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RÉSUMÉ

Une population vieillissante est mieux servie par des services d'assistance sociaux, personnels et de la santé qui visent à maintenir et à maximiser l'autonomie personnelle. L'Internet offre des opportunités nombreuses pour les individus de tous âges de communiquer, d'accéder aux informations, et de se livrer à des activités récréatives. Un échantillon à base communautaire de 122 adultes de plus de 60 ans ont rempli un questionnaire qui a évalué les trois groupes de caractéristiques : (a) la fréquence et les modes d'utilisation de l'Internet, (b) le bien-être (la solitude, la satisfaction de vie, l'auto-suffisance, les soutiens sociaux, et la dépression) et (c) les données démographiques (l'âge, le revenu, l'éducation). Des corrélations significatives sont apparues entre les trois groupes de variables mesurées. Tout en contrôlant les différences démographiques, l'utilisation d'Internet et de l'autosuffisance demeurent significativement corrélés. Parmi l'échantillon des personnes plus âgées, celles qui ont utilisé l'Internet plus présentaient une plus forte perception de leur efficacité que celles qui ont utilisé l'Internet que rarement ou pas du tout.

ABSTRACT

An aging population is best served by social, personal, and health support focused on maintaining and maximizing personal independence. The Internet affords numerous opportunities for individuals of all ages to communicate, access information, and engage in recreational activities. A community-based sample of 122 adults over 60 years of age completed a questionnaire which assessed three clusters of characteristics: (a) frequency and patterns of Internet use, (b) well-being (loneliness, life satisfaction, self-efficacy, social support, and depression), and (c) demographics (age, income, education). Significant correlations emerged between the three clusters of measured variables. Controlling for demographic differences, Internet use and self-efficacy remained significantly related. Among the sample of older adults, individuals who used the Internet more had higher perceptions of self-efficacy than those who used the Internet rarely or not at all.

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Increasing longevity and declining fertility have shifted the age distribution of populations throughout the world towards older age groups (Sum, Mathews, & Hughes, 2009). Between the years 1950 and 2000, the

number of persons over the age of 60 tripled and by 2050 is expected to reach two billion worldwide (National Institutes of Health, 2007). Anticipated consequences of such a demographic shift include increased demand for health care and social services, and pressure on families to care for older persons (Martini,

Garrett, Lindquist, & Isham, 2007). An aging population is best served by social, personal, and health support focused on maintaining and maximizing personal independence. Psychological wellness during late adulthood decreases the need for out-of-home care and increases a person's quality of life (Prohaska et al., 2006; Seeman, Lusignolo, Albert, & Berkman, 2001).

Psychological Wellness during Late Adulthood

The construct of well-being reflects a rather large collection of states that range from objective functional health to subjective perceptions of life quality (George, 2010). Subjective well-being most often refers to a positive orientation towards life and is generally based upon such feelings as happiness, morale, positive affect, and life satisfaction. Such various measures are interrelated and may constitute a single dimension (Slocum-Gori, Zumbo, Michalos, & Diener, 2009). Diener (1984) conceptualized psychological well-being as primarily a subjective evaluation of life satisfaction and high positive affect relative to negative affect. Subsequent approaches to Diener's delineation of psychological wellness have included *hedonia* and *eudaimonia* (Waterman, 1993). Hedonic conceptualizations of well-being emphasize pleasure seeking and pain avoidance whereas eudaimonic approaches emphasize living well and actualizing individual potential (Deci & Ryan, 2008). Ryff (Ryff, 1995; Ryff & Singer, 2008) used an eudaemonic framework to inform a model of psychological well-being encompassing six dimensions: (a) positive evaluations of self and life (*self-acceptance*); (b) a sense of continued growth and development (*personal growth*); (c) the belief that life is meaningful (*purpose in life*); (d) satisfying relationships with others (*positive relationships*); (e) the capacity to manage life and the surrounding world (*environmental mastery*); and (f) self-determination (*autonomy*).

Ryff's conceptualization of psychological well-being has been applied in several investigations with older adults (e.g., Chen & Persson, 2002; Laukka, 2007), although its validity has been questioned because of strong correlations among the six dimensions (Springer, Hauser, & Freese, 2006). Thus, while theoretical orientations to psychological wellness vary, common elements are apparent including (a) a general satisfaction with oneself and life, (b) the presence of supportive and enriching interpersonal relationships, (c) a perceived ability to meet personal demands of one's environment, and (d) a greater occurrence of positive, as opposed to negative, emotional states such as loneliness and depression.

Despite theoretical variability, a considerable volume of research has explored the correlates of psychological

wellness during late adulthood. Well-being, variously defined, has been related to positive social and physical outcomes such as (a) quality of family relationships (Ryan & Willitis, 2007); (b) physical health (Penedo & Dahn, 2005); (c) decreased disability (Freyne, Keough, Kelly, & Wrigley, 2005; McAuley et al., 2006); and (d) lower mortality rate (Gerstorf, Ram, Rocke, Lindenberger, & Smith, 2008; Lyra, Tormakangas, Read, Rantanen, & Berg, 2006). Behavioural correlates of well-being during later life include, but are not limited to, (a) religious involvement (Jang, Borenstein, Chiriboga, Phillips, & Mortimer, 2006); (b) volunteerism (Van Willigen, 2000; Windsor, Anstey, & Rodgers, 2008); and (c) engagement in leisure activities (Menec, 2003). Chow (2010) reported that education level, use of medications, physical mobility, and perceived financial needs were significantly associated with physical well-being during late adulthood, while gender, marital status, education, and physical mobility were significantly related to psychological well-being.

The indicators of subjective well-being in later life are associated with several background factors. Meta-analyses show that age, income, and education are positively related to subjective well-being, whereas female gender is negatively related (Pinquart & Sorensen, 2001). African-Americans (Yang, 2008) and Hispanic Americans (Barger, Donoho, & Wayment, 2009) score lower than White Americans on various measures of subjective well-being. Litwin and Shiovitz-Ezra (2010) reported that, independent of the effects of demographic and health confounds, older adults embedded in diverse and congregant social networks expressed a superior sense of subjective well-being as reflected, to varying degrees, in their levels of loneliness, anxiety, and/or happiness. Social networking, particularly among adolescents and young adults, has been facilitated by innovation in digital technologies (Ellison, Steinfield, & Lampe, 2007). Indeed, the convenience of the Internet has transformed many aspects of contemporary life (Johnson, 2007).

Internet Use during Late Adulthood

Older adults comprise the fastest-growing Internet user group, and this trend is expected to continue as the cost of information and communication technology decreases and as a technologically savvy generation ages (Sum et al., 2009). Predictors of Internet use in late life include (a) higher education and greater income (Charness & Boot, 2009; Wright & Hill, 2009); (b) positive attitudes towards computers and the Internet (Wagner, Hassanein, & Head, 2010); (c) high computer self-efficacy and low computer-anxiety (Czaja et al., 2006); (d) good physical health (Kaye, 2000); and (e) cognitive functioning (Czaja et al., 2006).

Approximately 45 per cent of Canadian adults between ages 65 and 74 are online whereas 21 per cent of individuals aged 75 and older are online (Statistics Canada, 2009). The United States, European Union, and Australia have observed similar percentages of older adults using the Internet (Jones & Fox, 2008; Peacock & Kunemund, 2007; Sum et al., 2009). The majority of older adults who use the Internet do so on a daily or weekly basis and spend at least five hours per week online (Statistics Canada, 2009; Sum et al., 2009). However, the extent of Internet use in late life varies among age groups. The baby boom generation typically spends more time online than older adults who were born before this cohort (Statistics Canada, 2009).

Reportedly, older adults engage in much the same activities online as younger adults do but to varying extents (Wagner et al., 2010). Communicative uses of the Internet, such as email, instant messaging, and online communities, are particularly popular for older adults, due in large part to helping maintain familial relationships and enabling social support (Thayer & Ray, 2006). Compared to online communication, older adults use the Internet to seek information less frequently (Wagner et al., 2010; Wright & Hill, 2009). Nonetheless, online information particularly related to physical health is commonly sought by older adults in an attempt to make more-informed decisions (Flynn, Smith, & Freese, 2006). Older adults also engage in leisure activities online, such as playing games, listening to music, and watching television, albeit less often than online communication and information applications (Sum et al., 2009). Given the extent to which digital technologies have revolutionized many daily functions (Arnaldi, Boscolo, & Stamm, 2010), the role of the Internet in late adulthood is of increasing concern.

Psychological Wellness and Internet Use during Late Adulthood

The literature to date examining the relationship between Internet use by older adults and psychological and social wellness has yielded inconsistent findings, and as a result, the nature of this relationship remains ambiguous. Correlational data has reported predominantly positive links between the use of information-communication technologies and well-being, variously defined. Chen and Persson (2002) examined both older and younger Internet users in relation to Ryff's (1995) conceptualization of psychological well-being. Older Internet users scored significantly higher than older non-users on measures of personal growth and purpose in life. Similarly, Blit-Cohen and Litwin's (2005) survey of community-based older adults linked computer use

to greater personal satisfaction and more-positive attitudes towards aging.

Use of the Internet for communication purposes (e.g., email and online communities) has been positively related to social aspects of well-being in late life, such as perceptions of social support. Wright (2000) surveyed older Internet users and found that those who frequently participated in online communities experienced less life stress and were more satisfied with their support networks than those who infrequently participated in online communities. Likewise, Sum, Mathews, Hughes, and Campbell (2008) demonstrated that older adults' use of the Internet for communication, but not for information seeking or commercial activities, was correlated with lower levels of loneliness. Given that correlational data does not permit causal conclusions to be drawn, experimental research is necessary to determine the nature of the relationship between technology utilization and wellness in late life. Causal relationships between computer and Internet use and positive psychosocial outcomes in late life have been reported, such as (a) increased social support (Cody, Dunn, Hoppin, & Wendt, 1999); (b) positive attitudes towards aging (Cody et al., 1999); (c) life satisfaction and self-control (Shapira, Barak, & Gal, 2007); and (d) fewer symptoms of depression and loneliness (Shapira et al., 2007).

Concurrently, however, research has failed to detect a relationship between technology utilization and wellness in late life. Upon reviewing the literature, Dickinson and Gregor (2006) concluded there is no evidence to suggest a relationship between computer use and wellness among older adults. Additional experimental research by Slegers, van Boxtel, and Jolles (2008, 2009) which utilized a rigorous, randomized controlled trial design also concluded that use of the computer and Internet does not have a direct influence on physical, emotional, or psychological well-being.

The body of literature examining relationships between Internet use and wellness during late adulthood is undermined by inconsistent findings and also by a lack of ecological validity. For example, although several investigations have examined Internet use in relation to aspects of psychological wellness, such research has narrowly defined well-being (e.g., Sum, Pourghasem, and Hughes, 2008; Wright, 2000). Within the context of research on Internet use, descriptions of well-being during late adulthood should be consistent with the literature (e.g., Greenfield & Marks, 2004; Keyes, Shmotkin, & Ryff, 2002; Ryff, 1995) yet inclusive of other dimensions of wellness that have been linked to technology utilization in previous research, such as decreased loneliness and depression. Such a conceptualization of well-being should include life satisfaction,

self-efficacy, social support, and decreased loneliness and depression.

There is, as yet, scant evidence that specific uses of the Internet relate to certain aspects of well-being. Moreover, previous research has focused primarily on communicative technology; it is not clear whether other types of Internet use would also be related to different facets of well-being. For example, there is evidence linking communicative use of the Internet and social aspects of well-being in late life borne out by findings of, for example, (a) social support (Cody et al., 1999; Sum et al., 2008); (b) greater social capital (Sum, Mathews, Pourghasem, & Hughes, 2008); and (c) less loneliness (Sum et al., 2008).

Comparatively little examination has been made of how Internet use for other purposes, such as information seeking, may relate to certain aspects of psychosocial functioning in late life, such as self-efficacy. Czaja et al. (2006) demonstrated that self-efficacy beliefs specific to computer skills were a significant predictor of technology utilization among older adults. It may be that a general sense of self-efficacy is linked to Internet use by older adults in that efficacy beliefs may increase the likelihood that an older person would learn a new skill such as using the Internet. Conversely, older Internet users may feel more empowered or efficacious as a result of having access to the large amounts of information online and the ease of access to social networks.

Finally, while empirical research on older adults' use of the Internet has frequently included analysis of variables such as age, education, and income, demographics have been given relatively little weight in the analysis of the relationship between Internet use and well-being (e.g., Chen & Persson, 2002; Sum et al., 2008). Older adults who use the Internet are more likely to be younger, and to have higher income and greater education than older adults who do not use the Internet (Czaja et al., 2006; Fox, 2004; Statistics Canada, 2009). Increased financial resources and higher levels of education are also associated with well-being (Cheung & Chan, 2009; Kaplan, Shema, & Leite, 2008). Demographic characteristics have been included as covariates in the context of Internet use and well-being in older adult populations (e.g., Slegers et al., 2008); however, the proportion of variance in Internet use accounted for by both demographic characteristics and well-being has not been established.

Research Questions

Our investigation, reported in this article, addressed three related research questions:

1. Is there a relationship between Internet use and psychological wellness (e.g., life satisfaction, social support,

self-efficacy, low loneliness, and depression) during late adulthood?

2. Are different types of online activities (e.g., communication, information seeking, and entertainment) differentially related to aspects of psychological wellness (e.g., life satisfaction, social support, self-efficacy, and reduced loneliness and depression) in older adults?
3. What are the patterns of relationships among demographic variables (age, income, and education), Internet use, and well-being in late adulthood?

Method

Participants

We surveyed 122 community-based adults over 60 years of age, who volunteered to complete a questionnaire on Internet use and well-being (females = 81, males = 41). The age cutoff of 60 was selected to enable sufficient comparisons between distinct age-groupings across the latter half of life (e.g., 60–69, 70–79, and over 80). Of the participants, 32 per cent were between the ages of 60 and 69 years, 43 per cent were between 70 and 79 years, and 24 per cent were 80 years and older. Regarding marital status, 38 per cent of participants reported that they were married, 35 per cent reported being widowed, 11.6 per cent reported being divorced, 9.9 per cent reported being single, and five per cent reported being separated. Over half of participants (52.9%) reported living by themselves, 38.8 per cent reported living with a spouse, and 8.3 per cent reported living with a partner or roommate. Almost 80 per cent of the sample reported that they were retired (77.9%), 8.6 per cent reported working full-time, 4.5 per cent reported working part-time, 7.4 per cent reported being retired and working part-time, and 1.6 per cent reported being unemployed.

With respect to education, 52 per cent of the participants reported starting or completing a university or college education, 11 per cent reported starting or completing technical school, 20 per cent reported completing high school, and 14 per cent reported not having a high school diploma. Concerning income, 10 per cent of participants reported an annual income of less than \$20,000, 47 per cent of participants reported an annual income between \$20,000 and \$40,000, 22 per cent of respondents reported an annual income between \$40,000 and \$60,000, and 21 per cent of respondents reported annual incomes exceeding \$60,000.

The distribution of age, marital status, living situation, employment status, education level, and annual income within this sample resembles 2006 census data for the city in which recruitment occurred, indicating that the sample is representative (Statistics Canada, 2007). The majority (59%) of respondents reported *good* physical health while 24 per cent reported *excellent*

health, 16 per cent reported *fair* health, and 1 per cent reported *poor* health.

Measures

Internet use

Adapted from the scales developed by Johnson (2007, 2008), Internet use was measured with 12 questionnaire items. One item assessed frequency of Internet use: *never* (0), *monthly* (1), *weekly* (2), or *every day* (3). Duration of Internet use was also assessed: *never* (0), *less than one year* (1), *one to five years* (2), and *more than five years* (3). The remaining 10 Internet use questionnaire items queried the extent of Internet use for the purposes of communication (email, chat rooms, instant messaging, and online communities), accessing information (search engines, accessing public and private information), and entertainment (music, movies, games). Respondents rated these 10 items on a 4-point scale ranging from *never* (0) to *often* (4).

Well-being

The questionnaire included 100 items that assessed five separate constructs related to well-being: (a) loneliness, (b) life satisfaction, (c) self-efficacy, (d) social support, and (e) depression. Loneliness was measured with the complete 20-item UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980). Items such as "I feel isolated from others", or "I lack companionship" were rated on a four-point scale ranging from *never* (0) to *often* (3). Total scores could range from 0–60, with higher scores indicating greater degrees of loneliness. Cronbach's alpha of the scale was found to be 0.89, suggesting the scale measured a single construct (Russell et al., 1980). The validity of the UCLA Loneliness Scale has been supported by several lines of empirical evidence (Hartshorne, 1993; Mahon, Yarcheski, & Yarcheski, 1995; Russell et al., 1980) and has been used with older adult populations (Green, Richardson, Lago, & Schatten-Jones, 2001).

The questionnaire included the 18-item Life Satisfaction Index (Neugarten, Havinghurst, & Tobin, 1961). Participants responded to items such as "as I look back on my life, I am fairly well satisfied" and "these are the best years of my life", with either *agree* (1), *disagree* (0), or *unsure* (0) as possible choices. Total scores could range from 0–18, with higher scores indicating greater degrees of life satisfaction. Cronbach's alpha of the scale was found to be 0.79, suggesting the measure reflected a single construct (Wallace & Wheeler, 2002). The Life Satisfaction Index has been validated for use in geriatric populations (Helms, Goffin, & Chrisjohn, 1998).

Self-efficacy was measured with 18 items drawn from the Self-Efficacy Scale (Sherer et al., 1982). Items from

the social self-efficacy subscale were excluded. Items such as "I am a self-reliant person" and "when I decide to do something, I go right to work on it" were rated as *agree* (3), *disagree* (2), or *unsure* (1). Total scores could range from 18–54, with higher scores indicating greater self-efficacy beliefs. Cronbach's alpha of the modified scale was found to be 0.86, suggesting that a single construct was being measured (Sherer et al., 1982). Both the criterion and construct validity of the scale has been established (Sherer et al., 1982). The Self-Efficacy Scale has been used in previous gerontological research (e.g., Singh et al., 2005).

Social support was measured with the 23-item Social Support Appraisal Scale (Vaux et al., 1986). To be consistent with the self-efficacy scale, items such as "I am well liked" or "I can rely on my friends" were rated as *agree* (3), *disagree* (2), or *unsure* (1). Total scores could range from 23–69, with higher scores indicating stronger subjective appraisals of social support. Cronbach's alpha of the modified scale was found to be 0.89, suggesting that a single construct was being measured (O'Reilly, 1995). Vaux et al. (1986) provided evidence for the validity of the 23-item measure, and subsequent research applied the Social Support Appraisal Scale to older adults (e.g., Coen, Swanwick, O'Boyle, & Coakley, 1997).

Depression was measured with the Beck Depression Inventory (Beck, Steer, & Brown, 1996). Each of 21 items has four possible choices reflecting different intensities of depressive symptoms, and they were scored accordingly, for example: "I do not feel sad" (0); "I feel sad much of the time" (1); "I am sad all of the time" (2); or "I am so sad or unhappy, I can't stand it" (3). Total scores can range from 0–63, with higher scores indicating more severe depressive symptoms (Beck et al., 1996). Cronbach's alpha of the scale was found to be 0.90, suggesting that a single construct was being measured (Steer, Rissmiller, & Beck, 2000). Evidence from Richter, Werner, Heerlein, Kraus, and Sauer (1998) suggested that the 21-item inventory is a valid assessment of depression. The Beck Depression Inventory has been used extensively with older adult populations (e.g., Scogin, Welsh, Hanson, Stump, & Coates, 2005; Segal, Coolidge, Cahill, & O'Reilly, 2008).

Procedure

Individuals in late adulthood were invited to participate in the research study. Participants were recruited from a variety of groups in Edmonton, Alberta. Over half (53%) of the sample consisted of individuals from seniors' centres, 33 per cent were from continuing education programs, and 14 per cent were from community organizations. There were no significant age, income, or education differences between recruitment sites. Permission was granted to

visit each participating organization and provide verbal and written information about the study to older adults present. Individuals who expressed interest in participating were asked to complete a questionnaire that measured Internet use, well-being, and demographic variables. In the majority of cases (82%), the questionnaire was completed in the presence of the principal investigator. Due to time constraints, a minority of individuals ($n = 20$) returned the questionnaire to the principal investigator by post.

Results

Of the 122 older adults sampled, 57 per cent reported using the Internet every day, 12 per cent used the Internet weekly, 6 per cent were online monthly, and 25 per cent had never used the Internet. More than half the participants (53%) reported using the Internet for at least five years, whereas 16 per cent reported being online for the past 1–5 years, 6 per cent had been using the Internet for less than one year, and 25 per cent reported never using the Internet. Table 1 presents the proportion of respondents selecting each questionnaire item response option. Nearly 60 per cent of respondents (59.8%) reported using email *often* whereas a substantially smaller percentage of respondents (4.4%) reported using instant messaging to the same degree. Over one-third of participants (35.3%) reported accessing online public information *often* (e.g., news and weather), and a comparable proportion (28.3%) *frequently* accessed private information (e.g., banking). Playing online games were the most frequently reported form of entertainment, with nearly one-fifth (19.1%) of participants reporting gaming daily.

Consistent with Johnson (2007, 2008), participant ratings of the 10 specific Internet use items were summed to reflect a score for the three categories of online behaviour including (a) communication (email, online

communities, instant messaging and chat); (b) information access (search engines, public and private information access); and (c) entertainment (movies, music, and games). Communication scores could range from 0–12, information access scores could range from 0–9, and entertainment scores could range from 0–9. Participant ratings of all 10 specific Internet use items were also summed to yield a *total Internet use* value. Total scores could range from 0–30. Table 2 displays the descriptive statistics for each category of Internet use. The information category yielded the highest average (4.28), reflecting frequent online information seeking among the older adults surveyed. The entertainment category displayed the lowest average (1.88), indicating lesser use of games, movies, and movies online. Table 2 also displays the descriptive statistics for each measure of well-being, including loneliness, life satisfaction, self-efficacy, social support, and depression. Mean scores were particularly high on the self-efficacy and social support scales, and low on the depression scale, reflecting a high-functioning sample with respect to well-being.

Table 3 displays the correlations between self-reported Internet use and the five scales of well-being. There were significant correlations between measures of well-being and Internet use. Loneliness was negatively correlated with the communicative category of Internet use. Life satisfaction was positively correlated with all measures of Internet use, except for the entertainment category of use. Similarly, self-efficacy and social support were both positively correlated with all measures of Internet use except for entertainment. Depression was negatively correlated with all measures of Internet use except for entertainment.

Multiple regression analyses were performed to determine the extent to which the measures of well-being predicted Internet use. Collectively, loneliness, life satisfaction, self-efficacy, social support, and depression significantly predicted Internet use frequency in older adults ($R^2 = .10$, $F [5, 108] = 3.726$, $p < .01$). However, within this model, self-efficacy was the only significant predictor of Internet use ($\beta = 0.32$; $p < .01$).

Table 4 displays the correlations between demographics (age, education, income) and the measures of Internet use and well-being. Age was negatively associated with almost every measure of Internet use. Age was also negatively correlated with social support. Income was positively correlated with all aspects of Internet use and four measures of well-being (life satisfaction, self-efficacy, social support, and depression). Education was positively correlated with every measure of Internet use except for entertainment. Education was also positively associated with self-efficacy. Multiple regression analyses were performed

Table 1: Self-reported frequency of specific Internet use (%)

Internet Use Items	Item Response Format			
	Never	Rarely	Sometimes	Often
Email	23.9	6.8	9.4	59.8
Chat Rooms	89.5	7.0	3.0	0.0
Instant Messaging	72.6	12.4	10.6	4.4
Online Communities	82.5	6.1	7.0	4.4
Search Engines	33.3	3.5	20.2	43.3
Public Information	32.8	8.6	23.3	35.3
Private Information	60.2	4.4	7.1	28.3
Music	62.1	13.8	19.0	5.2
Movies	78.3	13.0	5.2	3.4
Games	61.7	6.1	13.0	19.1

Table 2: Descriptive statistics for categories of Internet use and measures of well-being

Category	Mean	SD	Potential Range	Observed Range	α
Communication ^a	2.96	2.35	0–12	0–10	—
Information ^b	4.28	3.38	0–9	0–9	—
Entertainment ^c	1.88	2.21	0–9	0–9	—
Total ^d	9.12	8.27	0–30	0–29	—
Loneliness	35.5	10.8	0.0–60.0	7.0–60.0	0.91
Life Satisfaction	11.9	3.6	0.0–18.0	3.0–18.0	0.79
Self-Efficacy	44.2	6.4	18.0–54.0	18.0–51.0	0.83
Social Support	61.7	9.6	23.0–69.0	23.0–69.0	0.91
Depression	6.2	4.9	0.0–63.0	0.0–25.0	0.80

^a Summation of ratings on four items: email, instant messaging, online communities, and chat.

^b Summation of ratings on three items: search engine use, public information access, and private information access.

^c Summation of ratings on three items: movie, music, and games.

^d Summation of ratings on all 10 items.

to determine the degree to which demographic variables predict frequency of Internet use among respondents. Higher income ($\beta = 0.28$) and greater education ($\beta = 0.22$) significantly predicted frequency of Internet use ($p < .05$) whereas age did not. Collectively, income and education accounted for 24 per cent of the variance in Internet use frequency.

Because both Internet use and well-being were correlated with age, income, and education, partial correlations between all measures of well-being and Internet use were determined, controlling these demographic variables (see Table 5). Small yet statistically significant relationships between self-efficacy and several facets of Internet use remained, including (a) communicative Internet use, (b) online information seeking, and (c) total Internet use. No significant correlations were observed between self-efficacy and use of the Internet for entertainment purposes. Relationships between other measures of well-being and Internet use were non-significant when controlling for demographic variables.

Discussion

Results of the current investigation provide information on Internet use among older Canadian adults and the relation of such use to well-being and demographic characteristics. In the current sample, only one in four older adults surveyed reported never using the Internet. This result is in stark contrast to

the frequently cited Pew Internet and American Life Project (Fox, 2004) which reported that approximately 38 per cent of adults over the age of 65 go online. Of the present sample, 57 per cent reported using the Internet daily. Over half (53%) of those surveyed had been using the Internet for more than five years. The elevated rate of Internet use may indeed suggest that a growing proportion of older adults use the Internet. Alternatively, the results may also reflect a non-random sample of participants. For example, some individuals who were approached to participate may have assumed they were not eligible because they were not Internet users. As a result, non-Internet users may be under-represented in the current sample of older adults, thus limiting the generalizability of the findings.

Participants reported most often using the Internet for purposes of communication and information access. Emailing and accessing private and public information were the most popular usages; older adults used instant messaging and chat rooms relatively less frequently. The lesser use of real-time online communication may partially reflect unfamiliarity, or perhaps mistrust, with these Internet applications. Alternatively, the cognitive resources required for such applications may be declining in old age (Charness & Boot, 2009). For example, psychomotor skills and information processing speed are known to decrease with age (Schaie, 1996).

Table 3: Correlations between self-reported Internet use and measures of well-being

Internet Use	Loneliness	Life Satisfaction	Self-Efficacy	Social Support	Depression
Communication	-0.19*	0.29**	0.44**	0.26**	-0.33**
Information	-0.16	0.22*	0.41**	0.27**	-0.29**
Entertainment	-0.03	0.08	0.15	0.21*	-0.09
Total Internet Use	-0.11	0.23*	0.42**	0.29**	-0.28*

* $p < .05$. ** $p < .01$

Table 4: Correlations among demographic variables and Internet use and measures of well-being

	Age	Income	Education
<i>Internet Use</i>			
Communication	-0.31**	0.36**	0.32**
Information	-0.38**	0.40**	0.35**
Entertainment	-0.10	0.30**	0.11
Total	-0.32**	0.45**	0.34**
<i>Well-Being</i>			
Loneliness	0.10	-0.13	-0.01
Life Satisfaction	-0.09	0.25*	0.09
Self-Efficacy	-0.17	0.32**	0.21*
Social Support	-0.18*	0.26**	0.12
Depression	-0.05	-0.20*	-0.17

* $p < .05$. ** $p < .01$

Online entertainment was reported less frequently by participating older adults than Internet use for communication and information purposes. Nonetheless, 20 per cent of respondents reported playing online games every day. The current sample of older adults expressed a unique pattern of Internet use. Although a portion of the online behaviour of older adults included the pursuit of leisure activities, it primarily reflected convenience, a finding consistent with other surveys of older Internet users (e.g., Fox, 2004; Statistics Canada, 2009).

Correlational analyses suggested a link between older adults' use of the Internet and dimensions of wellness (e.g., loneliness, life satisfaction, self-efficacy, social support, and depression). Significant correlations also emerged between demographic variables (such as income) and both Internet use and well-being, raising the possibility that the correspondence between Internet use and well-being may be an artifact of the influence of socio-economic status on both technology utilization and successful aging. After controlling for demographic variables, the relationship between self-efficacy and Internet use remained significant. In particular, efficacy beliefs were related to use of the Internet for communicating and accessing information but not for entertainment purposes. Therefore, the

predicted relationships between Internet use and well-being were, in part, confirmed.

The robust relationship between self-efficacy and Internet use is subject to interpretation. Results could indicate that greater perceptions of self-efficacy drive older adults to use the Internet, an explanation that is consistent with Bandura's (1982) conceptualization of self-efficacy as the expectation of personal mastery or success. High expectancies of success make an individual more likely to initiate behaviours such as learning a new skill. Older adults who perceive themselves as capable of using or "mastering" the Internet may be more likely to learn and continue using the Internet on a regular basis. Theoretical and empirical investigations have explored the role of self-efficacy beliefs in technology adoption, and it appears that, regardless of the age group, these beliefs are key antecedents in the decision to use the Internet (Adams, Stubbs, & Woods, 2005; Agarwal, Sambamurthy, & Stair, 2000; Czaja et al., 2006).

Alternatively, the Internet could be causally linked to self-efficacy such that using this technology increases older adults' self-efficacy beliefs. When viewing the Internet as a tool to lead an independent life, remain in contact in family and friends, and make informed decisions, it seems plausible that older adults could perceive themselves as more efficacious as a result of using the Internet. To date, relatively few empirical investigations have examined the causal effect of older adults' Internet use on self-efficacy. Karavidas, Lim, and Katsikas (2005) examined the effect of computer training offered to a group of older adults and reported significant increases in self-efficacy as a result. In another study, Chu, Huber, Mastel-Smith, and Cesario (2009) provided Internet training, related to accessing health information online, to older adults. The Internet training resulted in significant increases in the older adults' *computer* self-efficacy. It is plausible that increases in computer self-efficacy could generalize to other types of efficacy beliefs. Igbaria and Iivari (1995) argued that computer experience positively affects self-efficacy expectations through providing opportunities for successful task performance and thus raising mastery expectations.

Table 5: Partial correlations between Internet use and measures of well-being, controlling for demographic variables

Internet Use	Loneliness	Life Satisfaction	Self-Efficacy	Social Support	Depression
Communication	-0.07	0.13	0.24*	0.10	-0.13
Information	-0.01	0.11	0.23*	0.08	-0.14
Entertainment	0.07	-0.05	0.05	0.14	0.05
Total Internet Use	0.03	0.08	0.24*	0.13	-0.12

* $p < .01$

Additionally, specific types of Internet use may differentially influence individual perceptions of self-efficacy. In our study, Internet use for purposes of communication and information, but not entertainment, was significantly correlated with self-efficacy. Likewise, the amount of time spent using the Internet may have a moderating effect on self-efficacy such that more time spent online leads to greater perceptions of self-efficacy. Recall that more-frequent use of the Internet was associated with higher levels of self-efficacy than individuals who were online less often.

The relationship between Internet use and self-efficacy in late adulthood could also be conceptualized as reciprocal. Self-efficacy influences older adults to use the Internet, and online experiences, in turn, reinforce and increase perceptions of self-efficacy. Such a reciprocal relationship between technology utilization and well-being was recently proposed from an ecological theoretical perspective by Johnson and Ptoplampu (2008). The impact of technology is mediated by several forces, such as family, school, and community characteristics. Technology in turn influences the individual's interactions with the immediate environment (e.g., email provides increased opportunity to maintain friendships). Internet use during late adulthood unfolds in response to opportunities and constraints associated with demographics (income, education, age) and psychological characteristics (self-efficacy). Clearly, Internet technologies have the potential to change, in fundamental ways, patterns of interactions either directly (e.g., online support) or indirectly (e.g., increased self-efficacy). While the relation between income, self-efficacy, and technology utilization during late life requires further investigation, results of the current investigation find support for the conclusion that Internet use, in its many forms and purposes, is a positive feature of successful aging.

By the nature of correlational research, the relationship between Internet use and self-efficacy could be explained by a third, unmeasured variable. Although the present investigation controlled for relevant demographic characteristics, other variables not currently measured could also explain the relationship between Internet use and self-efficacy. For example, cognitive functioning is predictive of both Internet use (Czaja et al., 2006) and self-efficacy (Seeman, McAvay, Merrill, Albert, & Rodin, 1996) in older adults. Therefore, further consideration of cognitive abilities in the context of technology utilization and psychological wellness in older populations is warranted.

Limitations and Future Research

While the present study has shed light on the complex relationship between Internet use, psychological

well-being, and demographic variables during late adulthood, there are several limitations to be addressed. As previously alluded to, a non-random sample of older adults was utilized. Given that recruitment occurred at seniors' centres, continuing education groups, and community organizations, the participants surveyed were sufficiently mobile, independent, cognitively intact, and motivated to attend these groups. As a result, the data may disproportionately represent high-functioning older adults. Nonetheless, given that the relationship between Internet use and self-efficacy emerged within a relatively homogeneous sample of older adults, this relationship may be just as probable, if not more likely, to emerge in a larger random sample of older adults which would contain greater variability in well-being and Internet use.

Social desirability is a threat to the validity of all self-report measures. Participants may not have answered questionnaire items truthfully in order to be seen in a socially desirable way. For example, respondents may not have admitted to experiencing severe depressive symptoms out of fear of being labeled "depressed". As a result, data from the present study may underestimate the degree to which older adults experience depressed mood or loneliness and restrict the degree to which patterns of Internet use can be related to varying severities of depression and loneliness. Measures of social desirability have been included in self-report research and according to one meta-analysis, almost half of the research including such scales have found that social desirability influenced results (van de Mortel, 2008). As social desirability was not measured and controlled for in our study, it remains a potential threat to the validity of the results.

In light of the results and accompanying limitations, there are several avenues for further study. The relationship between Internet use and well-being during late adulthood deserves theoretical consideration. While Johnson and Ptoplampu's (2008) ecological model has provided a theoretical basis of the reciprocal relationship between Internet use and well-being in childhood, its application and validation in older populations has not yet been established.

Furthermore, a randomized, controlled experiment is needed to determine whether Internet use directly fosters a sense of self-efficacy in older adults and to clarify the moderating role other variables may play, such as type of Internet use (e.g., communicative versus entertainment) and amount of time spent online. Slegers et al., (2008, 2009) have examined the effect of computer and Internet use on older adults' cognitive functioning and well-being in two of the most methodologically sound experiments to date. Slegers et al. were unable

to demonstrate any direct benefit of computer or Internet use either on older adults' emotional and social well-being or on cognitive functioning. However, there was no attempt to examine the differential effect of certain types of Internet use, nor was there a direct assessment of self-efficacy. While our study necessitates experimental research that examines the affect of particular types of Internet activities (i.e., information seeking) on self-efficacy, conducting such research will become increasingly difficult as a greater proportion of older adults use the Internet and individuals who have never been exposed to computers or the Internet become ever more rare. Future research on Internet use could focus predominantly on older-old adults (i.e., older than 80) as this age group is likely to have a smaller proportion of Internet users and vulnerable persons within this age group may stand to gain the most from activities that promote self-efficacy.

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