

# Routine Patterns of Internet Use and Psychological Well-being: Coping With a Residential Move

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## ABSTRACT

This paper examines how routine uses of the Internet for communication with family and friends and for entertainment may serve as indicators of overall levels of psychological well-being. At the same time, changes in psychological well-being in response to a major life event, such as a residential move, can drive changes in routine uses of the Internet, suggesting Internet-based coping strategies. Specifically, higher levels of depressive affect shortly after the move predicted increases in use of the Internet for entertainment for men and decreases in use of the Internet for communication with family and friends for women. We discuss implications of these findings for our understanding of the role of the Internet in everyday behavior and in instances of coping with stressful situations.

## Author Keywords

Internet use, residential mobility, gender, stress, depressive affect, loneliness

## ACM Classification Keywords

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

## INTRODUCTION

For many Americans the Internet has become an integral part of everyday life [13]; 68% of the US population reports using the Internet at least occasionally [10]. The Internet is a plastic technology, amenable to many uses. Recent surveys indicate that information seeking, consumption of news and media, shopping, entertainment and interpersonal communication are among the most popular of the services available to its users [10]. Although there has been much speculation as to the impact that Internet use may have on its users, 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. Rather than Internet use leading to some single momentous change, its integration as a set of routine activities in the daily life of the majority of

the U.S. population may be its most dramatic impact [13]. Recognizing that the breadth of functionality offered by the Internet begets different patterns of use, a number of researchers are studying the daily use of the Internet [16]. Despite this blossoming of research, however, relatively little is known about the factors that motivate people to use the Internet the way they do.

In this paper we propose that changes in psychological well-being, such as feelings of loneliness and depressive affect, may motivate changes in the way people use the Internet. Stressful life events that affect psychological well-being provide a lens to examine how people adapt their routine Internet use to cope with these shifts in psychological well-being. We consider a residential move to be such a stressful event. A residential move, and especially the loss of geographically proximal social relationships associated with it, is a stressor that can increase loneliness and depressive affect and reduce perceived social support [20].

Some types of routine Internet use could reduce some of the stressful aspects of a residential move. For example, use of the Internet for social purposes could help limit the damage to social relationships 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 [34]. For example, people who feel lonely in the new location may turn to the Internet to meet new people or seek entertainment as a form of coping.

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 routine Internet use before the move was associated with psychological well-being of the movers 3-4 months after the move. Part two examines whether changes in psychological well-being of the movers shortly after the move drove changes in subsequent uses of the Internet.

## 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 [27]. Any move is a hassle, but long-distance moving is a commitment to a significant change of place and, in some cases, way of life [8]. It may be more of

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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 [20]. 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 [20, 29] and the elderly [11]. Exposure to stressful events prompts individuals to use coping strategies to reduce the discomfort they experience [18]. Stress researchers have identified two major coping strategies: problem-focused coping and emotion-focused coping [18]. Although many different activities fit under these labels, researchers have identified sociability and escapism as two especially important ways of coping with stress [9, 18, 23]. In this paper, we focus on sociability and escapism coping strategies. Sociability is used for both problem-focused coping (e.g., friends helping to pack) and emotional-focused coping (e.g., friend providing emotional support). Escapism is used for emotion-focused coping.

#### **Sociability as a coping strategy**

Stress researchers have found that social relationships are important in the process of coping with stress [2, 9, 18]. In particular, social relationships help people deal with major life events and provide social support that can buffer them from negative effects of stress [2]. If people think they can obtain necessary social support from their social network 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 their physical distance from their social partners [19] and the ease with which they can contact appropriate ties. In the event of a long-distance move, distance or cost makes it more difficult for movers to have access to their friends and family [25]. Thus long-distance residential mobility may adversely affect perceived social support, by increasing costs of accessing support from existing social ties which are now far away.

Recent advances in information and communication technologies may mitigate these effects, reducing the financial and behavioral costs of communication and thus helping to keep social ties active [12]. For example, it may be possible to keep some social relationships alive by substituting Internet-based interaction for face-to-face interaction. Use of the Internet for communication with family and friends could also drastically decrease the financial costs of long-distance communication. This in turn would allow movers to communicate more frequently and to invest more time in each communication episode [12]. These changes could enable users to maintain more long-distance relationships and to access these relationships as needed.

Whether people can indeed use the Internet this way may depend upon their experience before the move in using the Internet for social purposes. 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.

*H1. Use of the Internet for communication with family and friends before the move is likely to be positively related to perceived social support after the move.*

*H2. Use of the Internet for communication with family and friends before the move is likely to be negatively associated with feelings of loneliness and depressive affect 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 moving process as a sudden loss of social bonds with people and places left behind and a gradual 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 with the new location and to integrate the new location as part of one's identity. Although the move forces people to abandon some of their favorite physical spaces (e.g., their church or coffee house), favorite Internet-based spaces 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, who may be either in the new location or distant from it. Yet knowing which websites to access and how to initiate interactions with others online may be a matter of skill and experience. Movers who have used the Internet to meet new people before the move are likely to feel more comfortable using it this way after the move as well. They are also 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 before the move will predict higher levels of emotional adjustment to the new location after the move.*

As movers adjust to the new location, they are likely to turn their attention to social contacts in the new location. 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 shortly after the move will predict a decrease in frequency of using the Internet for communicating with family and friends and for meeting new people 8-12 months after the move.*

#### **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 escape – a way to mentally distance oneself from the stress [18]. People may focus on hobbies or favorite activities 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 [28] and TV-watching [17] 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 [18].

Over the last several decades, computer games have become a leisure phenomenon [3]. The growth of the Internet has expanded the range of available entertainment options, adding both passive and active entertainment activities, including watching videos and listening to music, online gaming, content production or simply browsing the Web. In an 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 the hassles of daily life [35]. In a study of low-income families, Jackson and colleagues [14] reported that single mothers often used browsing the Web as a form of escaping their stressful environment and experiencing something different for a change.

This suggests that higher levels of Internet use for entertainment are likely to be associated with higher vulnerability to loneliness or depressive affect. Stressful events can often exacerbate feelings of loneliness or depressive affect. We argue that it may be possible to use frequency of Internet use for entertainment as a proxy for levels of loneliness and depressive affect before the move. We test this hypothesis by looking for an association between use of the Internet for entertainment and psychological well-being shortly after a residential move.

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

It is possible that high levels of loneliness and depressive affect after the move will motivate movers to rely on entertainment as a coping strategy more heavily. 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 themselves into a refusal to face pressing issues. Such refusal may eventually reduce more productive forms of coping such as social interaction [23].

*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 and December of 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 [27]. We intentionally over-sampled long-distance movers, because distance is an important factor in determining the stress associated with a residential move. The initial sample consisted of approximately 1/3 local movers and 2/3 long-distance movers. US Census defines any move less than 50 miles as a local move [27]. We used this definition to separate local and long-distance moves. We expected a lower response rate from long-distance movers because long-distance moves tend to be more stressful and movers are less likely to spend time filling out surveys.

Approximately 32% of the initial sample, or 1779 respondents, completed the first survey (T1). The median move distance for the whole sample was 97 miles (197 miles for long-distance movers, 4 miles for local movers). Prior research suggests that long-distance movers tend to be on average more educated [27], and, thus more likely to be using the Internet. Eighty-five percent of the sample used the Internet (84% for local movers, 87% for long-distance movers), compared with the national average of 68% [10].

Prior research suggests that it takes movers approximately 6-18 months to initially adjust to the move [6]. Nine months after the first survey, a follow-up survey was conducted among those who replied the first time. Of the 1779 respondents in the first survey sample, 65% (1156 respondents) completed the second survey (T2). The lower than desirable response rate for the follow-up may be due to the fact that people are likely to move again within a year after an initial move [6]. This made it difficult to track them down for a follow-up.

We conducted mortality analysis in order to assess the impact of the relatively high dropout rate between the two data collections. The final sample of 1156 respondents was not significantly different from 623 dropouts on most of the outcome and predictor variables. A series of t-tests based on the responses from T1 indicated that T2 respondents were significantly older, slightly less depressed and slightly less extraverted. They did not differ on the distance moved, frequency of Internet uses, levels of loneliness or perceived social support. Fewer people with high depressive affect should make it slightly more difficult to detect effects. Overall, any effects found in our models cannot be attributed to participant mortality.

*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. In order to attain some base-line measures of routine behavior before the move, we asked a set of questions where respondents reported on their behavior during the 6 months before 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]. The residential move tends to be a very specific stressful event and can be used as a natural marker for comparison of life “before” the move to life “after” the move. We used a 7-point self-report scale on which respondents reported the frequency with which they performed various behaviors. Responses were marked in logarithm-like intervals, with the end-points of the scale ranging from “several times a day” to “never,” and a frequency of 1-2 days a week as scale mid-point. 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 routine behavior, such as frequency of Internet use for a variety of purposes before the move, with reasonable accuracy.

While routine behaviors are relatively easy to recall accurately for a specific time period punctuated by a memorable event, memories of emotional states such as emotional adjustment to the move, perceived social support, loneliness and depressive affect are far less likely to be accurately recalled from an earlier time. Thus we did not ask our respondents to report on their psychological states before the move. Instead, we asked our respondents to report their emotional states after the move, at the time of filling out the survey. This design allowed us to conduct short-term prospective analyses with just the Wave 1 questionnaire, using routine behaviors before the move (T0) as predictors of emotional states 3-4 months after the move (T1). The Wave 2 (T2) questionnaire asked about routine behaviors and emotional states at the time of that questionnaire, which was administered 9-12 months after the move.

**Key variables<sup>1</sup>:**

*Emotional adjustment to the move:* The Emotional Adjustment to the Move scale consisted of 5 items that assessed the perception of adjustment to the move on a 5-point Likert scale (“strongly agree” to “strongly disagree”). It included items like “Getting adjusted to living in a new environment has been a difficult process” (Cronbach  $\alpha = .82$ , range 0-4).

*Perceived social support:* Perceived social support was measured using the ISEL-12 [5] on a 5-point Likert scale (“strongly agree” to “strongly disagree”). This self-report scale measured participants’ perceptions of whether they

would receive types of social support such as practical help, advice, and companionship. (Cronbach  $\alpha = .86$ , range 0-4)

*Loneliness:* Loneliness was measured using a subset of the UCLA loneliness scale [26]. In this scale participants indicated on a 5-point Likert scale how much they agreed or disagreed with six statements, such as “I can find companionship when I want it.” We selected items that did not explicitly require geographically proximity for social relations. (Cronbach  $\alpha = .90$ , range 0-4)

*Depressive Affect:* Depressive affect was measured using a 12-item version of the CES-D [24]. This scale is usually used to measure dysphoria in the general population. Participants were asked to indicate on a 4-point Likert scale (“5-7 days” to “0 days”) how frequently in the past week they had experienced symptoms of depression, such as “I felt that everything I did was an effort” (Cronbach  $\alpha = .86$ , range 0-3)

*Internet uses:* The Internet use scale was based on previous work by Kraut, Kiesler and colleagues [16], who showed that one can differentiate 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 logarithmic frequency scale with end points of “several times a day” to “never” and a mid-point of “1-2 days a week.” In the current survey, we expanded the number of items assessing respondents’ use of the Internet to meet new people. We hypothesized that people who use the Internet for meeting new people before their move would be more likely to use it for meeting new people in their local area after the move (See relevant Cronbach  $\alpha$  values in Table 1).

*Control variables and demographics:* The movers’ survey also included the following control variables: 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 [15] (Cronbach  $\alpha = .85$ ); and family environment, measured using 4 items from the family environment scale [21] assessing the degree of commitment and support family members provide for one another. (Cronbach  $\alpha = .86$ ).

Earlier 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 socially active 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. Dis-

<sup>1</sup> Details for scales used were omitted for space reasons and can be obtained by contacting the authors

Variable name (range) <sup>1</sup>	Mean	Std Dev	N	$\alpha^2$	$r^3$
Perceived social support (0-4) (T1 <sup>4</sup> )	2.95	0.75	882	0.86	0.59
Emotional adj. to move (0-4) (T1)	3.05	0.81	907	0.82	0.47
Depressive affect (0-3) (T1)	0.74	0.52	884	0.86	0.60
Loneliness (0-4) (T1)	1.19	0.81	883	0.90	0.65
Internet comm. w/ family & friends (T0 <sup>4</sup> )	2.17	1.34	898	0.75	0.51
Internet use for (range 0-6) entertainment (T2 <sup>4</sup> )	1.98	1.29	905	0.76	0.66
Internet use for (range 0-6) meet new people (T0)	2.23	1.57	899	0.86	0.65
Broadband (yes=1) (T2)	2.06	1.47	904	0.85	
Broadband (yes=1) (T0)	0.57	0.94	899	0.88	
Broadband (yes=1) (T0)	0.38	0.48	894		
Distance of move (ln (miles)) (T1)	4.44	2.27	899		
Tenure at curr. loc. (months) (T1)	4.42	2.45	905		
Male (male=1) (T1)	0.52	0.50	908		
Age (years) (T1)	41.23	14.83	905		
Employed (yes=1) (T1)	0.67	0.47	908		
Married (yes=1) (T1)	0.56	0.50	908		
Education (3-12) (T1)	8.15	1.87	883		

**Table 1.** Table presents the demographic profile of the final dataset and means and standard deviations of variables of interest.

<sup>1</sup>Variable range is 0-4 unless otherwise indicated.

<sup>2</sup>Cronbach  $\alpha$

<sup>3</sup>Stability coefficient (correlation between T1 & T2)

<sup>4</sup>T0 – before the move, T1 – 0-4 months after the move, T2 – 9-12 months after the move.

tance 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 people move to places where relatives or friends reside for this reason [8]. The movers' survey included one question assessing the number of close friends participants knew in the new location before the move.

Adjustment to a new location may be more difficult when relationships and community bonds left behind were strong, indicating strong commitment to the former 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 before the move. Responses were standardized and questions were combined into a 6-question informal social involvement scale (Cronbach  $\alpha = .77$ ).

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 and student status, marital status and income.

## RESULTS

1,156 individuals of the original sample completed questionnaires both at T1 and T2. 908 of the respondents indicated that they used the Internet before and after the move. We used this sample of Internet users in all subsequent

analyses, because our analyses focus on the relationship between uses of the Internet and psychological well-being. Such an analysis is irrelevant for those who did not use the Internet. Table 1 shows descriptive statistics for main variables in the analysis. The average age of the respondents was 41 years old, ranging from 16 to 86. In this sample, 52% were men, 56% were married and 67% were employed either part-time or full-time. Education level ranged from 5-8<sup>th</sup> 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 T1, the average mover has lived approximately 4.4 months in their new location.

### Analysis I: Internet use and psychological outcomes

The first analyses were designed to test the relationship between different types of Internet use before the move and psychological outcomes 4 months after the move. Preliminary correlational analyses indicated that measures of psychological well-being were moderately correlated (see Table 2). However, the size of correlations suggests that these measures tap into related but distinct concepts.

$r$ (N)	Depressive Affect	Loneliness	Emotional Adjustment
Loneliness	0.58** (883)		
Emotional Adjustment	-0.40** (883)	-0.42** (882)	
Perceived Social Support	-0.37** (880)	-0.69** (879)	0.31** (881)

**Table 2:** Correlations between psychological well-being variables. \*\*  $p < 0.001$

We conducted our analyses in two ways. First, we conducted a set of (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 4 months after the move on a set of demographic and control variables: reasons for moving, level of informal social involvement before the move, number of friends in the new location known before the move, distance of the move, tenure at the new location and five components of frequency of Internet use before the move. However, the inter-relationship of these dependent variables may undermine one of the assumptions of Ordinary Least Squares (OLS) regression. Therefore, we conducted the same analyses as a dependent system of OLS equations, accounting for non-independence of their error structures. Results did not change between analyses. We report results of the OLS analyses because they are easier to interpret. Table 3 presents results from these analyses.

#### Emotional adjustment 4 months after the move:

The first model in Table 3 shows the association of ways of using the Internet before the move with subsequent emotional adjustment to the move (for the full model,  $R^2 = .18$ ,  $F_{(24,812)} = 9.08$ ,  $p < 0.01$ ) Results indicate that longer-distance moves predict lower levels of emotional adjustment shortly

Outcomes (T1)	Emotional adjust. to the move			Perceived Social Support			Feelings of Loneliness			Depressive Affect		
	Std. $\beta$	Std. Error	p	Std. $\beta$	Std. Error	p	Std. $\beta$	Std. Error	p	Std. $\beta$	Std. Error	p
Intercept	3.04	0.03	**	2.94	0.02	**	1.20	0.02	**	0.75	0.02	**
entertainment	0.00	0.06		-0.15	0.05	**	0.19	0.05	**	0.21	0.04	**
Internet use for communication w/ family & friends	0.02	0.07		0.13	0.06	*	-0.15	0.06	*	-0.14	0.04	**
meeting new people	-0.02	0.03		-0.03	0.03		0.04	0.03		0.01	0.02	
Distance of the move	-0.20	0.06	**	-0.11	0.05	*	0.11	0.05	*	0.00	0.04	

**Table 3.** OLS regressions for Analysis 1. \*\* p<.01 \* p<.05

Each model also included demographics – gender, age, education, employment, marital status as well as extraversion, family environment, social involvement before the move, number of friends known in the new location before the move, motives for moving and several interactions which were not significant. Results removed for space considerations conformed to evidence from earlier research.

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 [20]. 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 before the move reported higher levels of emotional adjustment soon after the move.

Using the Internet to meet new people before the move did not predict emotional adjustment shortly after the move, providing no support for hypothesis H3. However, our respondents used the Internet to meet new people far less than for other purposes. It is possible that the hypothesized effects of using the Internet to meet new people exist, but that for such a small proportion of Internet users the effect is too small to detect. 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.

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 before 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 before the move, which could have an effect on how people feel about their new location after the move.

*Perceived social support 4 months after the move:*

The second model in Table 3 shows the association of ways of using the Internet before the move with subsequent perceived social support (for the full model,  $R^2=.22$ ,  $F_{(23,810)}=11.47$ ,  $p<.001$ ). Longer-distance moves predicted lower levels of perceived social support shortly after the move, as was expected based on prior literature [11, 12]. 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 routine social involvement before the move and knowing people in the new location before the move were important to perceptions of social support shortly after the move. We found that

those who were younger, more extraverted, married, employed, knew friends in the new location before the move, had a better family environment, and were more socially involved before 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 before 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, 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 the availability of social ties is related to perceptions of social support [33]. Internet-based communication modalities are fast and cheap, potentially contributing to the sense of connectedness with one’s social ties, thus increasing perceptions of social support even when distance becomes an issue.

More frequent use of the Internet for entertainment before the move, however, was associated with lower levels of perceived social support shortly after the move. One explanation for this finding is that high levels of media use for entertainment before the move may predispose people to use this escape mechanism in the face of the stresses associated with moving, and that this emotion-based coping mechanism was ineffective. However, a second explanation is that the people who were using the Internet for entertainment before the move were using it to cope with feelings of loneliness and depression they experienced at that time. Perceptions of social support tend to be highly negatively correlated with loneliness and depressive affect. Thus the association here between using the Internet use for entertainment before the move and subsequent perceptions of low social support may be an artifact of the relationship between coping behavior and aspects of psychological well-being that existed before the move.

*Loneliness 4 months after the move:*

The third model in Table 3 shows the association of ways of using the Internet before the move with subsequent loneliness (for the full model,  $R^2=.32$ ,  $F_{(23,812)}=17.86$ ,  $p<0.01$ ). Longer moves predicted higher levels of loneliness shortly after the move, as was expected based on prior research [11, 12]. Results also indicate that those who were single and less extraverted, those who had fewer friends in the new location before the move and reported a worse family environment, also reported higher levels of loneliness soon after the move. Our results show that lower levels of social involvement before 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. The movers' survey did not have the capability to control for base levels of loneliness before the move. However, residential mobility is likely to exacerbate feelings of loneliness. In fact, people who moved further reported higher levels of loneliness. Yet it seems that many respondents may have been lonely before the move, and that these feelings persisted after the move.

Using the Internet for entertainment more frequently before the move predicted higher levels of loneliness after the move. Again the results are interpretable in two ways. First, using escape as a coping mechanism for the move-related stress was ineffective. Second, lonely people may have used the Internet for escape before the move, and the association with loneliness after the move is an artifact of their initial state. These results partially confirmed hypothesis H5.

Using the Internet for communicating with family and friends less frequently before the move also predicted higher levels of loneliness, suggesting that feelings of loneliness may have been present before the move. These results partially confirmed hypothesis H2.

*Depressive affect 4 months after the move:*

The fourth model in Table 3 shows the association of ways of using the Internet before the move with subsequent depressive affect (for the full model,  $R^2=.18$ ,  $F_{(23,813)}=8.93$ ,  $p<0.01$ ). 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 before the move and a worse family environment were more likely to report higher levels of depressive affect. Using the Internet for entertainment more frequently before the move was related to higher levels of depressive affect, supporting hypothesis H5. Using the Internet for communicating with family and friends less frequently before the move also predicted higher levels of depressive affect, supporting hypothesis H2.

**Analysis II: Psychological well-being after the move predicting changes in Internet use**

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 lagged regression model described in Cohen *et al.* [4] and summarized here. 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  $Y_1$ . Thus all of the other predictors are measurements taken at T1, predicting changes in Y between T1 and T2. Table 4 presents the relevant results from these lagged OLS multiple regression models.

*Changes in frequency of using the Internet for socializing with family & friends:*

The first model in Table 4 predicts changes in using the Internet for communication with friends and family from post-move psychological states (for the full mode  $R^2=.46$ ,  $F_{(22,799)}=33.44$ ,  $p<0.01$ ). Users who reported having broadband access to the Internet reported increases in frequency of using the Internet for socializing with family and friends. Those who were unemployed and single also reported increases in using the Internet for socializing with family and friends, presumably because they had more time available for this activity.

Higher levels of loneliness soon after the move predicted a decrease in using the Internet for socializing with family 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 [23]. This result supports hypothesis H7, indicating that psychological well-being may drive change in routine 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 not supported.

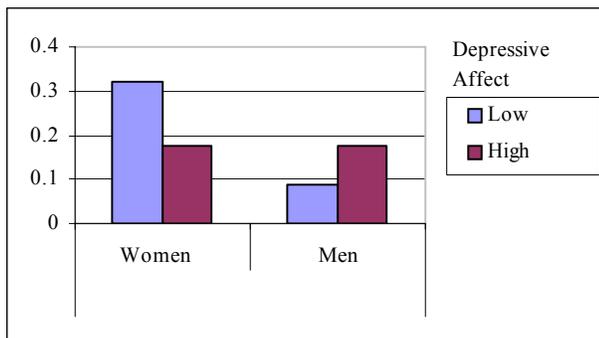
Internet use for (T2)	Communication w/ family and friends			Entertainment		
	Std. $\beta$	Std. Error	p	Std. $\beta$	Std. Error	p
Intercept	2.001	0.039**		2.113	0.040**	
Perceived social support	0.091	0.122		-0.033	0.122	
Emotional adj. to move	-0.120	0.104		0.224	0.105*	
Depressive affect	-0.035	0.123		0.135	0.125	
Loneliness	-0.217	0.109*		-0.044	0.110	
Broadband (yes=1)	0.130	0.040**		0.179	0.040**	
Internet comm. w/ fam-use for family & friends (T0)	1.430	0.088**		-	-	
entertainment	-	-		1.722	0.080**	
Male * Depressive affect	0.194	0.112 <sup>†</sup>		0.276	0.115*	
Male * Loneliness	-0.067	0.088		0.109	0.088	
Distance * Loneliness	-0.336	0.172*		0.043	0.173	

**Table 4.** Lagged regression analysis of change in frequency of Internet \*\*  $p<.01$  \*  $p<.05$  <sup>†</sup>  $p<.1$

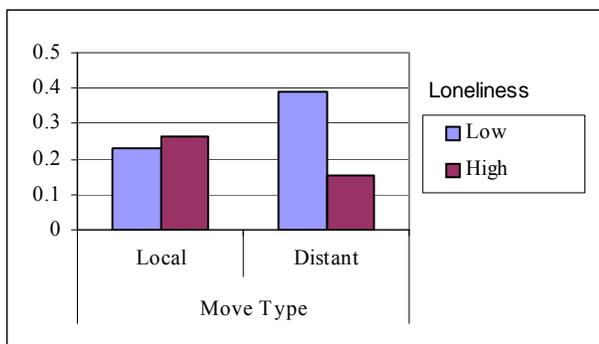
In this lagged model, independent variables measured at T0 and T1 predict changes in the dependent variable. See Table 3 for a list of variables included in the analysis but removed from Table 4 for space reasons.

More interesting are the two significant interactions, one for depressive affect and gender and the other for distance of the move and loneliness. Figures 1 and 2 illustrate these relationships<sup>2</sup>. The first interaction 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. When men and women have high levels of depressive affect, they do not differ in the frequency of using the Internet for socializing with family and friends, with women decreasing their use of the Internet from their baseline and men increasing it. It is possible that men find the Internet a more agreeable medium for communicating with their family and friends when they are depressed because it distances them from the people they need to communicate with. In contrast, women reduce their use of the Internet as a communication medium when feeling depressed because it may be a less satisfactory medium for them than more interactive media like the phone or face-to-face discussions.

The second interaction of loneliness and distance moved indicates that after a local move, loneliness has no effect on frequency of using the Internet for socializing with family and friends. However, after a long-distance move, people who experienced higher levels of loneliness soon after the



**Figure 1:** Predicting change in use of the Internet for communication with family and friends<sup>2</sup>

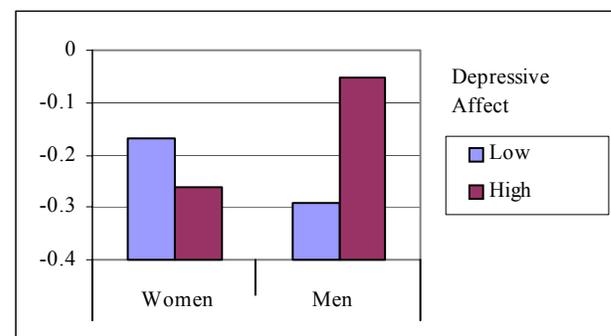


**Figure 2:** Predicting change in use of the Internet for communication with family and friends<sup>2</sup>

move decreased their frequency of using the Internet for socializing with family and friends 9-12 months after the move. Those who experienced lower levels of loneliness soon after the move reported 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:* The second model in Table 4 predicts changes in using the Internet for entertainment from post-move psychological states (for the full model  $R^2=.29$ ,  $F_{(21,800)}=17.7$ ,  $p<0.01$ ). Overall, 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 who 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. One would have expected the reverse if people were using online entertainment as an escape and distraction from the stress of the move and transition.

Although depressive affect soon after the move did not predict changes in use of the Internet for entertainment 9-12 months 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 after the move. However, the increase was more dramatic for men who reported high depressive affect soon after the move. This result partially confirms hypothesis H6.



**Figure 3:** Predicting change in use of the Internet for entertainment<sup>2</sup>

This result may help explain levels of depressive affect found among MMORPG game players [35]. 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.

<sup>2</sup> Scales for the Y axis for all three figures are presented after data was centered for the interaction analysis. Please contact the author for details.

## DISCUSSION & CONCLUSIONS

In 1967, three founders of the field of computer science – Alan Newell, Alan Perlis and Herb Simon – defined computer science as the study of “the phenomena surrounding computers.”[22] Since then, computers have permeated nearly every facet of daily life and the phenomena surrounding computers have also expanded to include the 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 [16, 30], but also what motivates people to use technology in particular ways [13, 30] and what impact technology use has on their health and psychological well-being [1, 16]. 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, data fully or partially supported five. As new services and users come online, patterns of routine 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.

Analysis I focused on predicting levels of psychological well-being shortly after a move from routine uses of the Internet before the move. 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 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, since 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 noted that the ability to disconnect from problems is not always a problem. People sometimes need to be able to distance themselves from their problems, 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 negative consequences.

Analysis I 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 analysis II 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 straightforward. While levels of loneliness shortly after the move predicted decreases in using the Internet for communication with family and friends as expected, they did not lead to changes in using the Internet for entertainment. The relationship between depressive affect and communication and entertainment uses of the Internet differed by gender. We found that men who reported higher levels of depressive affect shortly after the move actually increased their use of the Internet for social purposes, while women with similar levels of depressive affect decreased their use of the Internet for social purposes. While changes in behavior due to depressive affect for women is predicted by prior research on depression, changes for men are somewhat unusual and suggest that there is something about Internet-based communication that may allow men with higher levels of depressive affect to cope with stressful events. A different picture emerged when considering the relationship between depressive affect and Internet use for entertainment. Women who reported higher levels of depressive affect shortly after the move changed their use of the Internet for entertainment very little. Men with similar levels of depressive affect significantly increased their use of the Internet for entertainment.

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. The data also suggest that the most common uses of the Internet are the ones that have become routine behaviors and are capable of complex interactions with the 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 that there is a complex reinforcing relationship between routine Internet uses and psychological well-being in daily life. It is also important to keep in mind that this relationship differs by gender.

## LIMITATIONS

Although the current data set is of a longitudinal design, we were not able to obtain information about movers’ psychological well-being before 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 important to our ability to detect the impact of routine behaviors on emotional adjustment to the move. However, the current dataset still provided ample evidence of complex reinforcing relationships between uses of the Internet and psychological well-being. A third wave of the movers’ survey, currently in

the data collection stage, will be able to provide better assessments of the impact of routine behaviors on psychological well-being.

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