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HUMAN COMPUTER INTERACTION (HCI) IMPLICATIONS AND THE SAFE USE OF DIGITAL THERAPIES FOR PEOPLE WITH DEPRESSION AND/OR ANXIETY

Associate Professor Rhonda L Wilson RN PhD

@rhondawilsonmhn

rhonda.Wilson@Canberra.edu.au

Introduction

- **350,000 health apps available worldwide & approx. further 200 added to the total each day.**
- Cost-effective strategy for integration as a blended care modality within a comprehensive suite of mental health service delivery options
- Possible to assist more people at a time and place of convenience to them. Point-of-care.
- Critique the suitability of digital therapeutics: ensure safe & useful in the health context.
- R & D are required to engineer suitable future software & technologies...designed to treat ...effectively and safely

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LEARNING OBJECTIVE 1

To recognise the role that the computer interface plays in the delivery of a therapeutic dose of treatment to people with depression and anxiety.

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REVIEW ARTICLE

Combining e-mental health intervention development with human computer interaction (HCI) design to enhance technology-facilitated recovery for people with depression and/or anxiety conditions: An integrative literature review

*Amalie Søgaard Neilsen*¹ and *Rhonda L. Wilson*²

¹*Telepsychiatric Centre, Region of Southern Denmark, and* ²*E Mental Health, Clinical Institute of Research, University of Southern Denmark, Odense, Denmark*

Main question

- How can human computer interaction facilitate a positive experience for people with depression and anxiety?

Methods

- An integrative literature review selected to understand a wide range of human experiences about HCI.
- Incorporate quantitative & qualitative sources.
- Whitmore & Knafel's (2005) model for integrative review of the literature was followed to guide the review methodology.
- Aim: To determine & prioritize the components of HCI & computer design models that are central when designing treatment programmes for people with anxiety & depression within a framework (Morrison et al. 2012).
- Used PRISMA technique.

Inclusion Criteria

- CINAHL, Medline, EMBASE, and PsycInfo databases.
- Between 2007 & May 2017.
- Online therapeutic psychoeducational interventions specifically for people with anxiety and depression conditions
- Online therapeutic interventions that include design methods & principles
- Interactive elements including visual, textual, or auditory components
- Impact these factors have on the clinical effectiveness, adherence, or other clinical aspects.

Search Terms

E-MENTAL HEALTH DESIGN: LITERATURE REVIEW

TABLE 1: *Keywords including MeSH terms used in literature search strategy*

'depressive disorder' OR
'depressive' AND
'disorder' OR
'depressive disorder' OR
'depression' OR
'anxiety' OR
'affective' AND
'e-mental' OR
'digital' OR
'web-based' OR
'internet' OR
'telepsychiatry' AND
'usability' OR
'user' AND
'experience' OR
'interaction' OR
'internet intervention' AND
'usability' OR
'user experience' OR
'design'

Exclusion Criteria

Online therapeutic intervention defined as any web-based interventions with a self-help element that requires users to work their way through a series of computer-based or online information.

- Telepsychiatric counselling - eg videoconferencing or text-based counselling where treatment is based on person-to-person interaction rather than HCI.
- Social networks and other web pages or tools that were not explicitly designed for the purpose of treatment.
- Studies of online interventions with no mention of design considerations or with a nonspecific view on usability.
- Self-reported post-treatment usability scales were not considered sufficient to provide specific design reflections because they were limited to a general view about users overall satisfaction and comprehension of usability and do not adequately discriminate the unique design components
- One study focused on special design implication for older adults was excluded because it focused on specific design features based on their assumption that elderly people are digitally illiterate and that they are not sufficiently familiar with the use of computers in general.
- Interventions targeting relatives, families, and clinicians were excluded because they did not meet the inclusion criteria of experiencing a first-hand mental health problem or disorder.

30 articles were included in the review and their contents were analysed using Morrison et al. (2012) conceptual design

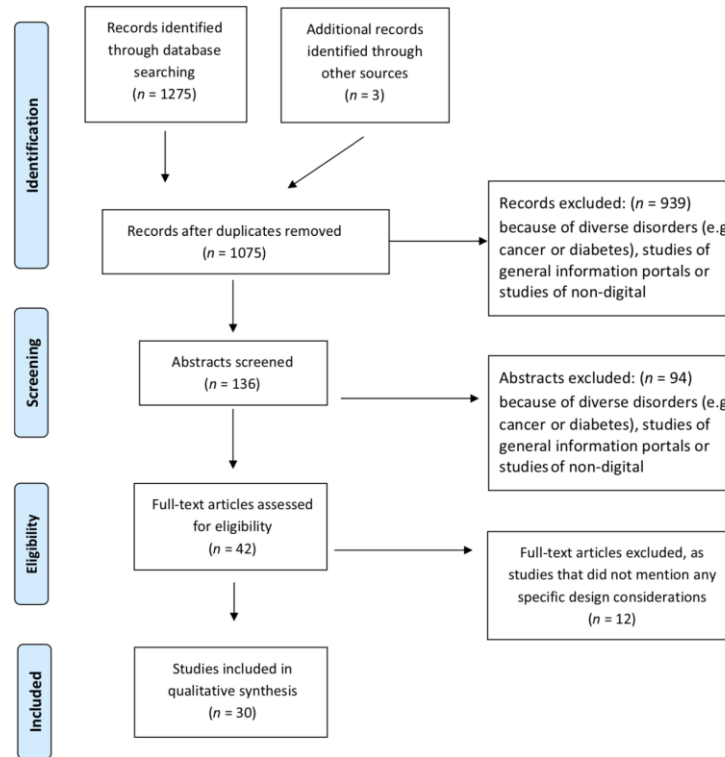


FIG. 1: Study identification and selection.

Findings

TABLE 2: *Overview of reviewed articles*

3 Protocols	Wilansky <i>et al.</i> (2016), Miloff <i>et al.</i> (2015), Kemmeren <i>et al.</i> (2016)
5 Meta-synthesis or reviews	Knowles <i>et al.</i> (2014), Cheek <i>et al.</i> (2015), Zhao <i>et al.</i> (2017), Renton <i>et al.</i> (2014), Brown <i>et al.</i> (2016)
11 Description and qualitative analysis of development and usability tests, interviews mm, focus group interviews	Tiburcio <i>et al.</i> (2016), Logsdon <i>et al.</i> (2013), Wozney <i>et al.</i> (2015), Kelders <i>et al.</i> (2013), Ho <i>et al.</i> (2016), Bae <i>et al.</i> (2009), Danaher <i>et al.</i> (2012), Cartreine <i>et al.</i> (2012), Davidson <i>et al.</i> (2014), Currie <i>et al.</i> (2010), Lauritsen <i>et al.</i> (2017)
2 Presentation of surveys	Bickmore <i>et al.</i> (2010), Richards <i>et al.</i> (2016)
4 studies of log data	(Whitton <i>et al.</i> (2015), Kok <i>et al.</i> (2014), Van Gemert-Pijnen <i>et al.</i> (2014), Lara <i>et al.</i> (2014)
5 other types of studies	Bresó <i>et al.</i> (2016), Rice <i>et al.</i> (2016), Mohr <i>et al.</i> (2010), Pham <i>et al.</i> (2016)

Design Elements

TABLE 4: *Components of Morrison et al. (2012) design framework*

Element	Component
Layout and instructional design	Text element (9), colours (6), illustrations (7), sound of audio recordings (5), look and feel of video recordings (8) navigation (6), instructions (7), and print out (4)
Social context and support (simulations of or real person-to-person interaction)	Chat (10), social community – discussion forum (7), personal stories (3), and reminders (10),
Contacts with the intervention	Feedback (11), and motivational messages (6)
Tailoring	Goal-setting (5), customizable character (3-4) game elements (5), and choices (7),
Self-management	Activity planning, activity scheduling, activity tracking (8), self-monitoring(9), diary, journal (5)

Main findings

- Main theme: Common aim to build *user-friendly & easy-to-use* systems. The overall design goal to support the strategy of the programme was frequently apparent, BUT the literature *fails to describe how this is achieved*.
- No papers adequately described how their design principles are applied in the context of an e-mental health intervention.
- Thus, no way of validating or critiquing the methodological approaches used to ensure that a reliable, trustworthy, and dependable approach has been used to establish the design infrastructure, & this remains a vulnerable component in the production of suitable evidence to support best e-mental health practice.
- The essential building blocks of producing a reliable and safe e-mental health intervention require a deeper level of critique so that quality interventions can be developed and implemented in the future.

Implications

- Publication of e-mental health interventions should describe design principles used within them, so clinicians can critically analyse the suitability of interventions for specific populations of patients.
- An interdisciplinary approach for the development & implementation of e-mental health interventions requires a close collaboration between mental health professionals and computing scientists to ensure safe e-mental health interventions are developed and tailored for specific conditions, patient types, adherence regimes and with the most appropriate multimodal combinations, & matched to user experiences.
- An interdisciplinary collaboration of this type will improve the ways that information technologists can create a finely targeted user experience for Internet-based e- mental health treatment programmes & in doing so assist with rates of adherence to treatment programmes, therapeutic outcomes, and reinforcing the recovery process.

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LEARNING OBJECTIVE 2

To understand the need to apply the principles of safe administration of digital treatment (with a similar approach to the safe administration of medications and other therapeutics)



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The right way for nurses to prescribe, administer and critique digital therapies

Rhonda Lynne Wilson

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8 RIGHTS FOR ADMINISTRATION OF DIGITAL THERAPEUTICS

1. Right digital therapy: Right prescription & administration of digital therapy guided by matching clinical evidence-base with the digital treatment.

2. Right person: Does the person possess the digital literacy skills required to engage with the digital intervention ?

3. Right condition: Has the digital intervention been shown to be useful, effective & safe for the condition previously?

4. Right dose: How many exposures to digital therapy are ideal to produce a clinical effect?

5. Right time: Is there a specific time for administration?

Is there a specific sequence that should be followed (eg Module 1 should precede Module 2?)

What would occur if a treatment exposure or module is missed or taken out of sequence?

What are the risks, or advantages, for maintaining adherence?

Is real-time intervention critical to effect?

6. Right (route) platform or device: Which device is best suited to delivery of the intervention?

Does the person have access to a suitable device?

What are the threats to success (eg loss of internet connection? Data privacy?) & how can these be best managed?

Does the screen experience or design align with the person's age, digital literacy, vision, motivation, lifestyle...)

7. Right evidence: Is there a scientific evidence base to ensure the conduct of evidence-based digital intervention nursing practice?

How can it be certain that there are no adverse side effects, or unintended harms? Or, how can these be ethically managed?

8. Right effect has been achieved, monitored & documented after administration:

How will effectiveness of the treatment be monitored & assessed? Under what circumstances will it be discontinued?

Safe Administration of Digital Interventions

- It is difficult for patients to determine the credibility, usefulness, and effectiveness of the 350,000+ health apps currently available in app stores
- Increasingly they will need to rely on nurses & other health professionals to provide expert professional advice regarding the selection of suitable self-care and blended-health care digital resources.
- To do this, nurses will need to be able to determine the validity, effectiveness and suitability of digital therapeutics to provide safe health care advice, based on best practice standards.

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LEARNING OBJECTIVE 3

To recognise the need for upholding patient safety through the professional critique of safe digital mental health treatment

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Work in Progress...

Digital Therapeutics Assessment Scale tool

Four part metric tool trial:

- Tailored design
- Precision prescription and administration
- Safety and security audit
- Quality and evaluation

Patient User Expectations

- Technological capacity exists
- Patients are digitally literate - perhaps more so than many clinicians
- Integration of BYO data & wearables (early identification and relapse prevention... monitoring... potential
- No regulation in the app store/ market...

Digital Hierarchy of Needs [@rhondawilsonmhn](#)

- **Technological self-determination** (ie Health self-determination & healthy behavioural change self-initiation. Proficient independent digital health consumer. Procurement of online services & goods. Communication exchange. Independent).
- **Recreational usability** (eg Games. 'Netflix'. Social media. SMS. Image & video sharing).
- **Educational &/or vocational usability** (eg LMS/VLE. Hierarchical online platforms. Email. Intranet)
- **Health accessibility** (eg Online GP appointments. 'Medicare' card access. SMS reminders).
- **Transport accessibility** (eg Card 'top-ups'... 'Opal' 'MyWay'. Car payments. Online registration. Online license testing).
- **Food security** (eg electronic 'basic needs' cards. EFTPOS. Swipe... tap... PIN).
- **Technology-based housing security** (eg direct debit - rent... utilities... MasterCard. ATM. Swipe. Online applications).
- **Technology-based financial security** (eg Intranet or platform-based time sheets. Work rosters. Online job applications. Internet payroll & banking. 'Centrelink' access & reporting).

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LEARNING OBJECTIVE 4

To recognise the need for evaluation of safe and evidence-based digital mental health interventions as they are increasingly included in routine mental health pathways for care

Limitations

- Small samples
- Recruitment
- Dominant female demographic
- Narrow & traditional designs (RCTs)
- Disruptive nature
- Many protocols & pilots
- Implementation

Challenges

- Fast pace of development
- Eagerness for implementation
- Recruitment
- Need for new methods & esp mixed methods
- Coordination of knowledge and practice needs
- Safety
- Pro & cons of industry & commercial entanglement (rich depth v. broad sweep) & (commercial gain v. public good)

What we still need to get right...

- HCI and user design
- Quality & safety for patients regarding the safe and effective administration of digital therapeutics
- Fine tune privacy – and on going risk to manage.

Future Research Directions

- Emerging technology to promote Mental Health (prevention and health promotion)
- Enhancing (lifestyles and recovery): technology mediated mental health treatments
- ***Patient safety in mental health settings: Person-centred technological responses***
- Implementation

Gap Map

- Young people
- Men
- Silos of service delivery (within health; welfare; education)
- Suicide
- Patient safety
- Workforce development (practice & research)
- Technological advancement
- Evidence

Threats to implementation

- Workforce digital literacy
- Health service platform architecture and plug in capacity
- Time
- Transportability
- Few digital therapies have been subjected to the rigour of clinical trials... required to validate their efficacy and qualify them as safe for therapeutic use in the clinical context



CONCLUSION

- HCI & design elements are largely unknown
- This has safety, security and quality implications re the prescription & administration of digital therapeutics
- Multitudes of apps, big gaps, hit & miss approach
- Patient users are ready – workforce is not; health IT architecture is not
- Current work will inform: Tailored design; Precision prescription & administration; Safety & security risk assessment; Quality evaluation

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Associate Professor Rhonda Wilson RN PhD

Twitter

@rhondawilsonmhn

Email

rhonda.Wilson@canberra.edu.au

Facebook

@ementalhealthnurse