EXPLORING THE RELATIONSHIP BETWEEN ICT USE, MENTAL HEALTH SYMPTOMS AND WELL-BEING OF THE HISTORICALLY DISADVANTAGED OPEN DISTANCE LEARNING STUDENT: A CASE STUDY

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Received Date: 19/03/2018 **Accepted Date:** 17/05/2018

ABSTRACT

Whereas there exists a complex pattern of interrelated factors that act as determinants of the successful implementation of ODL in developing countries, most point at differences in access, use of, or impact of ICT. In addressing an area of research that has not received any attention, this study reports on an investigation into the relationship between ICT use patterns, selected mental health symptoms and the emotional, social and psychological well-being of the historically disadvantaged ODL student in the South African context of disparities. Data collected from 315 students in online survey revealed medium ICT use, higher computer use by working students compared to full-time students, a low prevalence of computer overuse symptoms, medium loss of sleep and a preference for individualized and non-collaborative activities that require minimalistic use of ICT. Differences between the ICT use scores of students who reported symptoms of stress and sleep disturbances and those who did not report symptoms were not significant, while the majority of students were diagnosed as moderately mentally healthy or flourishing. A significant relationship was found between working students' ICT use scores and reduced performance, as well as between their ICT use scores and their social, emotional and psychological well-being scores. The strengths of the well-being relationships, however, ranged from weak to very weak. No significant relationships were reported for full-time students, nor for both groups between their ICT use scores and total mental health scores. The study concluded that in the context studied, ICT use patterns hold no risk factors for the mental health and well-being of the historically disadvantaged ODL student.

Keywords: Open distance learning, student well-being, mental health symptoms, historically disadvantaged student, developing countries, ICT use patterns.

INTRODUCTION

Rapid advances in information and communications technology (ICT) and Higher Education Institution (HEI) student bodies largely made up of Millennials who interact in new ways with such technology, means that the earlier hype and expectations of ground-breaking revolutions in open distance learning (ODL) are increasingly being realized. In most Sub-Saharan countries, however, many historical, economic, technological and infrastructural impediments not obvious to a first economy exists, with the result that the majority of e-learning initiatives rarely fulfil their promised potential. Some probable causes, as identified by Ssekakubo, Suleman and Marsden (2011), are high ICT illiteracy rates among the student community, low comfort levels with technology, usability issues and insufficient user/technical support. Other causes identified are poor infrastructure, financial constraints, lack of e-learning knowledge and teachers' resistance

to change (Kisanga & Ireson 2015), expected performance, institutional policies and ease of use (Maina & Nzuki 2015), and learners who have little access to or interest in using learning management systems (Kleessen, Hollow, Williams, Oloo, Alwala, Mutimucuio, Eduardo & Muianga, 2010).

Whereas it is readily apparent that there exists a complex pattern of interrelated factors that act as determinants of the successful implementation ODL, most point at differences in access, use of, or impact of ICT - generally referred to as the digital divide. Whereas much research has been conducted on the digital divide, Trucano (2015) notes in a status review of pressing questions formulated a decade earlier for a World Bank research agenda (see Trucano, 2005), that the emotional and psychological impact of ICT use on learners from disadvantaged communities is an area of research that still requires attention. From an educational perspective, a focus on student well-being is important for two reasons: the recognition that schooling should not just be about academic outcomes but that it is about the 'whole' student; and that students who have higher levels of well-being tend to have better cognitive outcomes (NSW, 2015).

Given this lack of research, the initial and broad purpose of this study is to investigate the relationship between ICT use patterns and the emotional and psychological well-being of the disadvantaged ODL student. In refining this purpose, it is noted that in the domain of psychology, psychological well-being is a term used synonymously with subjective well-being, which refers to the evaluations and judgments individuals make about the quality of their lives, and which consists of two broad traditions, namely hedonic well-being and eudaimonic well-being (Keyes, Shmotkin & Ryff, 2002). Whereas measures of emotional well-being reflect the hedonic tradition, in which quality of life improves as individuals perceived their lives as more emotionally satisfying, measures of psychological well-being and social well-being reflect the eudaimonic tradition, in which quality of life improves as individuals see themselves functioning more fully to their potential and capacities. Thus, in addition to psychological and emotional well-being, this study includes social well-being as a measure of interest.

A final well-being measure of interest included relates partly to techno-stress, which describes stress reactions in relation to computer use (Berg, Arnetz, Linden, Eneroth & Kallner, 1992), and to ICT stress, which has been used to describe stress induced by work, time pressure and technical problems in connection with ICT use (Johansson-Hiden, Wastlund & Wallin, 2003). Despite positive aspects of ICT use, the end result is stress that is manifested in both physical and psychological symptoms (Nawe, 1995), and which is considered a particular threat to well-being (Nimrod, 2017). In delineating such stress measures, Thomee, Eklof, Gustafsson, Nilsson and Hagberg (2007) proposed a model of possible paths for associations between ICT use exposure variables and selected mental health symptoms. Mental health outcome variables included in this study are symptoms of stress, sleep disturbances and reduced performance.

Lastly, and because it is generally considered to hold the key to Sub-Saharan's development, the South African context of disparities offers a unique setting in which to study the impact of ICT use patterns on the disadvantaged student's well-being. A largely westernized and industrialized country, the arrival of democratic rule in 1994 has seen massification and increased diversity in the student body. However, deeply-entrenched legacy effects attributed the previous political system of apartheid continue to impact on the historically disadvantaged (HD), and predominantly African, student who is still exposed to a nexus of material challenges. The net result in terms of ICT access, use and impact, is that the digital divide continues to exist in a form of "digital apartheid", the latter a term coined by Brown and Czerniewicz (2010) after a 6-year research project into South African university students' access to and use of ICTs, and which points at a deepening digital divide characterized by access and opportunity. Given such stressors, it is therefore not surprising that the average dropout rates of HD students more than doubles that of other student groupings (Letseka, Breie & Visser, 2009).

From the above, the updated purpose of this study is to investigate the relationship between ICT use patterns and selected mental health symptoms, as well as the emotional, social and psychological well-being of the HD ODL student in the South African context of disparities. The remainder of this article is divided into 4 parts. The following section covers related well-being studies. Section 3 presents the methodology, the well-being scales employed and states the hypotheses which drives the study. Empirical results and hypothesis testing are offered in Section 4, with a discussion and conclusion in Section 5.

RELATED STUDIES

Research exploring the impact of ICT use on well-being has been varied. Outside education, its impact on the well-being of nations (e.g. Banker, Ganju & Pavlou, 2013; OECD, 2017), the health and well-being of workers (e.g. O'Driscoll, Brough, Timms & Sawang, 2010; Day, Paquey, Scott & Hambley, 2012) and the well-being of youth and adolescents (e.g. Livingstone & Brake, 2010; Plowman, McPake & Stephen, 2010) present some of the popular research focus areas. In terms of mental health symptoms, Thomee et al. (2007) considered ICT exposure variables and effect variables perceived stress, symptoms of depression, sleep disturbances and reduced performance under young adults. For women, high combined use of computer and mobile phone as well as number of SMS messages per day was associated with increased risk in stress and symptoms of risk. Online chatting and e-mailing were associated with symptoms of depressions, while internet surfing increasing sleep disturbances. For males, number of mobile phone calls and SMS messages were associated with sleep disturbances, with SMS messages also associated with symptoms of depression. Similar results were reported by Goddard (2012), although the mediating role of technostress and misuse of technology in the latter study was not proven. Other ICT-related studies have confirmed associations with hopelessness (Bolland, Lian, & Formichella, 2005), sense of belonging (Faircloth & Hamm, 2005) and self-esteem (Vacek, Coyle, & Vera, 2010), which have respectively been linked to academic achievement, subjective well-being and risky behaviors.

In educational settings, the most visible well-being research appears to originate from the Organization for Economic Co-operation and Development's (OECD) Program for International Student Assessment (PISA, http://oecd.org). This initiative, however, is limited to 15-year old students and does not include any sub-Saharan countries. Where well-being research has been conducted in tertiary settings in developing countries, it has largely focused on various aspects of well-being in general, such as the role of education attainment on life satisfaction (Botha, 2013), happiness and work engagement of support staff (Field & Buitendach, 2011), and work-related well-being of educators (e.g. Jackson, Rothmann & van de Vijver, 2006; Chigona & Chigona, 2010). Where the focus shifted to ICT use and well-being of students in developed countries, much of the research have centered on white college students (Neal, Coleman, Hale, Cotton, Neal & Coleman, 2015). Despite such attempts, Cotten (2008) concluded a review of empirical studies of ICT use among college students by stating that "we know little about the use of multiple technology devices, multitasking with these and other devices, and the impacts of use on well-being" (p.65).

Two popular ICT use focus areas that Cotten (2008) highlighted in her review are internet and mobile phone usage, which are considered high-use key entry points in an ODL environment, and therefore requires more understanding. Gupta, Garg and Arora (2016) considered patterns of mobile phone usage and its effects on psychological health, sleep, and academic performance in students, and reported a significant negative impact when overused. Similarly, smart phone addiction under Turkish students has been shown to result in social anxiety and loneliness (Enez Darcin, Noyan, Nurmedov, Yilmaz & Dilbaz, 2015). There against, Jena (2015) reported a moderate correlation between compulsive use of smart phones and technostress.

The impact of internet use on well-being offers a more protracted research history. Outside education, Merry, Hetrick, Cox and Brudevold-Iversen (2012) found depression to be one of the most common

disorders noted among children and adolescents, with internet addiction (see Lam and Peng, 2010) increasing the risk in children but normal use having a positive social integration impact on adult well-being (Berkowsky, 2012). Shaw and Gant (2001) found that internet use under students was associated with decreased loneliness and depression and increased self-esteem and social support. Allan and Lawless (2003) examined the effect of online students' collaboration and stress and found that it has the potential, due to a combination of dependency and trust, to cause stress. Similar results were reported by Kim (2016) who showed online networking to be adversely associated with the psychological status of students.

Whereas the term ICT includes a range of hardware and software applications, and in an ODL setting, a first requirement is internet access. A survey conducted by Oyedemi (2012) in 10 South African HEIs revealed that beyond publicly available (but attendant constrained) access to the internet on campuses, personal/household internet access is a challenge for most students and reflects a pattern of inequalities. Likewise, the General Household Survey of Statistics South Africa (GHS, 2015) reported only 53.5% of all households to have at least one member with internet access (at home, work, place of study or internet cafes), with those with home internet access accounting for only 9.6% of the population. The report further notes that the vast majority of South Africans accessed the internet outside the home: at work (15.0%), internet cafes or schools and universities (9.3%) and using mobile devices (47.6%). However, high data package costs and out-of-bundle rates means that mobile phone internet access is not economically viable option for low-income users. Furthermore, GHS (2015) reports that only one-fifth of all households owned one or more computers, the figure decreasing to 7.5% in rural areas. It is evident from the preceding statistics that access to the internet presents a potential first mile problem to the HD ODL student.

Finally, for the part-time ODL student who is working full-time, rapid advances in ICT technology may also hold additional risk factors that may spill over into their private lives, inclusive of part-time studies. Such risk factors, in general, relates to worker accessibility and expected productivity (O'Driscoll, Brough, Timms & Sawang, 2010). For this reason, ICT use in an organizational setting is a topic that is receiving greater attention as it relates to employee stress, health, and well-being (Ninaus, Diehl, Terlutter, Chan, Huang & Erlandsson, 2015). A few recent studies include Day, Scott and Kelloway (2012), who point out that ICT-related productivity demands in the workplace can lead to poor health and well-being, and Day, Paguet, Scott and Hambley (2012), who found selected ICT demands to depend on the culture and context in which an organization operates, to be associated with strain, stress, and burnout. Yet, despite such research, evidence on the possible adverse effects of technology on employees' psychological health and well-being is insufficient (Diaz, Chiaburu, Zimmerman & Boswell, 2014). Ultimately, it is a case of a division between demands and resources (Patel, Ryoo & Kettinger, 2012), a dynamic that in case of the working HD ODL student who would use ICT for purposes of study in the evenings after work, or over weekends, adopts new perspectives.

In concluding this literature review, it is evident that there exists a need for focused research on the relationship between ICT use and facets of the HD student's well-being.

METHODOLOGY, MENTAL HEALTH SYMPTOMS AND WELL-BEING SCALES, AND HYPOTHESES

Study Population Context

At the HEI under study, distance education started out with a print-based mode of delivery, with the student body largely made up of mostly older persons who desired to further their qualifications through part-time studies. In 2013 student numbers peaked at 387 414, with HD students making up around 75% of registrations to date (Heda, 2018). Digitization of student transactions using integrated ICT applications started in 2000 with an in-house learning management system running on the SAKAI platform (http://www.sakaiproject.org). Over the past 17 years, the teaching and learning model was refined

numerous times when it became increasingly apparent that a full technology-driven model does not necessarily fit a changing student profile. Regardless, the HEI is committed to a shift from ODL to open distance and electronic learning (ODeL) approaches, which by definition, relies heavily on technology. Currently, a blended-learning model similar to one described by Arinto (2016) is followed. Here students are engaged in guided independent study of mostly text-based course packages, are provided with opportunities to participate in electronic collaborative learning activities or online-delivered course content, either synchronously or asynchronously, but contingent on the type of course offered and the level of commitment of the lecturer; optionally submit, or in some courses do, assignments on-line or work through online learning units, and sit for a proctored final examination at various centers throughout the country, or submit portfolios. To accommodate students who do not have access to technology, fully functional computer laboratories are available across the country. This arrangement, however, does not imply ease of access, given distances between rural-based HD students and available laboratories.

ICT Exposure Variables

Information about ICT use patterns were collected from online survey questions posed to two groups of HD students: students that work full-time and study part-time (working students), and students that either study full-time or part-time, but are not employed (full-time students).

For purposes of work and study, information collected included time per day spent on a desktop computer/laptop/netbook/tablet/mobile phone (collectively referred to as a computer), how often these were used for more than 2 hours without taking a break longer than 10 minutes, how often sleep was lost because of time spent on a computer, and how often certain ICT-related activities (e.g. emailing, use of word processors, dedicated work software applications etc., presented in Table 4) were performed for purposes of work and/or for studies (e.g. collaboration, emailing, using the internet for assignments, finding course information etc.). Participants were required to respond to items on a 5-point Likert-type namely *never, rarely, sometimes, often, always*. A total ICT use score for each student was calculated by summing their Likert-scale answers.

For descriptive purposes, and to gain a broader understanding of the extent of ICT use, two further questions as they relate to internet access points and hardware used to connect were included, as well as a question to gauge the presence of physical symptoms associated with ICT overuse (eye strain, back pain, headaches, and upper limb pain).

Perceived Mental Health Symptoms

Information about current stress was collected using a single-item measure from the QPSNordic (Lindstrom, Elo, Skogstad, Dallner, Gamberale, Hottinen, Knardahl & Orhede, 2000), as validated by Elo, Leppanen and Jahkola (2003). Information on sleep disturbances was collected using a single item as used by Thomee, Harenstam and Hagberg (2012), and which was adapted from the validated (Nordin, Akerstedt & Nordin, 2013) Karolinka Sleep Questionnaire (Kecklund & Åkerstedt, 1992). Reduced performance, as employed by Thomee, Harenstam and Hagberg, 2012), was based on earlier research that suggested symptoms of stress, depressed mood or tiredness to influence performance at work or school.

The mental health outcome variables, questionnaire items, response categories, and categories are presented in Table 1.

Table 1. Mental health outcome variables (Thomee et al., 2012)

Variable	Cohort questionnaire item	Response categories	Categories in present study	
			Yes	No
Current stress	*Stress means a situation when a person feels tense, restless, nervous, or anxious or is unable to sleep at night because his/her mind is troubled all the time. Are you currently experiencing this kind of stress?*	a = *not at all*, b = *just a little*, c = *to some extent*, d = *quite a lot*, e = *very much*	d–e	a–c
Sleep disturbances	*How often have you had problems with your sleep these past 30 days (e.g., difficulties falling asleep, repeated awakenings, waking up too early)?*	a = *never*, b = *a few times per month*, c = *several times per week*, and d = *every day*	c–d	a–b
Reduced performance	*Have the following complaints influenced your performance at work or in studies over the past 14 days?* (a) *stress/depressed mood?* (b) *tiredness*	a = *No*, b = *Yes, negligibly*, c = *Yes, a little*, and d = *Yes, quite a lot*	(a) d or (b) d	(a) a–c and (b) a–c

The hypothesis to be tested is: **H1:** There is a relationship between HD students' ICT use scores and mental health symptoms, as measured by feelings of stress, sleep disturbances and reduced performance.

Social, Psychological and Emotional Well-Being Scales

To assess social, psychological and emotional well-being, the 3-factor Mental Health Continuum Short Form (MHC-SF), a self-reported scale successfully validated in the South African context by Keyes, Wissing, Potgieter, Temane and van Rooy (2008), as well as by de Bruin and du Plessis (2015), was employed. The MHC-SF consists of 14 items that were chosen as the most prototypical items representing the construct definition for each of the three facets of well-being. The first 3 items (happy, interested in life, and satisfied) are indicators of emotional well-being, the next five (social contribution, social integration, social actualization, social acceptance, and social coherence) indicators of social well-being, and the last six (self-acceptance, environmental mastery, positive relations with others, personal growth, autonomy, and purpose in life) indicators of psychological well-being (Keyes, 2009). Based on their experiences over the last month, participants were required to respond to items on a 6-point Likert-type scale, namely *never, once or twice, about once a week, 2 or 3 times a week, almost every day*, or *every day*. As with ICT use, the Likert scale scores for each facet were summed to represent a student's well-being score.

Furthermore, and to complement the mental health symptoms focus presented in the previous section, a diagnosis of the presence of positive mental health is possible when all the responses are reviewed. Specifically, a diagnosis of flourishing is made if someone feels 1 of the 3 hedonic well-being symptoms (items 1-3) "every day" or "almost every day" and feels 6 of the 11 positive functioning symptoms (items 4-14) "every day" or "almost every day" in the past month. Languishing is the diagnosis when someone feels 1 of the 3 hedonic well-being symptoms (items 1-3) "never" or "once or twice" and feels 6 of the 11 positive functioning symptoms (items 4-8 are indicators of social well-being and 9-14 are indicators of psychological well-being) "never" or "once or twice" in the past month. Individuals who are neither "languishing" nor "flourishing" are then coded as "moderately mentally healthy." (Keyes, 2009).

The following three hypotheses are forwarded:

- **H2.** There is a relationship between HD students' ICT use scores and their level of positive social well-being, as measured by feelings of social contribution, integration, actualization, acceptance and coherence.
- **H3.** There is a relationship between HD students' ICT use scores and their level of positive psychological well-being, as measured by feelings of self-acceptance, environmental mastery, positive relations with others, personal growth, autonomy and purpose in life.
- **H4.** There is a relationship between HD students' ICT use scores and their level of positive emotional well-being, as measured by feelings of happiness and satisfaction and being interested in life.

Data Collection

From a HEI population size of approximately 256 000 HD students in 2017, a selected margin of error of 5% and a confidence level of 95%, a representative sample size, given an estimate response rate of 30%, would be 1280, with the number of responses required 384. The actual sample, however, was increased to 10 000. In a previous unpublished survey on ICT use patterns, printed questionnaires were randomly distributed to 3000 students. Despite self-addressed envelopes being included the postal package, the response rate was a low 4.3 %, and it was felt that more students need to be surveyed in an effort to increase the number of responses. Since the current study is interested in actual ICT use, an online questionnaire was appropriate i.e. respondents will be ICT users, while more students can be surveyed at a lower cost. After ethical clearance, student email addresses were randomly selected from the institutional database, and towards the end of the 2nd semester 2017, an invitation to complete the online questionnaire within a deadline of 4 weeks was sent. A reminder post was sent two weeks later. Due to a slow response rate, the questionnaire was made available for a further 3 weeks until it became clear that no further meaningful increase in responses can be expected.

RESULTS

Socio-demographic Information

At the conclusion of the survey period, 315 responses were received for a response rate of 3.15%, resulting in an actual margin of error of 5.52%. Whereas the response rate was disappointing, the total number of responses were considered acceptable for valid statistical procedures.

The socio-demographic profile of respondents was in line with the current HEI student profile. Sixty-four percent were employed and studying part-time, with the remainder either studying full time (15%), or part-time, but not employed (21%). Sixty percent of respondents were female. Fifty-eight percent were older than 30 years of age, 21% between the ages of 26 to 30, with the remainder (21%) 25 years or younger. Only 2% were younger than 20 years of age. The majority of respondents (82%) were from the African population group, with 9% from the Indian population group, 7% from the Colored population group, and 2% from other HD groups. In terms of year of study, 35% were 1st year students, 10% 2nd year, 17% 3rd year, 12% 4th year, 18% honors, 4% Masters and 3% PhD candidates. The majority home language was English (19%) followed by Northern Sotho (19%) and Zulu (16%), with the rest of the country's 11 official languages making up the remainder.

Reliability

To establish internal consistency, construct reliability was measured using Cronbach's alpha, with listwise deletion of variables effected in two instances to increase the Alpha value. The following coefficients were reported for constructs employed in further analysis: Use of technology for purpose of work (0.725); Activities performed using ICT for purposes of work (0.842); Use of technology for purpose of study (0.626, which, according to Nunally (1988), is acceptable for a self-developed scale); Activities performed using ICT for purposes of studies (0.789); Physical symptoms from ICT use (0.822); Emotional well-being (0.882); Social well-being (0.860); and Psychological well-being (0.863). Factor construct scores for each participant were computed by using the average of the items that loaded onto that factor.

ICT Exposure Variables

Table 2 lists student exposure to and use of a computer. In the table, *never* and *rarely* responses were combined and presented as *low* use, *sometimes* as *medium* use, and *often* and *always* as *high* use. For purposes of work, the majority of working students (68%) were categorized as having high computer use (> 5 hours a day). Twenty-three percent spent 1-4 hours per day on a computer, while only 9% spent less than an hour per day on a computer. For purposes of study, 70% of working students spent between 1-4 hours a day on

a computer, 38% spent 1-2 hours, and 32% 3-4 hours. A small percentage of working students (17%) spent > 5 hours a day on a computer for purposes of study, the understanding that they do not work a full day.

Table 2. Computer use, and losing sleep because of computer use

Variables and response categories	For purposes of work (working students)		For purposes of study (working students)		For purposes of study (full-time students)	
	n=201	%	n=201	%	n=114	%
Computer use						
Low	18	9%	26	13%	11	10%
Medium	46	23%	141	70%	65	57%
High	137	68%	34	17%	38	33%
Losing sleep						
Low	80	40%	60	30%	32	28%
Medium	109	54%	130	65%	75	66%
High	12	6%	11	5%	7	6%

Comparatively, the majority of full-time students' (57%) spent between 1 and 4 hours per day on a computer for purposes of study, 25% spent between 1-2 hours, 32% between 3-4 hours, and 33% spent > 5 hours per day. A small percentage (10%) spent less than an hour a day on a computer for purposes of study. To gain a deeper understanding of the extent of computer use, students were asked to report loss of sleep because of sitting late at night at a computer for purposes of work and/or study. The majority of students from both groups (65% and 66%) reported medium loss of sleep because of studies, while 54% of working students reported medium loss of sleep because of work commitments. Only a small percentage (6% and below) of both groups reported a high loss of sleep for work and/or studies.

Overuse (and incorrect use) of computers are known to contribute to a range of undesirable physical symptoms. Table 3 presents total symptom counts for eye strain, back pain, headaches and upper limb pain symptoms reported. For the working student, and for purpose of work and study combined, only 7% experienced at least one of the physical symptoms related to ICT-overuse all the time, this percentage increasing to 9% for full-time students.

Table 3. Computer overuse symptoms, total symptom count

Variables and response categories	Working students (total symptom count across 4 categories)		Full-time students (total symptom count across four categories)	
	n=201	%	n=114	%
Computer overuse (physical symptoms)				
Low	391	49%	208	46%
Medium	358	44%	209	45%
High	55	7%	39	9%

More or less half the students from both groups (49% and 46%) reported a low prevalence of physical symptoms, with similar proportions (44% and 45%) reporting medium prevalence. Further analysis revealed the two most common symptoms often or more experienced by working students to be eye strain and back pain (65% and 53% respectively), followed by headaches (51%) and upper limb pain (36%). For full-time students back pain and headaches were the most common symptoms (58% each), followed by eye strain (53%) and upper limb pain (49%).

Table 4 lists student exposure to ICT-related activities as they were performed for purposes of work and studies. The arrow direction in the last column is a visual representation of the predominant direction of use i.e. towards higher use, or towards lower use.

Table 4. Exposure to ICT-related activities

Variables and response categories	Low		Medium		High		Dir
	n	%	n	%	n	%	⇦➔
Purposes of work (working students) n = 201							
Emailing	16	8%	63	32%	120	60%	➔
Use of word processors, spreadsheets	26	13%	74	37%	101	50%	➔
Use of dedicated work software applications	47	24%	66	33%	86	43%	➔
Use of phone	26	13%	75	38%	99	50%	➔
Use of the internet for work purposes	21	11%	78	39%	100	50%	➔
Video calling	147	74%	46	23%	7	4%	⇦
Purposes of study (working students) n=201							
Collaborating (forums, WhatsApp groups, Wikis, emailing, phoning)	74	37%	89	44%	38	19%	⇦
Emailing lecturers and/or Unisa departments	104	52%	93	46%	4	2%	⇦
Browse the Internet for completing assignments	25	12%	107	53%	69	34%	➔
Downloading or browsing study material	11	5%	100	50%	90	45%	➔
Uploading assignments	21	10%	76	38%	104	52%	➔
Phoning lecturers	171	85%	28	14%	2	1%	⇦
Finding course information for purposes of registration	42	21%	101	50%	58	29%	➔
Checking marks, syllabus, news, messages, schedules, accounts…	12	6%	88	44%	101	50%	➔
Working through online learning units and/or self-assessments	43	21%	95	47%	63	31%	➔
Watching podcasts	119	59%	62	31%	20	10%	⇦
Purposes of study (full-time students) n=114							
Collaborating (forums, WhatsApp groups, Wikis, emailing)	39	34%	54	47%	21	18%	⇦
Emailing lecturers and/or Unisa departments	36	55%	45	39%	6	5%	⇦
Browse the Internet for completing assignments	15	13%	55	48%	44	39%	➔
Downloading or browsing study material	10	9%	53	46%	51	45%	➔
Uploading assignments	18	16%	41	36%	55	48%	➔
Phoning lecturers	89	78%	24	21%	1	1%	⇦
Finding course information for purposes of registration	35	31%	53	46%	26	23%	⇦
Checking marks, syllabus, news, messages, schedules, accounts	12	11%	47	41%	55	48%	➔
Working through online learning units and/or self-assessments	29	25%	58	51%	27	24%	⇦➔
Watching podcasts	70	61%	40	35%	4	4%	⇦

The majority of working students performed a range of work-related ICT activities, with high to medium use the norm, except for video calling. For purposes of study, the predominant use pattern for both groups appears to be dependent on the type of activity performed. Individualized and non-learning activities that require short-term ICT use, such as accessing personal and study-related information, downloading study material, uploading assignments etc. were performed most, while more time-consuming learning and collaborative activities, such as watching podcasts, phoning and emailing lecturers, forum collaboration etc. were performed least. An exception to this pattern, and an activity that requires the most amount of online time, is working through online learning units and/or self-assessments. While this activity is course dependent at the HEI under study (i.e. not all courses offer online learning units), it is the only activity that suggests that at least half of all students spent a moderate amount of time online for purposes of study.

The overall impression gained in terms of ICT activities, is that students do what is needed in order to study off-line, with working students exhibiting higher overall use because of added work-related activities. Also, with working students having access to the internet at work (see Table 5), it is conceivable that they utilize work-breaks to access static study information, possibly explaining why their ICT related patterns for purposes of study slightly exceeds full-time student patterns.

The average mean ICT use score, out of a maximum of 5, was 3.33 for working students (work and study combined) and 3.28 for full-time students. The observed difference, however, was not significant ($t=1.9675$, $p > 0.05$). Table 5 lists student internet access points. As with the table 4, the arrow direction in the last column is a visual representation of the predominant direction of use.

Table 5. Internet access points

Variables and response categories	Low		Medium		High		Dir
	n	%	n	%	n	%	⇦➔
Working students (n = 201)							
At work	27	13%	54	27%	120	60%	➔
Fixed internet at home	83	41%	63	31%	55	27%	⇦
Internet Cafe	166	83%	31	15%	4	2%	⇦
Computer laboratory	166	83%	33	16%	2	1%	⇦
Wi-Fi hotspots	118	59%	72	36%	11	5%	⇦
Friend	173	86%	26	13%	2	1%	⇦
Mobile phone	11	5%	71	35%	119	59%	➔
Full-time students (n=114)							
At work	90	79%	9	8%	15	13%	⇦
Fixed internet at home	50	44%	25	22%	39	34%	⇦
Internet Cafe	68	60%	42	37%	4	4%	⇦
Computer laboratory	83	73%	28	25%	3	3%	⇦
Wi-Fi hotspots	60	53%	43	38%	11	10%	⇦
Friend	78	68%	31	27%	5	4%	⇦
Mobile phone	14	12%	33	29%	67	59%	➔

For working students, the internet is predominantly accessed at work (60%) and/or through a mobile phone (59%). Further analysis (not reflected in the table) revealed 30% to not have fixed internet at home. When it is available, its use is predominantly low to medium. Other common access points such as internet cafes, computer laboratories and Wi-Fi hotspots are, as expected, very rarely used by working students. For full-time students, mobile phone access is the most common method (59%). Fixed internet from home is not available to 40% of all students, but when available, use is predominantly low to medium, with the average working student's use slightly higher. Access through internet cafes, Wi-Fi hotspots, computer laboratory and friends is also higher than working students' but its use remains low to medium. A few full-time students access the internet at someone else's work. The impression gained is that both groups will access the internet mainly through a mobile phone, with the working student making use of opportunistic access available at work (e.g. during a lunch break), while full-time students' access is more spread and opportunistic i.e. they will make use of internet access points as and when it is available.

In summary, data collected revealed medium ICT use, higher computer use by working students compared to full-time students, a low prevalence of computer overuse symptoms, medium loss of sleep and a preference for individualized and non-collaborative activities that require minimalistic use of ICT. Having described patterns of HD student ICT use, the relationships between ICT use and mental health outcome variables and student well-being is reported next.

Relationship between ICT Use Scores and Mental Health Outcome Variables

From Table 6, only 18% of working students reported symptoms of current stress (feeling tense, restless, nervous, anxious, and being unable to sleep because of a troubled mind). There against, a slightly higher percentage of full-time students (26%) reported symptoms of current stress. Further analysis revealed no significant difference between the ICT use scores of working students who experienced current stress (M= 3.6069444, SD=0.516) and working students who did not experience current stress (M=3.5457879, SD=0.573); t(199)=1.971957; p=1.43793; p>0.05. Similarly, no significant difference was reported between the ICT use scores of full-time students who experienced current stress (M= 3.559354, SD=0.353) and full-time students who do not experience current stress (M=3. 2.55711, SD=0.441); t(112)=1.981372; p= 12.7414; p > 0.05.

Table 6. Mental health outcome variables

Variables and response categories	Working students		Full-time students	
	n=201	%	n=114	%
Symptoms of stress				
No	165	82%	84	74%
Yes	36	18%	30	26%
Sleep disturbances				
No	145	72%	76	67%
Yes	56	28%	38	33%
Reduced performance				
Stress/depressed mood	27	13%	27	24%
Tiredness	116	58%	56	49%
Both	33	16%	23	20%
None	25	12%	8	7%

A slightly higher percentage (28%) of working students' reported difficulties falling asleep, repeated awakenings and/or waking too early in the past 30 days, which was slightly less than what full-time students reported (33%). However, no significant differences were found between the ICT use scores of working students who reported sleep disturbances (M=3.188312, SD=0.563) and working students who did not report sleep disturbances (M=3.159875, SD= 0.495); t(199)=1.971957, p=0.35109, p > 0.05. Similarly, no significant differences were found between the ICT use scores of full-time students who reported sleep disturbances (M=3. 313596, SD=0.563) and full-time students who did not report sleep disturbances (M=3.273026, SD= 0.646); t(112)=1.981372, p=0.33351, p> 0.05.

In terms of complaints that resulted in reduced performance at work and/or in studies over the last 14 days, 13% of working students reported feeling stressed or having a depressed mood over the last 14 days, with 58% reporting tiredness. Sixteen percent reported both symptoms to be present, with 12% reporting no reduced performance. For full-time students, the percentage of students reporting feeling stressed or having a depressed mood over the last 14 days is moderately higher at 24%, a lower percentage (49%) reporting tiredness, and a slightly higher percentage (20%) reporting both symptoms to be present. A statistically significant difference between working students' ICT use scores and reduced performance complaints, as determined by one-way ANOVA (F(3,197)= 21.374 <0.001), was reported. Post hoc comparisons using t-tests, employing Bonferroni correction with alpha levels of 0.0125, indicated that the ICT use scores for working students who reported a performance decrease because of stress or a depressed mood (M=3.453, SD= 0.601), tiredness (M=3.466, SD=0.561) or both (M=3.498, SD=0.597) were significantly different to working students who reported no reduced performance complaints ((M=2.516, SD= 0.422; t(50)=6.453, p < 0.001; t(139)=7.982, p < 0.001; t(56)=6.992, p< 0.001). For full-time students, no significant difference between ICT use score and reduced performance complaints, as determined by one-way ANOVA (F(3,110)= 0.4064 > 0.05), was reported.

Diagnoses of the presence of positive mental health, made possible by considering the three well-being facets together, revealed 10% of working students to be mentally languishing, 45% to be mentally flourishing, and 45% to neither be languishing nor flourishing, but moderately mentally healthy. There against, a slightly higher percentage of full-time students (16%) were found to be mentally languishing, a slightly lower percentage (37%) to be mentally flourishing, and more or less an equal percentage (47%) to be moderately mentally healthy.

For purposes of hypothesis testing, and to determine the nature of the relationship between HD students' ICT use scores and their total mental health score, Spearman's rank correlation coefficient was calculated. For both working students and full-time students, a very weak but non-significant relationship was reported, with p(199)=0.0721, P=0.3088 and p(114) =0.0773, P=0.1713 respectively.

- **H1:** there is a relationship between HD students' ICT use scores and their mental health, as measured by feelings of stress, sleep disturbances and reduced performance, is thus rejected.

Relationships between ICT Use Scores and Emotional Well-Being, Psychological Well-Being, and Social Well-Being

For working students, a weak but significant relationship was reported between their level of ICT use (work and studies) and their social well-being, with p(199)=0.2301, P<0.001013. For full-time students, a very weak but nonsignificant relationship was reported (p(114) =0.1672, P=0.0754).

Whereas **H2**: There is a relationship between HD students' ICT use scores and their level of positive social well-being, as measured by feelings of social contribution, integration, actualization, acceptance and coherence, is accepted for working students, the weak relationship strength, however, offers limited scope for practical significance and/or interpretation.

For working students, a very weak but significant relationship was reported between their level of ICT use (work and studies) and their psychological well-being, with p(199)=0.1935, p<0.005926. For full-time students, a very weak but insignificant relationship was reported (p(112) =0.1839, P=0.0502).

As with the previous hypothesis, **H3**: There is a relationship between HD students' ICT use scores and their level of positive psychological well-being, as measured by feelings of self-acceptance, environmental mastery, positive relations with others, personal growth, autonomy and purpose in life, is accepted for working students, but the weak relationship strength once again offers limited scope for practical significance and/or interpretation.

A similar result and conclusion was reported for **H4**: There is a relationship between HD students' ICT use score and their level of positive emotional well-being, as measured by feelings of happiness and satisfaction and being interested in life. For working students, a weak but significant relationship was reported between their level of ICT use (work and studies) and their emotional well-being, with p(199)=0.2644, p=0.000149. For full-time students, a very weak positive but insignificant relationship was reported (p(112)=0.1489, P=0.1138).

DISCUSSION AND CONCLUSION

This study set out to investigate the relationship between ICT use patterns, selected mental health symptoms, and the emotional, social and psychological well-being of the HD ODL student in the South African context of disparities. As noted by Alavi and Leidner (2001), understanding learners' psychological processes is crucial if HEIs want to provide effective e-learning programs.

In terms of ICT use patterns, it was observed that the mean ICT use scores of 3.33 for working and 3.28 for full-time students fit between "sometimes" and "often" on the 5-point Likert-scale employed. In the results section tables, this was presented as medium use, and the latter is therefore an accurate description of the average ICT use pattern of HD students. High use patterns were limited to most of the working students' use of a computer for work, their work-related ICT activities and the combined use of a computer for purposes of work and studies. Here it is noted that the target population for this study was HD students who had access to ICT, with the result that few students from both groups reported low computer use - the only exceptions the low prevalence of computer overuse symptoms reported, and the lower use of ICT on time-consuming learning and collaborative activities. Non-ICT factors may have resulted in the agreements reported. For example, the medium loss of sleep because of computer use as reported by both groups could be related to the common student ritual of cramming and nick-of-time deadline-making, which has been

reported in web-based and blended-learning environments (Romano, Wallace, Helmick, Carey and Adkins, 2005). Similarly, the two most common complaints across the two groups (back pain and headaches) is in line with complaints reported in the general population (see Zwart, Dyb, Hagen, Svebak, Stovner and Holmen, 2004). Eye strain, as the most common complaint for working students, occurs frequently in the general office worker (Portello, Rosenfield, Bababekova, Estrada & Alejand, 2012).

Similarly, the observed preference for individualised and non-learning activities that require minimalistic use of ICT as opposed to more learning-intensive collaborative activities, can possibly be explained by a high reliance on mobile phones/costly internet access. Mobile phones are also not necessarily suitable for online activities. Naicker and van der Merwe (2012), in a student technology readiness study in the South African context, found that the extent to which student mobile handset devices fit technological requirements associated with m-learning, as well as the extent to which students are able to afford data bundles required to effect m-learning strategies, are unfavorable. This view is partly supported by Thinyane (2009), who in reporting 98% of students from two South African HEIs to make use of mobile phones for purposes of study, to largely not use, nor appear interested, in using collaborative Web 2.0 technologies.

In summarizing the ICT use patterns described, there are hints, including the author's own experience as an ODL instructor at the HEI under study, that aspects of the digital divide remain firmly in place, and slightly more so for the full-time HD student.

How can the impact of ICT use patterns (or the lack thereof at times) on students' well-being be interpreted? Firstly, the finding of no significant differences between the ICT use scores of HD students who reported symptoms of stress and sleep disturbances and those who did not, can possibly be attributed to the statistic that many more students from both groups reported no symptoms. Rather, when a positive mental health diagnosis based on the three facets of well-being was made, a large majority of students from both groups were diagnosed as moderately mentally healthy or flourishing. While the focus of the current study is on reporting the relationship between ICT use and student well-being as opposed to offering psychological analyses and interpretations, two local studies are nevertheless noted for purposes of comparison. Although Bantjes, Kagee, McGowan and Steel (2015) employed a different measurement scale and slightly varying psychosocial correlates, it is noted that the mentally languishing percentages of 10% for working students and 16% for full-time students in the current study exceed the 4% of largely historically advantaged (HA) students in that study who experienced severe symptoms of depression. In another local study that evaluated student subjective well-being, psychological problems or symptoms and life functioning, Young and Campbell (2014) found HD students to report higher levels of psychological distress that their HA counterparts. The relevance of these comparisons to the current study is that it underlines the stressors which the HD student is subjected to, and under which ICT is used.

Although marginal, the results also showed the full-time student to be in a slightly less healthy mental space than the working-time student. Not deriving an income, as well as being subjected to numerous other student stressors are well-documented (e.g. Seedat, Stein, Jackson, Heeringa, Williams, & Myer, 2009; Govender, Mkhabela, Hlongwane, Jalim & Jetha, 2015), may explain this finding. However, the weak relationship reported between HD students' ICT use score and their total mental health score was not significant, leaving this study to conclude that ICT use patterns hold no apparent risk factors for the mental well-being of the HD ODL student. The only meaningful relationship this study can report in terms of ICT use patterns and the selected mental health outcome variables, was the significant relationship found for working students between their ICT use score and reduced performance, with this association readily explained by their higher combined ICT use for work and study.

Secondly, and in reporting specific and significant relationships between HD students' ICT use patterns and social, emotional and psychological well-being, it is noted that it was once again limited to the working

student group. Given the weak to very weak nature of the relationships and the limited scope it allows for practical significance and/or interpretation, the results, at best, support Cotton's (2008) view that that technology use does not have direct impacts on well-being, but rather the impacts are mediated through other psychosocial aspects of individuals, such as their self-concepts, sense of mastery or self-efficacy over their lives, and perceptions of their abilities in to both technologies and student (and work) life more generally. The above appears a fitting description of the working HD student group, who, despite remaining social inequalities, may just experience a better quality of life than the full-time student.

In concluding this study, the implications for practice appear tangible at first. ODL HEIs, who are committed to student well-being, may well be encouraged by the fact that the current study could not find substantial relationships between ICT use patterns, selected mental health symptoms, and social, emotional and psychological well-being of the HD student. For one reason, it suggests that ICT requirements associated with current ODL approaches is not a burden to the HD student. It also suggests that there is no reason for the imminent shift to ODeL to be delayed. However, it is important to recognize that an ODeL approach will require *increased* student use of ICTs, and that such use may well result in a more pronounced impact on student well-being. That stated, there were limitations in the current study that need to be highlighted. Although the study population demographics mirrored the student profile at the HEI under study, an ICT use inclusion bias existed where only students that had access to ICTS were targeted. Borrowing from Liebenberg, Chetty and Prinsloo (2012), while not every student was included, every student is affected, and for this reason further research is required. Specifically, there is a need to contrast the current findings with HA students at the HEI under study, as well as the need to offer a paper-based survey that will include students who may not have access to ICT.

Finally, as noted by Thomee et al. (2012), it remains desirable to support healthy use of modern technologies in order to prevent possible destructive uses or effects. For this reason, it is imperative that the relationship between ICT use and/or requirements and student well-being is included as a factor in any future ODeL considerations.

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