confirming hypothesis H2.

Analysis Part II

The longitudinal nature of this data set allowed us to test whether levels of psychological well-being soon after the move predicted changes in frequency of Internet use for entertainment and communication with family and friends. These analyses followed the methodology described in Cohen et al. [4]. The logic of analysis is as follows. The movers' dataset is a two-time-point dataset. When assessing change in variable Y between T1 and T2, we regress Y_2 on a set of predictors and include Y_1 into the equation as another predictor. This is done in order to remove the potential influence of Y_1 , on the relationship between predictors and Y_2 . This method insures that estimated effects of other predictors on Y_2 are independent of Y_1 . This model is often called a lagged regression model. Thus all of the other predictors are measurements taken at T1, predicting changes in Y between T1 and T2. Table 3 presents the relevant results from these lagged OLS multiple regression models.

Changes in frequency of using the Internet for socializing with family & friends: ($R^2=.46$, $F_{(22,799)}=33.44$, $p<0.01$)

Users that reported having broadband access to the Internet reported increases in frequency of using the Internet for socializing with family and friends. Those that were unemployed and single also reported increases in using the Internet for socializing with family and friends, presumably because they simply had more time available for this activity. Results indicate that higher levels of loneliness soon after the move, predicted a decrease in using the Internet for socializing with family

and friends, presumably because they simply had more time available for this activity. Results indicate that higher levels of loneliness soon after the move, predicted a decrease in using the Internet for socializing with family

Internet use for	communication w/ family and friends			entertainment		
	Std. β	Std. Error	p	Std. β	Std. Error	p
Intercept	2.001	0.039	**	2.113	0.040	**
Perceived social support	0.091	0.122		-0.033	0.122	
Emotional adj. to the move	-0.120	0.104		0.224	0.105	*
Depressive affect	-0.035	0.123		0.135	0.125	
Loneliness	-0.217	0.109	*	-0.044	0.110	
Internet conn.(broadband)	0.130	0.040	**	0.179	0.040	**
Internet use for communication w/ family and friends (T1)	1.430	0.088	**			
Internet use for entertainment (T1)				1.722	0.080	**
Male * Depressive affect	0.194	0.112	t	0.276	0.115	*
Male * Social support	0.177	0.112		0.093	0.113	
Male * Loneliness	-0.067	0.088		0.109	0.088	
age * Social support	-0.259	0.246		0.234	0.265	
age * Loneliness	0.330	0.201		-0.020	0.203	
Distance * Social support	0.146	0.213		0.152	0.213	
Distance * Loneliness	-0.336	0.172	*	0.043	0.173	

Table 3. Prospective analysis of change in frequency of Internet use. Each model also included demographics – gender, age, education, employment, marital status as well as extraversion, family environment, the number of friends known in the new location prior to the move, distance of the move and motives for moving. Results removed for space considerations conformed to evidence from prior research. In this lagged model, independent variables measured at T1 predict changes in the dependent variable. ** $p<.01$ * $p<.05$ t $p<.1$

and friends. This is consistent with other social science research on loneliness, which indicates that lonely people are likely to decrease frequency of socializing with friends and family. This result also supports hypothesis H7, indicating that psychological well-being is likely to drive change in habitual Internet use. There was no relationship between levels of emotional adjustment soon after the move and changes in using the Internet for socializing with family and friends 9-12 months after the move. Hypothesis H4 was rejected.

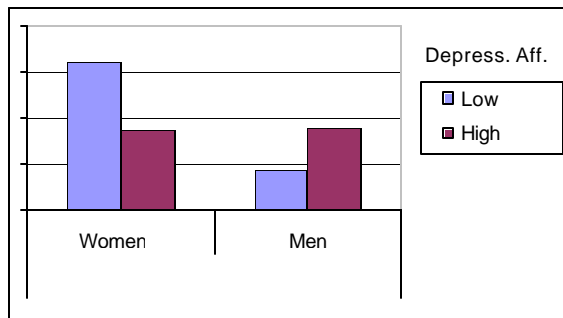


Figure 1: Predicting change in use of Internet for communication with family and friends.

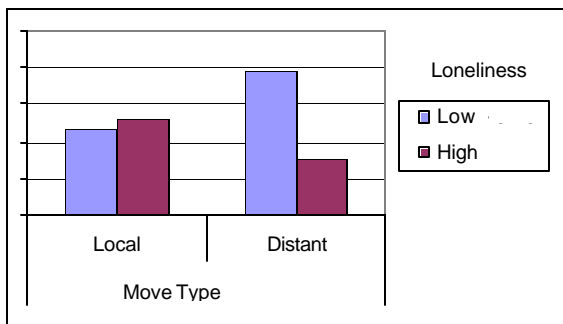


Figure 2: Predicting change in use of Internet for communication with family and friends.

More interesting are the two significant interactions of depressive affect and gender and distance of the move and loneliness. Figures 1 and 2 illustrate the relationship. Our results indicate that men and women who reported higher levels of depressive affect do not differ in the frequency of using the Internet for socializing with family and friends. This is surprising, because regardless of levels of psychological well-being, research suggests that women tend to communicate more and more often with family and friends than men do. A closer look at this relationship indicates that at low levels of depressive affect, women increase use of the Internet for socializing with family and friends, while men do not. In fact, for women, lower levels of depressive affect predict higher frequency of using the Internet for socializing with family and friends, while for men the relationship reverses. It is possible that men find the Internet a more agreeable medium for communicating with their family and friends when they experience high levels of depressive affect.

Interaction of loneliness and distance of the move indicates that in the event of a local move, loneliness has no effect on frequency of using the Internet for socializing with family and friends. However, in the event of a long distant move, people who experience higher levels of loneliness soon after the move report decreases in frequency of using the Internet for socializing with family and friends 9-12 months after the move, while those who experience lower levels of loneliness soon after the move report increases. These results suggest that movers that are most vulnerable after the move are also the ones less likely to benefit from available communication technologies.

Changes in frequency of using the Internet for entertainment ($R^2=.29$, $F_{(2,1,800)}=17.7$, $p<0.01$)

Users that reported having broadband access to the Internet, reported increases in using the Internet for entertainment. Those that were single and reported a worse family environment also reported increases in using the Internet for entertainment. Surprisingly, users that reported higher levels of emotional adjustment soon after the move reported increases in frequency of using the Internet for entertainment 9-12 months after the move. However, this could be an artifact of the expanding range of entertainment options available on the Internet.

Although depressive affect soon after the move did not predict changes in use of the Internet for entertainment 9-12 month after the move, overall, there was a significant interaction of depressive affect and gender (see Figure 3). This interaction illuminates interesting differences in the way men and women may react to stress and heightened levels of depressive affect. For women, lower levels of depressive affect soon after the move predicted some increase in using the Internet for entertainment 9-12 months

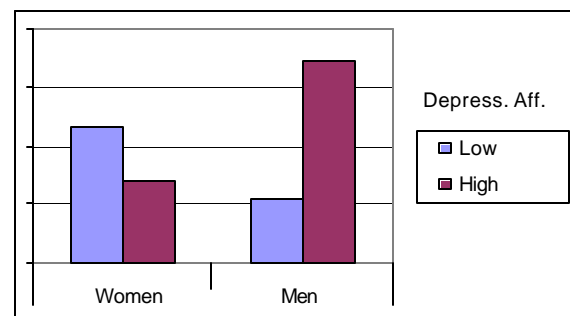


Figure 3: Predicting change in use of Internet for entertainment

after the move. However, the increase was much more dramatic for men who reported high depressive affect soon after the move. This result confirms hypothesis H6.

This result may help explain levels of depressive affect found among MMORPG game players [34]. It is still unclear whether intense amounts of game-playing could cause depression in the players. However, our results suggest that men who experience high levels of depressive affect, may be more likely than women to increase game playing and to use this activity as a coping mechanism.

Whether this is an adaptive or a maladaptive coping mechanism, however, remains to be seen.

DISCUSSION & CONCLUSIONS

In 1967, Alan Newell, Alan Perlis and Herb Simon wrote an article in *Science*, in which they defined computer science as the study of “the phenomena surrounding computers.”[21] Over the years of technology development and advancement since 1967, computers have permeated nearly every facet of every day life. As computing technology gained momentum in its adoption and use by the general public, the phenomena surrounding computers have also expanded to include daily life and psychological well-being of computer users. In recent years many HCI practitioners have studied not only whether and how people use technology [22], but also what motivates people to use technology in particular ways [11, 30] and what impact technology use has on their health and psychological well-being [1, 14]. In this paper we extend this work by considering the relationship between particular uses of the Internet and psychological well-being after a major life event, such as a residential move.

Of the seven hypotheses advanced in this paper, we were able to provide full or partial support for five. With the number of Internet users increasing on a daily basis, patterns of habitual Internet use are likely to vary wildly. However, we argue that certain patterns of Internet use can become reasonable indicators of users’ levels of psychological well-being. We illustrate this concept by testing whether habitual patterns of Internet use prior to a residential move can predict levels of psychological well-being shortly after the move.

Part I of our analysis focused on predicting levels of psychological well-being shortly after a move from habitual uses of the Internet. We found frequency of using the Internet for social communication with family and friends and for entertainment to be reasonably good predictors of levels of perceived social support, loneliness and depressive affect shortly after the move. Our data suggest that there is a strong reinforcing relationship between perceptions of social support and use of the internet for communication with family and friends. Rhetoric surrounding Internet-based communication has often considered that increased feelings of connectedness may be beneficial to Internet users. Our data seems to confirm this assumption, suggesting that research and development of applications that can help manage social relationships and increase the feelings of connectedness are an important endeavor.

There also seems to be a similarly strong relationship between feelings of loneliness and depressive affect and using the internet for entertainment. This connection is somewhat troubling as increases in bandwidth encourage further development of interactive entertainment content provided via the Internet. Such types of activity may prove more enticing than healthier forms of coping for individuals suffering from severe forms of loneliness and depression. Yet, stress researchers have often pointed out that ability to

disconnect from problems is not always a negative thing. People need to be able to distance themselves from their own problems sometimes, in order to be able to reevaluate them. It is a challenge for entertainment technology designers and developers to provide content and tools that can offer the necessary escape but would be able to mitigate extreme overuse that could lead to further negative consequences.

Part I of our analysis suggested that frequency of Internet use for communication with family and friends and for entertainment was implicated in perceptions of social support and feelings of loneliness and depressive affect. In part II of our analysis we tested whether levels of psychological well-being shortly after the move predicted changes in frequency of Internet use for these purposes. Our results indicate that the story is not straight forward. While levels of loneliness shortly after the move predicted decreases in using the Internet for communication with family and friends as expected, relationship between depressive affect and communication and loneliness and entertainment uses of the Internet differed by gender. We found that men who report higher levels of depressive affect shortly after the move actually increase their use of the internet for social purposes, while women with similar levels of depressive affect decrease their use of the internet for social purposes. While the effect of depressive affect on women is predicted by prior research on depression, effect on men is somewhat unusual and suggests that there is something about Internet-based communication that may benefit men with higher levels of depressive affect as they cope with stressful events over time.

Overall these results suggest that there is a complex interaction between routine behaviors and psychological well-being. These interactions are easier to observe under conditions of stress and adjustment to a stressful event over time. Our data indicate that there are significant gender differences in how people cope with stressful events, loneliness and depressive affect, and how they use the Internet to fulfill their needs. Our data also suggest that the most common uses of the Internet are the ones that the majority of Internet users in the general population find useful. These are also the ones that have become routine behaviors and are capable of complex interactions with psychological well-being of Internet users. When designing technology for the general population rather than niche groups of early adopters, it is important to consider the intricate interactions of routine behaviors and psychological well-being in daily life.

LIMITATIONS

Although the current data set is of a longitudinal design, we were not able to obtain information about movers’ psychological well-being prior to the move. Thus we were not able to assess change in psychological states due to the move and to isolate the impact produced by the stress of the move. The movers’ survey also failed to measure satisfaction with the previous location, which may have been crucial to our ability to detect the impact of habitual

behaviors on emotional adjustment to the move. However, the current dataset still provided ample evidence of intricate relationships between uses of the Internet and psychological well-being. The third wave of the movers' survey, currently in data collection stage, will be able to provide better assessments of the impact of habitual behaviors on psychological well-being.

REFERENCES

- Bargh, J. and McKenna, K.Y.A. (2004), The Internet and Social Life. *Annual Review of Psychology*, 55. 573-590.
- Bolger, N., Zuckerman, A. and Kessler, R.C. (2000), Invisible Support and Adjustment to Stress. *Journal of Personality & Social Psychology*, 79. 953-961.
- Bryce, J. (2001), The Technological Transformation of Leisure. *Social Science Computer Review*, 19 (1). 7-16.
- Cohen, J., Cohen, P., West, S.G. and Aiken, L.S. (2003), *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates, Mahwah, New Jersey.
- Cohen, S. and Hoberman, H. (1983), Positive Events and Social Supports of Buffers of Life Change Stress. *Journal of Applied Social Psychology*, 13. 99-125.
- Davanzo, J. (1983), Repeat Migration in the United States: Who Moves Back and Who Moves On? *The Review of Economics and Statistics*, 65 (4). 552-559.
- Diener, E., Emmons, R., Larsen, J.D. and Griffin, S. (1985), The Satisfaction with Life Scale. *Journal of Personality Assessment*, 49 (1). 71-75.
- Fischer, C.S. (1982), *To Dwell among Friends: Personal Networks in Town and City*. University of Chicago Press
- Heller, T. (1982), The Effects of Involuntary Residential Relocation: A Review. *American Journal of Community Psychology*, 10 (4). 471-492.
- Hiller, H. and Franz, T.M. (2004), New Ties, Old Ties and Lost Ties: The Use of the Internet in Diaspora. *New Media & Society*, 6 (6). 731-752.
- Hoffman, D., Novak, T.P. and Venkatesh, A. (2004), Has the Internet Become Indispensable? *Communications of the ACM*, 47 (7). 37-42.
- Jackson, L.A., Von Eye, A., Barbatsis, G., Biocca, F., Fitzgerald, H.E. and Zhao, Y. (in press), The Social Impact of Internet Use on the Other Side of the Digital Divide. in Kraut, R., Brynin, M. and Kiesler, S. eds. *Information Technology at Home*, Oxford Univ. Press.
- John, O.P., Donahue, E.M. and Kentle, R.L. (1991), The Big Five Inventory: Versions 4a and 54, The Institute of Personality and Social Research, University of California, Berkeley, CA.
- Kraut, R., Kiesler, S., Boneva, B., Cummings, J.N., Helgeson, V. and Crawford, A.M. (2002), Internet Paradox Revisited *Journal of Social Issues*, 58 (1)49-74.
- Kraut, R., Kiesler, S., Boneva, B. and Shklovski, I. (in press), Examining the Impact of Internet Use on Tv Viewing: Details Make a Difference. in Kraut, R., Brynin, M. and Kiesler, S. eds. *Domesticating Information Technology*, Oxford University Press.
- Kubey, R.W. and Csikszentmihalyi, M. (1990), Television as Escape: Subjective Experience before an Evening of Heavy Viewing. *Communication Reports*, 3 (2). 92-100.
- Lazarus, R. (1993), From Psychological Stress to the Emotions: A History of Changing Outlooks. *Annual Review of Psychology*, 44. 1-21.
- Litwak, E. and Kulis, S. (1987), Technology, Proximity, and Measures of Kin Support. *Journal of Marriage & Family*, 49 (3). 649-661.
- Magdol, L. (2002), Is Moving Gendered? The Effects of Residential Mobility on the Psychological Well-Being of Men and Women. *Sex Roles*, 47 (11). 553-560.
- Moos, R. and Moos, B. (1994), *Family Environment Scale Manual: Development, Applications, Research*. Consulting Psychologist Press, Palo Alto, CA.
- Newell, A., Perlis, A.J. and Simon, H.A. (1967), What Is Computer Science? *Science*, 157. 1373-1374.
- Pew Internet & American Life Project. (2003), Internet Activities.
- Radloff, L.S. (1991), The Use of the Center for Epidemiologic Studies Depression Scale in Adolescents and Young Adults. *Journal of Youth and Adolescence*, 20 (2). 149-166.
- Rohlfing, M.E. (1995), "Doesn't Anybody Stay in One Place Anymore?" an Exploration of under-Studied Phenomenon of Long-Distance Relationships. in Wood, J.T. and Duck, S. eds. *Understudied Relationships: Off the Beaten Track*, Sage Publications, Thousand Oaks.
- Russell, D., Peplau, L. and Cutrona, C. (1980), The Revised UCLA Loneliness Scale: Concurrent and Discriminant Validity Evidence. *Journal of Personality & Social Psychology*, 39 (3). 472-480.
- Schachter, J. (2004), Geographic Mobility: 2002-2003 *Current population reports*, U.S. Census Bureau.
- Schull, N. (2002), Escape Mechanism: Women, Caretaking and Compulsive Machine Gambling. *Working paper*, 41.
- Sproull, L. and Kiesler, S. (1991), *Connections: New Ways of Working in the Networked Organization*. The MIT Press, Cambridge, MA, US.
- Stockols, D. and Shumacker, S.A. (1982), The Psychological Context of Residential Mobility and Well-Being. *Journal of Social Issues*, 38 (3). 149-171.
- Taylor, A.S. and Swan, L. (2005), Artful Systems in the Home. In *Proc. CHI 2005*, ACM Press.
- Tourangeau, R. (2000), Remembering What Happened: Memory Errors and Survey Reports. in Stone, A.A., Turkkan, J.S., Bachrach, C.A., Jobe, J.B., Kurtzman, H.S. and Cain, V.S. eds. *The Science of Self-Report: Implications for Research and Practice*, Lawrence Erlbaum Associates, Mahwah, New Jersey, 29-48.
- Weiss, R.S. (1990), Losses Associated with Mobility. in Fisher, S. and Cooper, C.L. eds. *On the Move: The Psychology of Change and Transition*, John Wiley & Sons Ltd., West Sussex, 3-12.
- Wood, W. and Tam, L. (2005), Changing Circumstances, Disrupting Habits. *Journal of Personality & Social Psychology*, 88 (6). 918-933.
- Yee, N. (2001), The Norrathian Scrolls: A Study of Everquest (Version 2.5).

