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Is a Picture Worth a Thousand Words? The Development and Validation of a Picture-Based Knowledge Transfer Tool for University Students

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Abstract in English

This thesis documents the development and validation of a picture-based mental health Knowledge Transfer tool for university students, named the PicMH-U. As a knowledge transfer tool, the PicMH-U was developed with the participation of the potential users (stakeholders): Canadian university students. The information it seeks to communicate is the mental health difficulties that have been found to most affect Canadian university students – as assessed by the 2016 Enquête sur la Santé Psychologique Étudiante – along with psychosocial resources they can access to seek assistance. This information and population are used in order to address the demonstrated alarming rate of mental health difficulties among university students and need for mental health awareness and intervention.

The objectives for this thesis are two-fold: 1) to describe the state of the field of using images to communicate mental health/psychological research to North American adults; and 2) to develop and validate a mental health knowledge transfer/mobilization (KT) tool for a section of the adult population: university students. The first objective was satisfied through a systematic review (Article 1; Chapter 3) and the second objective through consultation with stakeholders (Chapter 2) and a longitudinal randomized controlled trial (Article 2; Chapter 4). The articles in this thesis have been submitted to peer-reviewed journals but are currently unpublished.

Results from the systematic review (SR) indicate that experimental research on image-based mental health communication to North American adults is limited to tobacco use and control. The SR found that Picture Warning Labels spurred more negative affect and more conversations about the Health Warning Labels, were rated as more effective at encouraging

quitting, and increased actual quit behaviors. Secondly, the randomized controlled trial found that the PicMH-U (image condition) had better results on tests of short-term, long-term, prompted and free recall, but not on user satisfaction, intention to use services, or actual use of services when compared to the text condition.

This thesis contributes to the advancement of the field of picture-based communication, knowledge transfer and community mental health by researching an intervention often used in community practice but not commonly validated by experimental research. By validating the use of the picture-based mental health tool among university students, this thesis aims to provide empiric evidence to support the use of picture-based communication methods within mental health.

Keywords: knowledge transfer, knowledge mobilization, images, pictorial superiority effect, graphic medicine, mental health, communication, university students.

Résumé en français

Cette thèse porte sur le développement et la validation d'un outil visuel de transfert de connaissances en santé mentale. Cet outil est nommé le PicMH-U, un acronyme pour picture-based mental health tool – university version. Cet outil de transfert de connaissances a été développé avec la participation de la population cible, soit les étudiant.e.s universitaires. L'information qu'il contient porte sur les problèmes de santé mentale qui ont le plus grand impact sur les étudiant.e.s universitaires, tel que recensé en 2016 par l'Enquête sur la santé psychologique étudiante (ESPE), et une liste de ressources psychosociales à laquelle les étudiant.e.s peuvent accéder. Ces éléments ont été ciblées pour répondre aux taux disproportionnés de problèmes psychologiques et l'importance de mettre en place des interventions psychosociales appropriées pour les étudiant.e.s universitaires.

Cette thèse poursuivait deux objectifs: 1) connaître l'état de la recherche sur l'utilisation des images pour communiquer/transférer la recherche en santé mentale et en psychologie aux adultes nord-américains; et 2) de développer et valider des outils de transfert de connaissances avec un échantillon de cette population, soit : des étudiant.e.s d'une université canadienne. Le premier objectif a été satisfait à l'aide d'une revue systématique de la littérature (Article 1; Chapitre 3) et le deuxième grâce à des consultations avec la population cible (Chapitre 2) et un essai contrôlé randomisé longitudinal (Article 2; Chapitre 4). Les deux articles sont soumis à des revues évaluées par des pairs mais ils ne sont pas publiés.

Les résultats présentés dans le premier article montrent que la recherche sur l'utilisation des images pour transférer des connaissances en santé mentale auprès d'adultes nord-américains

se limite exclusivement à la lutte anti-tabagique. Les résultats présentés dans le deuxième article montrent de meilleurs résultats pour la condition « avec les images » (PicMH-U) que pour la condition « texte » (TextMH-U) sur tous les tests de mémoires, mais pas sur la satisfaction des utilisateurs, l'intention d'utiliser les ressources, ni l'utilisation des ressources.

Cette thèse contribue à l'amélioration des domaines portant sur la communication à l'aide d'images et le transfert de connaissances en santé mentale communautaire en étudiant une intervention fréquemment utilisée dans les communautés de pratique mais qui n'est pas validée par la recherche empirique. En validant l'utilisation des images pour la communication de résultats de recherche en santé mentale chez la population étudiante, cette thèse fournit des données probantes permettant de renforcer cette pratique.

Mots clés: transfert de connaissances, mobilisation des connaissances, images, santé mentale, communication scientifique, étudiants universitaires.

NOTE LIMINAIRE

Le choix a été fait de rédiger cette thèse par articles plutôt que sous la forme classique parce que cela permet à l'étudiant de travailler à la fois à la rédaction de sa thèse et à celle d'articles qui sont soumis à des revues évaluées par des pairs. La présentation par articles vise à faciliter et à accélérer la diffusion des résultats de la recherche et donne l'occasion à l'étudiante d'apprendre à concevoir et à rédiger des articles, selon les modalités et les critères propres à son domaine de recherche. Toutefois, puisque l'article doit pouvoir être lu et compris comme un texte indépendant, cette thèse présente inévitablement un certain nombre de redites. Un effort particulier a été fait pour limiter ces répétitions, mais elles sont parfois indispensables à l'intégrité de la thèse.

INTRODUCTORY NOTE

This thesis is presented in the form of articles instead of the classic format because it allows the student to simultaneously work on the thesis while preparing articles for submission to peer-reviewed journals. Presentation in article format gives the student the opportunity to learn how to conceptualize and write articles according to standards of their field of research. Nevertheless, as the articles can be read as independent texts, this thesis will inevitably have some redundancies. Special effort was made to reduce repetitions; however, they are sometimes necessary for the comprehension of thesis as a whole.

Table of Contents

List of figures (in the order they were mentioned)

List of Tables (in the order they were mentioned)

List of acronyms

- **ESPE:** Enquête sur la santé psychologique étudiante
- **KT:** Knowledge transfer, knowledge mobilization, knowledge translation, etc
- **MH:** Mental health
- **NA:** North America/North American
- **PicMH-U:** The picture-based KT tool, the stimulus for the Image condition
- **TextMH-U:** The text-only KT tool, the stimulus for the Text condition
- **SR:** systematic review
- **RCT:** Randomized controlled trial

** N.B: The terms image (most accurate term) and picture (used most often in the literature) will be used interchangeably throughout this thesis.

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Chapter 1: Introduction

Pictures/images are static visual representations of concepts, objects or scenes. They can take the form of drawings, graphs, tables, photographs, paintings, engravings, emojis, and digital renderings. Images can be as complex as a Van Gogh or as simple as a straight white line. Different images have differing effects on the mind and subsequent processes, depending on their colour, newness, emotional content, realism and many other characteristics (Broers et al., 2018).

Text is made up of a series of symbols or characters – lines, curves and dots – that create words. Those words represent concepts, objects, or scenes. Essentially, text is a form of image but processed verbally; you see it, but it has an associated sound. However, both images and text rely on visual capture and processing to be understood. Visual processing occurs through reflections of light on the retina capturing small glimpses of an object then sending those image captures to the visual cortex to be assembled (Serre et al., 2007). This is the recently discovered Feedforward visual process. The information is then sent to other regions of the brain to be understood, depending on the content, and then back to the visual cortex, creating Feedback loops (DiLollo et al., 2000). It was previously theorized that all visual processing required a Feedback loop, but recent research has amended that (Children's Hospital Boston, 2009; Potter et al., 2014). Our eyes are constantly moving within their sockets and within space so that we are constantly processing images (Madrid & Hout, 2018; Casile et al., 2019). Recent research postulates that we learn and finetune this processing system over time and experience (Potter et al., 2014).

Knowledge Transfer

Knowledge transfer – also known as research implementation, knowledge exchange, knowledge mobilization, knowledge management or a multitude of other names – describes the potentially multidirectional processes of producing and sharing knowledge between academic/research and practice communities, one informing the other (Canas et al., 2019). There is great confusion in the field in regard to what term to use, the definitions of those terms, and the activities involved (Community First: Impacts of Community Engagement, 2014; Paulin & Suneson, 2012). This issue was identified by Graham et al (2006)'s seminal work titled "Lost in Knowledge Translation? Time for a Map". While substantial advances have been made since then, there are still a variety of terms being used to describe the field. As such, the term Knowledge Transfer will be used throughout the thesis because it is the one adopted by the candidate's research team, Équipe RENARD. Knowledge Transfer (KT) is defined as "all the actions dedicated to recognizing and making known the activities and results of research in social and human sciences, in Arts, and in Letters, in order for them to be used by practice settings, decision-makers, and the public at large" (Translated from Fonds de recherche du Québec – Société et culture, FRQSC, 2011). Additionally, KT is the term that best describes this research among the ones defined by Graham et al. (2006). KT is one of the terms most often used, including outside of the health domain; it describes the activities of creating, amassing, synthesizing, defusing, and using knowledge; incorporates the possible bidirectionality of knowledge sharing processes; aims to increase access to knowledge; and it intends for knowledge to be utilized (Government of Alberta, 2006; UK Particle Physics and Astronomy

Research Council, 2006; and UK Office of Science and Technology, 2006 in Graham et al., 2006).

The word "knowledge" often refers to research and evidence-based practices, but can also include skills, goods, tools, and ideas. "Transfer" describes just that; all the activities or processes by which the knowledge is either used by stakeholders (e.g. decision makers, practitioners, educators, general population, service users) or is transferred from practice communities to be studied academically (Graham et al., 2006). These processes can be bi- or multidirectional (Canas et al., 2019), demonstrating an exchange of information between research and practice communities (Van Eerd & Saunders, 2017).

Stakeholder engagement has become an important part of knowledge transfer and health research (Boaz et al., 2018). Stakeholders can be "individuals, organizations or communities that have a direct interest in the process and outcomes of a project, research or policy endeavor" (Deverka et al., 2012). Multiple researchers conclude that involving stakeholders in research increases the use and integration of scientific findings and evidence-based practices (Van Eerd & Saunders, 2017). Engaging stakeholders in research is an emerging practice, contributing to what is called Integrated Knowledge Transfer, participatory research, engaged scholarship, or co-production of knowledge (Gagliardi et al., 2017). The integration of stakeholders in KT is a reliable way to create research that is useful and used by the target population (Canadian Institutes for Health Research, CIHR, 2016). Stakeholders can be involved in identifying subjects that are important, applying for funding, devising plans, modifying procedures, communicating research, and commenting on drafts (Van Eerd & Saunders, 2017). As stakeholder engagement is considered the preferred strategy in KT (Gagliardi et al., 2017; Van

Eerd & Saunders, 2017), the target population was involved as much as possible in the development and validation of the novel KT tools described in this thesis. The ways in which stakeholders were involved in the research process will be detailed throughout this thesis and summarized in Chapter 2. This will provide future researchers and practitioners with examples of how to co-produce knowledge within the university context.

According to Graham et al. (2006), knowledge creation can be imagined as a funnel shape, in which stakeholders can intervene at any or every stage (Figure 1). This framework has also been adopted by the Canadian Institutes of Health Research (2016). Though these are stages, they are not purely sequential; they can be cyclical, multidirectional, and involve some activities but not others. *Knowledge creation* is where skills, goods, research, and ideas come into existence. *Knowledge inquiry* involves introducing all the knowledge that exists in a particular domain (e.g. health, education, technology) of varied quality, date, and source. *Knowledge synthesis* is when knowledge is identified, filtered for quality, utility, and pertinence then summarized. And finally, *knowledge tools* are where raw knowledge has its presentation and format adapted to facilitate its use by specific stakeholders. Once a knowledge tool is developed, it can be evaluated, validated, and modified before *knowledge application/implementation*. Feedback can be collected from stakeholders at any point including after implementation, potentially leading to further modifications and evaluations.

Despite the cyclical and interacting nature of KT, this thesis follows the aforementioned order of KT processes in Graham et al. 2006, succeeded by a concluding statement. First, the Knowledge Creation process responded to needs in community practice. Subsequently, Knowledge Inquiry was done by searching for examples of image-based communication, image-

based KT in the physical health domain, and specifically within MH KT. Information as to the effectiveness of image-based communication, compared to the standard text communication was also collected. The Knowledge Synthesis process involved conducting a systematic review of experimental research on image-based MH KT with North American adults (Article 1). An image-based and a text-based MH Knowledge Tool were then created, tested, and validated (Article 2). Finally, the thesis ends with a summary of Knowledge Created through the thesis, and information on how the tools could be adapted and applied, using Graham et al. (2006)'s Knowledge-to-Action Cycle (General Discussion).

Knowledge Creation

The initial Knowledge Creation for this thesis came from practice settings. An ever-increasing amount of informal image-based communication addressing different MH issues was amassed. Comic strips, illustrated blogs, gifs and other picture-based mediums were being used to publicly express experiences with anxiety (Wright, 2013; Purple Clover, 2014; ABCD, 2015), depression (Nedd, 2014; Brosh, 2013), MH stigma (Babis, 2014), autism (How to Explain Autism to People, 2015), schizophrenia (Deneweth, 2015), bipolar disorder (Forney, 2012) and post-partum stress (Scott, 2015). While highlighting the use of picture-based communication among these practitioners, these illustrations provided a look into the private struggles of the estimated 20% of adults who currently have a diagnosable mental illness (Canadian Mental Health Association, n.d.). Images are also used for MH in the forms Art Therapy, projective testing (ex. Rorschach, Thematic Apperception Test), diagnostics (ex. Dominique Interactive) and cognitive tests such as Wechsler Adult Intelligence Scale and Wechsler Intelligence Scale

for Children. However, when it comes to using pictures for communicating MH research results findings indicate that experimental studies are limited.

The mental health KT tools developed take two forms: the Picture-based Mental Health tool – University edition, or PicMH-U, and the Text-based Mental Health tool – University edition, or TextMH-U. The tools were developed by summarizing information from the research report of the Enquête sur la santé psychologique étudiante (ESPE) conducted at Université de Montréal in 2016. This study translates to "Survey on Student Psychological Health". The recruitment material for the ESPE used the header "Ça va?" with images of large, red lips.

The ESPE report is publicly available, for free, on the website of the Fédération des associations étudiantes du campus de l'Université de Montréal (FAÉCUM; translated as the Federation of Student Associations of the Campus of the University of Montreal). The ESPE had the intention of assessing the MH status of students, knowing what on-campus resources they access for psychosocial difficulties, and providing suggestions to the University on how to better orient on-campus resources to meet the needs of students (Colindres, 2016). The issues targeted by the ESPE include substance (mis)use, financial difficulties, psychological distress, isolation and lack of support at school, unhealthy eating, suicide ideation and attempts, sleep difficulties, depressive symptoms, burnout, and excessive workload.

When the candidate's knowledge transfer class was polled, nine of the 17 students had participated in the ESPE questionnaire, but only one student had read the report, and that was after having talked to the candidate about their respective research. In creating this tool and testing it against a text-based summary, the aim is to see if both the text and image-based

versions are adequate syntheses and to see if one condition provides better results than the other on assessments of user satisfaction, recall, intention to use resources, and accessing resources.

Knowledge Inquiry: Research on the efficacy of images

A picture-based KT tool such as the one in this thesis has not been retrieved and studied. However, images have been used and validated in multiple other contexts. The following section will be used to illustrate the Knowledge Inquiry process by summarizing the research that led to the creation of the KT tools.

Image-based Knowledge Transfer

The use of visual tools is widespread in KT. Television, newspapers, print ads, billboards, PowerPoint presentations, conferences, webinars, workshops, social media, comics and cartoons, theatre, policy briefs, poster presentations, websites, and flyers are all visual knowledge application tools that have been used and evaluated in the health domain (Langer et al., 2016; Bennett & Jessani, 2011; Fraser & al Sayah, 2011). Elaborated below are some of the ways pictures have been used in health communication.

Infographics. Infographics are a visual tool widely used in communication, business, health, and KT but not as frequently studied. They contain short text with picture supports (Buljan et al, 2017). They are used to represent complex information, data, or knowledge quickly and clearly; activating the brain's object and pattern recognition systems to ostensibly improve comprehension (Segue Technologies, 2014). Infographics should contain six key elements: a sequential storyline, descriptive titles and subsections, relevant statistics, a bold and coordinating colour palette, and attention directing images with essential information highlighted in some way

(Clua, 2017). They should be concise, accurate and information-rich, while reducing extraneous and distracting elements (Arcia et al, 2016). Infographics are frequently used online because they are brief, eye-catching and entertaining, colourful, often use a storytelling format which increases engagement, are easy to scan for relevant information, are more likely to be shared, and increase awareness of the concept or brand (Gillet, 2014; Segue Technologies, 2014). Incorporating pictures is part of the "best practices" of diffusing information online (Redsicker, 2014). Research findings on the efficacy of infographics are mixed due to KT strategies being context dependent. No conclusive, universal statement can be made to their efficacy as efficacy depends on the target audience, information transferred, purpose, etc. (Crick & Hartling, 2015).

Comics and Graphic Novels. Omnipresent in informal contexts, such as in the "Funnies" section of local newspapers, comics are gaining in popularity and in seriousness. There is a growing body of theses and dissertations presented in picture and comic form (Comics Research, n.d.). There are also several comic books recounting wars and historical events (for examples see Satrapi, 2007; Brown, 1999; Spiegelman, 1986; Sacco, 2004, 2013, 2014). Touching on touchy subjects, comics and pictures as a whole are used not only as a powerful form of expression, but as an outreach method, taking research out of the textbook or classroom and into the lives of everyday people, making it more accessible. However, there has not been subsequent validation of these communication methods in context; the research loop was not closed, leaving comics sequestered to the realm of practice.

Pictures and Physical Health. There is a long history of using pictures for the communication of health information. Illustrated posters and advertisements were used during World War I and following conflicts to alert people to certain infectious diseases and to

discourage behaviour that could decrease their spread (Helfand, 1990; Centre for Disease Control, 2016). Currently, pictures are ubiquitous in demonstrating health behaviours such as proper coughing and sneezing techniques (The Lung Association of Canada, 2009; Alberta Health Services, 2019). This field is now termed Graphic Medicine (Scott Library, 2018).

The Healthy Aboriginal Network has used a series of comic books to communicate relevant health and psychosocial information to Aboriginal youth. Topics such as suicide, reintegration after gang life, sexual health, living with Fetal Alcohol Spectrum Disorder, and diabetes prevention are communicated in a culturally-sensitive storybook format with text and images (Healthy Aboriginal Network, 2014). Many of their comics have sold out.

Sean Muir (Ontario Health Promotion E-Bulletin, 2005), Executive Director of the Healthy Aboriginal Network states that:

> Comic books were chosen to address health promotion because of the access it gives us to youth and their whole families. Most people find comics fun and non-threatening, receive multiple exposures as they ‘read' them over and over again, and are able to grasp the story or message visually as well as in written form. It is interesting that health and literacy are so closely related – low literacy generally results in low health. We are encouraged by the response that we may have tapped into a really terrific idea to combat both challenges.

Nevertheless, their comics have not been scientifically evaluated either.

Equité Santé, a team of researchers pushing for equality and equity in health research and access, also used comic-style images to communicate health information to marginalized

populations. They turned their policy briefs originally destined for policymakers in specific West African nations into single-panel cartoons (Queuille et al., 2015). These imaged policy briefs were then compiled into a book. Within 50 days of having the book on their website, it was downloaded over 5,000 times (Ridde, 2015). This team has also assessed the use of videos (moving images) and theatre for health promotion (Hébert, 2018).

Pictures and Mental Health. Despite comics being used as a personal communication method within MH, the findings suggest it is not widely studied as a scientific MH communication method with adults. A preliminary literature review done 2015-2016 retrieved only three examples of the use of pictures for MH KT within North America: “Can Mental Health Education Using a Storybook Reduce Mental Illness Stigma in Children?” (Research thesis; Innocent, 2013), “Marbles: Mania, Depression, Michelangelo, and Me” (Book; Forney, 2012), and "The Illustrated Happiness Trap" (Book; Harris & Aisbett, 2014). Unfortunately, the first example pertains to children and the other two have not been empirically tested. As such, a systematic review was undertaken to collect experimental research on using pictures to communicate mental health research to North American adults.

Cognitive Research on Images

Though picture-based MH communication has limited scientific evidence in context, images without text have been shown to have a distinct impact on cognition. Humans have the capacity to recall pictures with great detail. A striking study by Brady et al. (2008) illustrates this. The authors presented participants with 2,500 different pictures of real-world objects. Each image was presented for three seconds, for a total presentation time of five-and-a-half hours. There were three conditions in which participants were asked to identify which picture were

among the 2,500: 1) the Novel condition where one of the 2,500 images was presented with a novel foil image from a different object category and they were asked to choose which they had seen before, 2) the Exemplar condition in which a previously-seen image was presented with a new image from the same object category, and 3) the State condition in which one of the previously-seen images was presented with the same image in a different state or orientation (e.g. door opening from the left instead of the right, box opened instead of closed). Despite possible fatigue from the long testing time, participants in the Novel condition correctly identified the old object 92.5% of the time. In the Exemplar condition, the object previously seen was chosen 87.6% of the time. Finally, in the State condition, the correct state was identified 87.2% of the time. In a separate task, participants were asked to identify any repeated objects. They were presented with the original 2,500 picture-objects with 396 repeated images inserted. Accuracy was very high at 96% and false positive rate was very low at 1.3% (Brady et al., 2008).

In addition to accurate recall, humans can recognize images very quickly. It was previously theorized that visual object recognition relied on a feedback loop where information is relayed from the visual cortex to the temporal lobe and back to the visual cortex, taking a minimum of 100 milliseconds (Children's Hospital Boston, 2009). It is during these loops that visual information is first understood (enters consciousness) and then enters (or not) our short or long memory (Lamme, 2006). The more re-entrant loops, the better and longer the information is stored (Potter et al., 2014).

However, research conducted at the Massachusetts Institute of Technology (MIT) demonstrates that participants could correctly identify pictures faster than previously theorized was required for feedback loops (Potter et al., 2014). Participants were presented with a series of

six or 12 new images at either 80, 53, 40, 27 or 13 millisecond intervals. They were asked to identify images with a certain theme, for example, people smiling. The researchers wanted to see how pictures presented in rapid succession (RSVP format) fared against experiments where pictures were followed by a blank screen. Presenting pictures with a blank screen interval allows for a processing time that extends after the image was presented. Previous research found that a minimum of 20ms were needed to identify pictures when blank screens were used (e.g., Thorpe et al., 1996). However, this presentation model is not realistic as our eyes are constantly moving and capturing new visual scenes one after the other (Madrid & Hout, 2018; Casile et al., 2019). The RSVP process is similar to real-word image processing where one image "masks" the preceding one. By exposing the participants to images with a decreasing interval between stimuli, the researchers wanted to see what the shortest amount of time needed was for accurate visual object recognition, thus knowing if feedback or re-entrant loops were necessary to identify and make meaning of visual objects.

In this more realistic context, Potter et al. (2014) found that participants can recall and select images within a certain theme, whether the theme was given before or after presenting the image. Their results confirm earlier research that found that presenting the theme before stimulus exposure increased accuracy compared to announcing the theme after the stimuli (Evans et al., 2011; Cukur et al., 2013). Yet, Potter et al. (2014) found that there was no difference in accuracy between the Before and After conditions at 13ms. Thus, participants were able to extract meaning from a series of random images *after the fact* in as little as 13 milliseconds – 75 frames per second – the fastest their computer could perform (Trafton, 2014).

Vision dominates human sensory processing. Vision provides the brain with over 80% of its information (Bowman, 2012) and approximately two-thirds of our neural tissue treats visual information when our eyes are open (Medina, 2008). Vision is not only dominant in the amount of neural capacity it uses, it will also overpower other senses, changing the tactile perception of an object if it differs from its visual perception (Bowman, 2012). However, reading text is also a visual process. As such, it is essential to compare the two methods of disseminating knowledge to distinguish which form of communication is supreme within vision.

Picture Superiority Effect

Picture Superiority Effect (PSE) is the empirical finding that shows that pictures perform better than words on tests of recall and recognition. This has been found whether the word is written or verbal. For example, a drawing of an elephant is better remembered than the word "elephant". This effect was first documented in 1894 by Kirkpatrick. He demonstrated that real-world objects produced better recall results than written or spoken words, both immediately and after a three-day delay (Kirkpatrick, 1894). This effect was then replicated by many researchers, reproducing findings with a variety of information, contexts, and populations, (e.g. Anderson, 2009; Ally & Budson, 2007; Nelson et al., 1976). Additionally, humans can process pictures 60,000 times faster than text (Vogel et al., 1986).

Dual Coding (Paivio, 1975, 1991; Paivio et al., 1968; Paivio & Csapo, 1973) is the leading theory on PSE. It postulates that pictures encourage better recall because when a participant is presented with a picture and asked to remember it, they remember both the picture and the verbal label of the picture, which is not the case when they are asked to remember just a word. Therefore, the picture produces two pathways to memory (visual and verbal) whereas the

word only produces one (verbal). However, when instructed to visualize an image of the word presented, words fare as well as pictures – the PSE is not present (Oates & Reder, 2010). This process of creating imagery for words is not automatic like it is to create a word for pictures, so unless Dual Coding is instructed for words, PSE prevails.

Pictorial Superiority Effect

When the Picture Superiority Effect is demonstrated with complex information in applied contexts, such as in KT, it is called the Pictorial Superiority Effect. Houts et al., (2006) conducted a systematic review on the role of pictures in health communication. They found several hundred studies in fields such as psychology, education, and marketing, along with 19 studies specifically in the domain of health communication. Using McGuire's Information Processing Theory (1968), Houts et al. (2006) discuss the conditions under which pictures can be used to increase attention, comprehension, recall, and adherence to physical health instructions.

The information cited below is from Houts et al. (2006) except where specified. There is greater brain activation when participants were presented with pictures as compared to text. Pictures were shown to be five times better than text alone or audio alone in delayed recall tests. Pictures plus audio had similar results to pictures plus text, suggesting that the differences found are due to the pictures themselves and not the activation of visual processing alone. There exists a low literacy rate, even in a person's spoken language and in industrialized nations. However, reducing the complexity of the language or the reading level of written materials only benefits good readers, not poor ones. As such, non-literary communication methods are essential in providing access for low-income, minority, and low education populations. Additionally, patients only remember 29-72% of what their doctors tell them verbally. Pictures also increased whether

written information given to patients was read or not (whether the participants paid attention to the information).

Houts et al., (2006) also compiled the results from their systematic review into guidelines for using images in health communication. Drawings increased comprehension compared to photographs. Line and cartoon drawings – as compared to shaded drawing – had the best results. Colour pictures fared better than black and white ones. Participants preferred culturally-relevant and realistic materials, along with representations of people similar to themselves. Adherence to treatment suggestions involves decision-making/intending (accepting the message as worth acting upon) and acting on the decision (carrying out the recommended actions). Adherence is influenced by emotions elicited by the stimuli; negative emotions may decrease the behaviour. Pictures provide a context by which to organize the information presented in text format. Therefore, text should be used to caption or explain the pictures and should be relatively close to the images. Prompts such as circles and arrows can be used to draw the reader's attention to specific information when using complex pictures. Finally, the researchers recommend that pictures should be field tested before a picture-based tool is used. Though Houts et al. (2006) focused on physical health KT, their guidelines were used to develop the PicMH-U.

Thesis Objectives

The aims of this thesis are to describe the state of experimental research on picture-based MH KT with North American adults; to develop – in collaboration with the target audience – a text alone (TextMH-U) and a text plus picture (PicMH-U) version of the MH research content; validate the PicMH-U content and format among a sample of Canadian university students from different fields; and test which communication method is a better way to transfer this particular

information to this particular population. If the tool is validated, it can be implemented on campus to sensitize students to the MH difficulties that most commonly affect them and the resources available to respond to those difficulties. However, implementation and subsequent evaluation is beyond the scope of this thesis.

Chapter 2: Stakeholder Engagement

The PicMH-U was created to communicate mental health research to university students. The research it communicates is data from the Enquête sur la Santé Psychologique Étudiante (FAÉCUM, 2016). The ESPE was a campus-wide survey that assessed all departments and levels of the Université de Montréal student population. Out of approximately 40 000 students, 10 217 participated in the ESPE. It found that approximately 51.6% had moderate, moderately severe or severe Major Depressive symptoms. Almost two thirds of students (64%) had levels of psychological distress comparable to the top quintile of the general population of Québec. Approximately 6% of students had nearly all symptoms of burnout. In regards to suicidality, 7.8% seriously considered killing themselves in the last year and 4.7% opted to not disclose; 1.2% attempted suicide and 1.5% preferred not to say. These suicidality rates were two to three times higher than the general Québec population.

Stakeholders – Canadian university students – were consulted at various points in the five-year development and validation process. They were consulted through email, in person, and online surveys depending on the information sought. Before the tools were created, stakeholders were asked if a visual KT tool would be beneficial to them and they said yes. The logic behind the tool and the methodology for its validation were presented to the candidate's knowledge transfer class (First Consultation), which allowed for logic gaps and stakeholder concerns to be identified in advance of creating the tool. Subsequent consultations were done in focus group format (Second Consultations). Additionally, a stakeholder was involved in generating search terms for the systematic review, a stakeholder designed the versions of the PicMH-U used in the second consultation and in the randomized controlled trial (RCT), and

stakeholders tested the functionality of the online RCT before it was used. Lastly, informal consultations with stakeholders were used to address minor changes. The target population was recruited through posters on campus and emails from departments to participate in the qualitative and experimental validation of the KT tools.

Every decision, no matter how small, was subject to stakeholder input before being discussed by the research team. For example, participants in the small group discussions were confused by the use of the graduation cap emoji in place of a name in the cell phone screenshots. The graduation cap emoji - along with the formal language used - led them to believe that the student was corresponding with an employee of the university when the intention was a conversation between university student friends. The group discussions did not provide a conclusive solution to this problem, so the candidate asked francophone students from other universities what gender-neutral word, symbol or image could be used to show that it was two friends conversing. Finding gender-neutral terms in French is difficult because all words are assigned a binary gender, which would limit the generalizability of the PicMH-U. For example, using “amie” would mean the friend is a woman, but using the gender-neutral formulation of “ami.e” is relatively new and uncommon. As such, the candidate compiled a list of options based on the students’ suggestions and they were brought to the research team to discuss and decide. A poll was then done with the options proposed of “pôte”, “comrade”, a non-functional phone number, a phone number of one of the resources, angel emoji, and heart emoji to see which ones students liked best. Out of the options preferred by students the research team chose a non-functional phone number like ones used in film and television. A small decision like that took several weeks to complete but it was important for stakeholders to see themselves in the tool.

This responds to Houts et al. (2006)'s guidelines of using representative and culturally-relevant images, along with KT strategies of designing a tool for a specific population (Breckon & Dodson, 2016). Though some of these consultations with stakeholders were informal, they were crucial for the development of the KT tools.

In addition to consulting student stakeholders, there were two meetings with university representatives. First, a member of FAÉCUM was contacted to discuss the ESPE report, prospective KT tools, and the benefits of knowledge transfer. Second, the director of the university's psychotherapy service for students (Centre de santé et de consultation psychologique; CSCP) was contacted to talk about the tools and interventions the university is undertaking to respond to the ESPE. They were open to sharing some information, such as what psychosocial interventions the university is planning and how those respond to the ESPE. Unfortunately, there was resistance when it came to collaboration. This resistance is detailed in the General Discussion under the subheading Assessing Barriers to Using the Knowledge.

First Consultation

The first structured consultation with stakeholders was in April 2017 in the candidate's and primary research director's knowledge transfer course. Omitting the candidate and their teammate, there were 17 students in the class. The ages ranged from early-twenties to late-fifties, and they studied in diverse fields (psychology, public health, education, independent study, etc). The candidate and their teammate explained the purpose of the PicMH-U, asked who had participated in the ESPE and who had read the ESPE report then presented several drafts of the PicMH-U.

Of the 17 students, nine had participated in the ESPE. However, only one had consulted the report and only after discussing with the candidate. The other eight students did not know a report had been produced, nor where to find it. The PicMH-U drafts shown reused the images from the original ESPE promotion campaign. These images were large, red lips ostensibly expressing different emotions. Along with the lips, text labels for the difficulties surveyed in the ESPE and a list of on-campus resources were listed in varying layouts (Annex 1). Despite the lips being used in the ESPE, students found them off-putting and garish. They also found them confusing, not understanding the emotions they were supposed to convey, nor the relevance of the lips over other forms of emotional expression. The students suggested a clear, sequential lay out of the text: the text labels should caption the images and the resources should be in a columned list. Further, the students suggested listing non-campus resources due to what they found was a long waitlist for on-campus psychological intervention. One student stated that there were over 280 students ahead of her when she contacted the university's psychotherapy clinic.

Second Consultation

The second consultation consisted of structured focus group style interviews. An ethics certificate was obtained prior to collecting data but there was no intention to publish this consultation process as stand-alone research. No compensation was provided but refreshments were served during the interviews. The consultation was used to understand stakeholder's needs and modify the PicMH-U before testing. The same predetermined questions were used for each group consulted and the consultations followed focus group methodology, though the consultation groups were smaller than is recommended for focus groups (Eliot et al., 2005). Interviews were in groups of two to three students, with a total of seven participants. Participants

were recruited through posters displayed over the campus. Interested students were asked to email the doctoral candidate who scheduled the group discussions. Who participated in which group was decided entirely by participants' shared availabilities. Students were presented with different layouts of the PicMH-U created by a graphic designer who is also a university student in Québec. These new versions used simulated screen-captures of a conversation between two friends to illustrate the difficulties that affect students (Annex 2). A separate page contained off-campus crisis resources, along with another cellphone screen-capture. The header of "Ça va?" was used to provide continuity with the original ESPE promotion campaign of that name. The primary researcher asked the interview questions, in order, allowing participants to discuss freely. Follow-up and clarifying questions were asked, as needed. Each group discussion ran from 60-90 minutes and were audio recorded then transcribed.

Qualitative data from the group discussions was analyzed using Bader & Rossi (1998) three step process. 1) "Background briefing", where the context of the data collection (the purpose of the group discussion, the questions to be discussed, the participants, etc) are decided. 2) "Content analysis": a researcher summarizes the data by looking, on a macro level, at the patterns, consensus among participants, and themes. Content analysis employs different steps. First, a transcript of the interview is created. The transcript is then read through and irrelevant data – such as off-topic discussions – are eliminated. General themes are then identified and coded during a second reading. The transcript is re-read until all relevant themes are coded. Next, all references to the same theme are grouped together and the themes are clarified. A summary report is then written, while assuring confidentiality of the participants. 3) "Finalization of the

report". The report is presented to the other researchers in order to verify the themes and to point out possible omissions or misinterpretations.

Of the seven participants, five stated they had not even heard of the ESPE report, one had heard about it and read a portion of the report and the other had heard about it but not read it. Three of the seven participants had seen the original campaign to participate in the ESPE.

The images used for this consultation are in Annex 2. Several themes emerged: 1) Emojis, 2) Cell phone imagery used, 3) Text inside of the phones, 4) Text outside of the phones, 5) Statistics, 6) Resources, 7) Attention. Participants proposed alternatives to aspects they did not enjoy. They said that the tool would generalize well to other populations and named high school students – another group with high rates of MH difficulties – as a possibility.

1) **Emojis:** Emojis were considered attention-grabbing, easy to understand, and pertinent to how our society currently communicates. One participant shared that often when they are in distress, they can only express themselves in emojis so it was affirming to have that represented. Participants stated that they would not have read the tool if it was presented as text-only, concluding images were a more effective way of communicating this information. Participants felt the emojis reflected their reality, particularly the ones imaging unhealthy food - as that is what is available on campus and what students have time to eat - and substances due to the many parties on campus and the use of stimulants to study. Participants appreciated that some of the emojis showed darker skin tones, being inclusive of racialized students. Certain emojis were hard to see, irrelevant or confusing. They suggested making the size of certain emojis smaller and the quantity more uniform, allowing the text to be made bigger and easier to read.

2) Cell Phone Images: Participants found the cell phones captivating, encouraging them to read closer. This, too, was deemed relevant to their current communication methods; stating that they rarely express negative emotions in person, preferring to SMS or message on cellular platforms such as Facebook Messenger or Instagram.

3) Text Inside the Phones: They were confused as to who was engaged in conversation, feeling that the clinical nature of the questions being asked gave the impression that it was a student expressing their distress to one of the psychosocial resources listed or to someone at the university (a graduation cap was used instead of a phone number or name in the contact spot of the phone). Some text was hard to read and "Message reçu" at the end left participants feeling uneasy and concerned for the well-being of the person who did not respond. They appreciated that the battery level was marked as 100% (would have been distracting otherwise) but suggested the time change in each screenshot. They correctly identified the information in the phones as corresponding to psychosocial difficulties university students face. They stated that "Ça va" is the new "Bonjour"; used everyday but usually with no depth or expectation of receiving an authentic response. The expectation is to say "Bien" ou "Ça va" back then move on. When people respond with genuine or negative emotions, the reply is usually dismissive, ex. "You'll be better tomorrow!"

4) Text Outside the Phones: Participants found the text outside of the phones eye-catching and relevant. They liked the font and the censored curse words but suggested some grammar and positioning changes. «Ne vous inquiétez pas, on est ici pour vous» was perceived as invalidating. Some did not like the colour green being used as it communicated hope and

suggested adding a direct link to the report to encourage people to read it. They proposed that the text be made bigger and to reduce negative/blank space.

5) Statistics: "Frappant", the statistics spoke to the frequency and intensity of student mental health issues. Participants suggested the statistics be presented as images (pie charts, relative risk icons, etc) instead of fractions and be moved to the bottom of the page.

6) Resources: The participants were aware of the shortcomings of on-campus resources, both at theirs and other universities. They mentioned waitlists of close to two years for therapy; a maximum amount of sessions; needing to pay for some or all of the cost; often student therapists or just "active listening"; workers that are not well-versed in gender, sexuality or race issues; not available in a crisis due to office hours and waitlist; and no ability to choose your therapist. They felt having a list of resources accompanying the tool is essential. A lot of the resources were new for participants, including those studying and working in "helping/caring" fields such as psychology. They felt that the resources would be even more important for those who may not know psychological help exists, perhaps engineering and chemistry students. They suggested more specialized resources (ex. ones addressing racism and financial precarity) be added as there were resources specific for people marginalized based on gender, sexuality and age. They proposed changes to the text in and outside of the phone, along with moving the phone to the beginning of the page in order to "introduce" the resources.

7) Attention to Details: Between the various elements of the tool, participants were not sure where to look first; most participants stated they noticed the emojis first (especially the food and sadness ones), then looked at the text outside of the phone ("Ça va?", or the statistics), next

read the conversation in the phones from start to finish, and finally re-read the statistics or other text outside of the phones.

Benefits to Stakeholders

The university student population benefits from this KT tool by receiving the salient results from the ESPE, thus sensitizing them to student MH. Approximately a quarter of the student population participated in the ESPE, but when polled, few stated they accessed the report. Stakeholders were also given 20 resources they could access. Many of these resources are available 24 hours a day, seven days a week, 365 days a year and are accessible from anywhere by phone, thus increasing their utility.

University students experience mental health difficulties in excess of the general population. For example, only 20% of the general population scored as high as 64% of the student population on a measure of psychological distress (FAÉCUM, 2016). Students also reported two-to-three-times higher rates of suicidality (FAÉCUM, 2016). As such, students represent a disproportionate amount of people struggling with their MH. This impacts not just the student, but their friends, families, and the larger community. Due to the results of the IARSSM and Resource Use measures in Article 2, it can be assumed that students access MH care when needed. It is now known what their levels of MH stigma, awareness of non-emergency crisis services, and which resources are most used. The resources participants actually used - Appoint, Transit, Tel-Jeune, Ligne pour parents, private psychologist, school psychologist and online message boards - could be looked at as MH supports for this population. They could be better promoted or funded, though additional research should be conducted. By sensitizing students to their MH struggles, providing them with resources and potentially better

allocating resources, this KT process may alleviate MH difficulties among this population and thus, reduce societal strain.

Additionally, results from the thesis can be transferred to stakeholders. Participants in the RCT were asked to provide their email address if they would like results from the study. The thesis, the articles and/or a summary of results can be sent to them with the dual intention of Knowledge Dissemination and Uptake.

Chapter 3: Knowledge Synthesis: Article 1

The Use of Pictures for Mental Health Knowledge Transfer with North American Adults: A Systematic Review

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Keywords: health communication, knowledge transfer, knowledge mobilisation, pictorial superiority, graphic warning label, mental health, images.

Abstract

Background: Pictures have been used to communicate health research for centuries. Widely used informally, pictures to communicate empirical mental health research is an emergent field. Purpose: A systematic review (SR) was used to identify studies answering the following question: do pictures (alone or in conjunction with text) work better than text alone to communicate mental health research to North American adults? The aim of this SR was to inform concurrent research on the development and validation of a picture-based mental health tool for Canadian university students. Methods: Six databases were searched during January-June 2019. Only experimental designs were included. Results: 17 relevant experimental articles were found, published between 2011 to 2019. All (100%) dealt with tobacco consumption and all were randomized controlled trials. All images centered physical health effects (e.g. cancerous lungs, diseased mouths, premature babies) and were presented in conjunction with text in the form of Health Warning Labels (HWLs). Results show that, pictures spurred more negative emotions and more conversations/information sharing, were rated as more effective at encouraging quitting, and increased actual quit behaviors. Conclusions: While commonly used to communicate personal mental health experiences and physical health research, results from the SR indicate that experimental research on image-based mental health communication with North American adults is limited to the single subject of tobacco consumption and focused on physical health consequences. This indicates a gap between research and practice as the applications are diverse, but the research to validate those applications is limited.

Introduction

Pictures – drawings, paintings, graphs, photos – have been a useful form of communication since the dawn of humanity. Long before the first photograph was taken in 1826 [1], humans were using cave drawings, hieroglyphs, masks, and other forms of visual art to spread information and tell stories.

Using pictures for scientific health communication is comparatively new. In public health, illustrated advertisements were used during World War I and subsequent wars to alert people to infectious diseases and the behaviors that encourage their spread [2, 3]. This practice has intensified during the pandemic caused by COVID-19. Anatomical drawings have been used in medical education for centuries [4].

Since then, the use of pictures in health has spread to encompass wound care and other discharge instructions, transmitting the risks and benefits of an intervention, and communicating research in an emerging field called Graphic Medicine. This term, first used by Dr. Ian Williams, involves the use of drawings, comic books (aka graphic novels) and other forms of image-based communication in patient care, medical education and other health sciences [5]. Graphic medicine can be funny or serious, used by practitioners as well as patients, for individual and group/community interventions, be brief or long-term, communicate personal experiences as well as research, and can be both educational and therapeutic [5].

Graphic medicine can be a form of Knowledge Transfer/Mobilization/Translation/Exchange. Definitions and terminology abound within the field. For the purpose of this article, the definition of Knowledge Transfer adopted by the local

research authority will be used "…all the actions dedicated to recognizing and making known the activities and results of research in social and human sciences, in Arts, and in Letters, in order for them to be used by practice settings, decision-makers, and the public at large" [6].

Graphic medicine in the field of mental health (MH) has largely been used to communicate lived experiences with a particular psychosocial condition. Anxiety, depression, autism spectrum disorder, schizophrenia, post-partum issues, bipolar disorder, sexual assault, and MH stigma are some of the issues discussed in the form of a comic strip, gif or other picture-based medium [7, 8, 9, 10, 11, 12, 13, 14, 15, 16].

Despite being able to easily find graphic medicine for personal mental health communication, retrieving empirical research that validates this practice was difficult: a literature review conducted in 2015-2016 retrieved only one study that evaluated the effectiveness of picture-based KT in mental health: quasi-experimental research using a storybook to reduce MH stigma among elementary school children [17]. As such, the present Systematic Review (SR) sought to more thoroughly assess the state of experimental research on the use of images for MH communication among North American (NA) adults. The research question for this SR is: do pictures (alone or in conjunction with text) work better than text alone to communicate mental health research to North American adults?

In the present review, empirical experimental research involving NA adults was targeted in order to inform the authors' development and validation of an image-based MH KT tool among Canadian university students. The tool – the PicMH-U – is a summary of a report on the mental health of students at a Canadian university called the Étude sur la Santé Psychologique Étudiante (ESPE; translated as Study on Student Psychological Health). The International Patient

Decision Aids Standards Collaboration recommends that decision aids such as the MH KT tool in development should be developed with a process that includes the identification of up-to-date scientific evidence [18]. Though we live in global societies where migration and information-sharing take place frequently, social norms – including MH stigma and care – are heavily influenced by culture, era, age and location; named the Cultural Influences on Mental Health Model [19]. As such, the focus was on North American studies with adult populations in this systematic review.

A systematic review was chosen to answer the research question because: 1) they have a highly focused research question that is defined before searching the literature, 2) they compile the best available evidence to answer the research question and synthesize data, 3) they include only certain study designs, 4) they are systematic and comprehensive, 5) they allow for quality assessment of the articles retrieved, and 6) they can make gaps in research apparent [18]. According to the Canadian Institutes for Health Research (CIHR) [18], systematic reviews are a form of knowledge synthesis, which can be used for either knowledge support or decision support. They define knowledge synthesis as "the contextualization and integration of research findings of individual research studies within the larger body of knowledge on the topic. A synthesis must be reproducible and transparent in its methods, using quantitative and/or qualitative methods" [18].

The steps for knowledge synthesis are as follows: 1) state the research objectives clearly, 2) define inclusion criteria, 3) conduct a comprehensive search which identifies potentially relevant articles, 4) apply the inclusion criteria to those articles, 4) aggregate the most complete data set possible by extracting data and appraising the quality of articles, 5) analyze, appraise,

interpret, and synthesize the data, and 6) write a structured, detailed report of the findings [20]. Detailed methods are presented below.

Methods

The methods used in this SR were developed based on the Canadian Institutes of Health Research "Guide to Knowledge Synthesis" [18] in order to provide a clear process and reasoning and to align this SR with others in the field of KT. The search strategy was developed and overseen by an information professional who specializes in KT as is recommended by the CIHR. A stakeholder - a Canadian university student – was integrated into the research team, as is recommended for systematic reviews, especially those in health KT [21].

Inclusion criteria were that the articles: 1) communicated research-based mental health content and not personal opinion or experience (i.e. not self-expression through art) in a 2) picture-based format (picture only or picture+text) and compared it to text, 3) the picture condition used fixed images, not video or interactive images, as this would add confounding variables, 4) the image condition in the article centered pictures, e.g. comparing verbal instructions to visual instructions, but excluding patient information leaflets that only had one small image, 5) the research participants were primarily adult humans, 6) the article was published in either French or English, was 7) peer-reviewed experimental research, excluding systematic reviews, theses, and theoretical articles, and 8) was conducted with a North American sample. Experimental design was defined as a study that uses a strict scientific design in a controlled environment that includes a variable or variables that the researcher can manipulate, along with variables that can be measured and compared [22].

For MH inclusion/exclusion criteria, the conditions assessed by the ESPE along with ones in the Diagnostic and Statistical Manual 5 [23] as it is the MH compendium used in NA. This provides a standardized set of diagnoses, conditions, and psychosocial factors that have been shown to affect the intended population of the KT tool this SR informs. This includes articles that communicated psychological information while excluding ones focused on physical health conditions such as diabetes or dressing wounds. The distinction between mental and physical health is debatable. For example, it is easily imaginable that cancer diagnosis and treatment will affect mental health, or that depression and anxiety affect vitality, digestion, and other physical health dimensions. Nevertheless, for the context of this article, only studies communicating some form of psychosocial/mental health research such as MH diagnoses and conditions, psychiatric medications, addiction and substance (mis)use information, and nutrition were included.

In order to find relevant articles, the steps used are as follows. Keywords were generated by the four members of the research team (the two authors, the information professional, and the stakeholder) so that the search terms covered three concepts: health (including mental health), knowledge transfer, and pictures (TABLE 1). Keywords were combined in order to find articles that mentioned all three concepts. An OR operator was used between words of the same concept, and an AND operator between concepts. Asterisks were used, when possible, to search for similar words with different endings. For example, psych* was used to simultaneously search for the words psychology, psychologist, psychologists, psychological, psychiatric, psychiatry, psychiatrist, psychiatrists, and psychosocial. If asterisks were not permitted by a particular database, each word was searched separately. The word “picture” was excluded as a search term because it produced hundreds of false positives; it was often used in the figurative sense, not in

the literal sense. Pictorial, pictogram and pictograph were used instead. Search fields were Title, Abstract, Keywords and MeSH when available.

This process was first done on PsycInfo, then the same search terms and procedure were used on Ovid (all of Ovid, starting from 1946), CINAHL (Cumulative Index of Nursing and Allied Health Literature), Art Abstracts, Communication Abstracts, and Sociological Abstracts. Databases were searched from January to July 2019. No limits were made as to the date the articles were published as the Picture Superiority Effect (PSE) has been reported since the 1800s [24]. As only peer-reviewed empirical articles with an experimental design were included, grey literature, books or summary reports were not searched. Abstracts, conferences and clinical trial registers would not give enough detailed information on outcomes, analyses, population sampled and why, possible bias, etc. needed for this SR.

The first author was responsible for searching databases and assessing eligibility (single reviewer). Approximately 7950 abstracts and titles were scanned. All abstracts scanned had full-text articles attached to them. If the article was deemed relevant based on the title and abstract, it was downloaded. A total of 244 articles were deemed potentially relevant based on their title and abstract; 231 remained after removing duplicates. A further 214 were excluded based on the inclusion criteria after reading the full text, leaving 17 relevant articles. See PRISMA flowchart.

Interrater reliability for selection fidelity was tested, as is suggested for Cochrane systematic reviews [25]. In SRs, selection fidelity is used to assess the reliability of the inclusion criteria applied to the bank of potentially relevant articles. The assessment is usually done on article abstracts [26]. Selection fidelity for this SR was assessed on 23 articles; 10% of the 231 studies deemed potentially relevant based on their abstract and title after removing duplicates.

The first author and the information professional served as judges for interrater reliability (double reviewer). When inclusion judgements were made based solely on abstract and title, agreement between the two judges was 82.6%, with Cohen's kappa indicating substantial agreement (k= -0.625) [27]. However, due to the complexity of the research question and the design of many studies, it was often necessary to read the entire article to determine relevance. For example, one article deemed irrelevant based on its abstract making little mention of comparing pictures to text was actually pertinent when reading its Methods and Results. When based on reading the full text, interrater reliability was 100%, Cohen's k = 1. Calculations were done using Excel.

The Results section begins with a quality assessment, followed by data extraction organized by a priori outcomes. The outcomes detailed are: the knowledge transferred, the population sampled, study design, emotional elicitation, user perception of the materials, effect on attitudes and cognitions, conversations and information sharing, attention, recall, intention, and adherence to the message.

A narrative synthesis was chosen over meta-analysis due to the heterogeneity of the studies and the risk of bias present in some [18]. Many of the studies used structural equation modeling and reported indirect effects, making it difficult to combine quantitative data or calculate z scores. As such, a cross-study narrative synthesis was chosen. A risk of bias assessment was done at the study level using the Cochrane Collaboration's process and Risk of Bias assessment tables [25]. Not all research limitations fit within the Cochrane Collaboration's Risk of Bias Assessment [25] – such as the use of validated measures and appropriate statistical testing methods, and unequal treatment between conditions – so a narrative description of

quality and bias follows. A novel data extraction form was used to assess, categorize, and summarize the aforementioned results, including the quality and risk of bias assessments. The first author conducted the Quality Assessment and Data Extraction (single reviewer).

Results

Seventeen of the 231 articles deemed potentially relevant based on Abstract screening (7.37%) and were thus included in the analysis and narrative synthesis. TABLE 3 contains a list of articles included, along with summary details of each. Their publication dates ranged from 2011 to 2019

Quality Assessment and Risk of Bias

The majority of articles used validated measures (N=14; 82.4%) to assess variables. Eleven of them used validated measures exclusively and the other three used one or some, but not all. Almost all studies reported indirectly on some form of bias (N=15; 88.2%) with sampling/selection bias due to using a convenience sample being the most common (N=13) and attrition (performance bias) being second. All articles reported limitations – as is standard practice – though reporting of limitations was narrow. The authors of this SR often had to extract limitations based on the research design that were not mentioned in the section intended for that purpose (high risk of reporting bias). Studies tended to share the limitations of non-representative samples (N=15) and of modest results and small effect sizes reported (N=6). Twelve articles had variables measured that were not reported (high risk of reporting bias). All studies randomized their participants but only three mentioned how this was done (unclear risk of selection bias). No article reported on allocation concealment (unclear risk of selection and detection bias) and only

one mentioned blinding of personnel (unclear risk of detection bias). Only one article mentioned blinding of outcome assessment (unclear risk of performance bias).

Three studies [28, 29, 30] used the exact same sample with different variables being analyzed in each. This repeated use of the same dataset is not uncommon, but may possibly introduce bias, such as selection or detection biases, or inflate familywise error from doing multiple tests on the same dataset. Hall et al. [30] and Morgan, Golden et al. [29] both mention bootstrapping – which is a method to counteract multiple comparison inflated error [31] – but Morgan, Southwell et al. [28] do not describe which statistical tests they used at all. Means, standard deviations and significance are reported, but which analyses led to those results are not reported (high risk of reporting and performance biases). There was also no mention of dropout/attrition in Morgan, Southwell et al. [28], which seems unlikely given the design of the study: a 4-week longitudinal RCT with weekly in-person sessions, digital questionnaires multiple times a day, required the collection of used cigarette butts, and required purchasing an 8-day supply of cigarettes at a time, every week (unclear risk of attrition bias; high risk of reporting bias). There was also overlap in the authors of the other studies – probably due to all articles being on the same subject – but what effect that may have on the experiments is unknown as aspects of the researchers' influence were not reported in any study.

Several additional methodological limitations were detected in Strasser et al. [32]: The conditions were unequal both in size of the Health Warning Labels (HWLs) and in the information they communicated; the recall outcomes were assessed using different keywords therefore the judges could not have been blind to condition, though they were reported to be unaware of the study's hypotheses; the keywords used in the text condition are not present in the

Text Warning Label (TWL) shown in the article (text of TWL: “SURGEON GENERAL’S WARNING. Smoking By Pregnant Women May Results In Fetal Injury, Premature Birth and Low Birth Weight”; keywords for text condition: “quitting, smoking, reduces, risk, and health, or the root words (e.g., reduce)”) but the keywords for the picture condition are in the PWL shown; most attention outcomes had no significant differences between conditions but the non-significant ones were not reported in the text, only the results table; there were many exclusion criteria reported that were not included in other studies (e.g. “no current substance abusers”) and with no justification as to why those participants were excluded.

Outcomes

The Knowledge Transferred

All articles (N=17) dealt with tobacco consumption: a Substance Use Disorder in the DSM 5 [23]. Fifteen articles communicated Food and Drug Administration (FDA) anti-smoking messages (88.2%), either in their original form (N=9) or with modifications made to their size [33], tobacco product [34], or some aspect of their message, such as intensity or type of emotion evoked [35, 36, 37, 38]. Three articles used non-FDA information as stimuli: Health Warning Labels (HWLs) from various countries [39]; Federal Trade Commission (FTC) HWLs for the text condition and Health Canada HWLs for the image condition [32]; and text from the United States National Cancer Institute website with pictures being added for the image condition [40]. The image condition always contained pictures along with text except in one article which evaluated the differences between text-alone, image-alone and the two in tandem [41].

Population Sampled

All articles used an adult or adult plus youth sample. Fifteen articles targeted smokers for their population (88.2%), with the remaining two using the general university student population (11.7%). Studies differed in how they defined "smoker": some used carbon monoxide breath tests, some required a self-report of smoking at least 100 cigarettes in their lifetime and at least one in the last 30 days, and others required participants submit their daily cigarette butts. Therefore, it may be difficult to compare or generalize their results as they defined the same sample population differently. Fifteen studies took place exclusively in the United States, with the outliers being conducted in Mexico and one with an international sample. A few studies (N=3; 16.6%) targeted low-income smokers in different regions to see if picture-based health warning labels (PWLs) were more effective for this population and/or compared to the general population of smokers. This is because text-only warnings (TWLs) have been found to require a higher level of literacy skills than picture-based warnings, while smokers tend to have less education than the general population [42, 43].

Study Design

All studies (N=17) were Randomized Control Trials (RCTs). Four experiments used trained interviewers to gather data and/or assess variables (often for recall assessments), but there were no mixed method (quantitative plus qualitative) designs. Eight articles (47.1%) used online RCTs to detect differences between conditions. Two articles had both an online sample and an in-person sample. Five studies were conducted in person, but using a computer for stimulus administration, and often (N=4, 23.5%) for testing of variables as well. This includes eye-tracking studies. Six studies used naturalistic exposure to the stimuli by adding the HWLs to real

cigarette packs. Seven articles (41.2%) used only two conditions – text and text+images, with text being the control condition – while others had more complex designs assessing specific features of the HWLs such as size or emotion. Hammond et al. [39] and Van Dessel et al. [44] had 78 and 49 conditions, respectively – one for each individual HWL – then grouped data based on pictorial vs text. Seven articles employed a longitudinal design (41.2%) with follow-up ranging from 1-week to six. Some (N=4) of these experiments delivered repeated exposure to the randomly assigned HWLs while the other three had an online, one-time exposure with testing done both immediately and at follow-up.

Emotional Elicitation

The emotional reaction of participants to the HWLs was the most common outcome measured, with 11 of the 17 articles (64.7%) having at least one variable measuring emotions. Studies varied in how they assessed emotional reactions and to what other outcomes they related emotions. For example, Hall et al. [45] found that the picture condition increased Psychological Reactance and certain Psychological Reactance factors (including anger) were negatively associated with perceived effectiveness and ability to motivate quitting, but were positively associated with avoidance of cigarette packaging; this reactance was stronger in smokers. Brennan et al. [35] found that the three types of PWLs increased negative emotions which was associated with increased intentions to forgo cigarettes and avoidance of cigarette packaging. Morgan, Southwell et al. [28] found that PWLs were more often described as gross, scary and depressing, while TWLs were described as stupid and pointless. Popova, Owusu, et al. [41] found that the more emotions evoked, the more informative the HWLs was rated. Generally, the findings of these 11 articles are that PWLs increase negative emotional reactions compared with

TWLs, regardless of size of the HWL [33] or nicotine dependence of the participant [36]. This higher emotionality can lead to changes in other outcomes such as risk perceptions, recall and quit intentions (described in detail below), though in what direction and for how long those changes last varies based on several factors such as length of time. High emotions were associated with lower recall immediately after exposure but had the best recall after a delay; the emotions interfered with memory at first, but recall lasted longer the more intensely negative emotions were triggered [37]. As such, it appears that Emotional Elicitation is an important outcome in this type of research, evidenced both by the frequency at which it was measured and by the other behaviours and attitudes it affects.

User Perception of Materials

User Perception was the second most frequently studied outcome, though wide variety exists within it. Variables were grouped under this outcome if they measured the participants' *subjective perceptions* of the condition stimuli/HWLs. Studies measured credibility, ability to motivate quitting, perceived effectiveness of the HWLs, relevance to the participant, motivation to avoid cigarettes, informativeness, and freedom threat perceptions, but many of these outcomes were not reported. In the four articles that asked participants to rate the perceived effectiveness of the HWL at motivating quitting smoking, the PWLs had stronger results than the TWLs, with Van Dessel et al. [44] concluding that this association was present whether the participant was a daily smoker, occasional smoker, or non-smoker. Hammond et al. [39] found that PWLs increased perceived effectiveness by two points on a scale of 10 compared to TWLs, and this effect was stronger among participants with low or moderate education compared to the higher education group. Men, older people, and daily smokers found all warnings less effective than

women, young people, and non-smokers [44]. Hall et al. [45] state that effectiveness was mediated (reduced) by Reactance; affirmed by Lavoie et al. [46] who conclude that PWLs had higher ratings of source domineeringness, freedom threat and negative cognitions, which are parts of Reactance. The picture and text conditions were rated as equally informative [41], interesting, annoying and likable [40] but PWLs were rated as more believable [38] and more credible [36].

Effect on Attitudes and Cognitions

Seven articles (41.2%) studied the effect of HWLs on cognitions and attitudes. Three of them found that pictures increased negative thoughts and feelings about smoking [36, 38, 46] and Morgan, Golden et al. [29] state that PWLs increase cognitive elaboration. However, Skurka et al. [33] found no differences in cognitive elaboration, Klein et al. [34] found no differences in reported cravings, and Van Dessel et al. [44] found that PWLs actually increased positive evaluations of smoking among daily and occasional smokers, which they attribute to Reactance. Popova, L., Thrul et al. [47] found no significant differences between the text and picture conditions on participants' estimates of expected longevity; both reduced expected longevity compared to control.

Conversations and Sharing Information

Three articles reported on conversations and information sharing. Participants in the picture condition had more conversations about smoking (wanting to quit, the information in the HWLs) in person and online [28], which lead to increased quit attempts due to increased

cognitive elaboration [29]. Strasser et al. [40] found that participants exposed to pictures were more likely to report that they would share the information.

Attention

In the three studies that measured attention, PWLs had longer reading/viewing times, reduced time to first viewing, and less time spent viewing non-HWL parts of ads [32, 34, 44]. This increased attention was associated with lower evaluations of smoking [44] and higher recall [34].

Recall

The three articles which studied recall all found the picture condition had higher recall than the text condition [32, 34, 37], but, as mentioned, that recall was mediated by emotions. Increased recall was associated with greater risk perceptions and quit intentions [37].

Intentions

Only three studies measured intentions to quit directly related to the presence of pictures. Shi et al. [38] and Skurka et al. [33] found no differences between the TWLs and FDA PWLs, but Brennan et al. [35] found that pictures+text increased intentions to forgo cigarettes, intentions to avoid packaging, and intentions to quit. Peters et al. [37] found that PWLs increased intentions through the path of increased emotionality but did not report a direct path from condition to intention.

Adherence to the Message: Quit Attempts and Tobacco Reduction

Assessing the effect of pictures on adherence is difficult due to the design of the studies. FDA PWLs (with pictures and text) reduced cigarettes per day compared to text [38], but not in Brennan et al. [35] where the picture only condition increased quitting while the picture+text did not. Romer et al., [36] found no differences in quitting completely, but there was a reduction in cigarettes per day in the picture+text condition. PWLs increased quit attempts but through the paths of increased conversations and increased cognitive elaboration [29]. Similarly, Hall et al. [30] conclude that pictures increase avoidance and forgoing of cigarettes, but through the paths of increased negative emotions and increased reactance.

Discussion

The purpose of this systematic review was to answer the question "do pictures (alone or in conjunction with text) work better than text alone to communicate mental health research to North American adults?". This thorough SR of experimental articles retrieved 17 relevant studies. What decided effectiveness of the conditions (i.e. the variables/outcomes) differed widely, as did the design of the studies so it is impossible to say that PWLs are universally better than TWLs in all contexts, with all populations.

That being said, some general statements can be made based on the reported results from the 17 experiments. PWLs prompted more discussions about and information sharing of the HWLs, elicited more negative emotions, and were rated by participants as more effective at encouraging quitting. PWLs also increased quitting behavior - increase in quit attempts, less cigarettes consumed, higher self-reports of intentions to quit, and increased avoidance - but it is

not known if these effects last longer than six weeks, nor why the effect was found in some studies and not others. This variability is not unusual and supports the claim that no KT strategy will be 100% effective in all cases and therefore must always be evaluated in context [48].

All studies retrieved focused on tobacco interventions, a type of Substance Use Disorder. This result is interesting as pictures are so commonly used in MH with NA adults but have only been experimentally validated using one type of stimuli. This means that we are frequently engaging in a practice that is not necessarily evidence-based.

There is a lot of converging evidence to support the benefits of picture-based MH KT with NA adults – cognitive PSE, Pictorial Superiority Effect in physical health communication, PWLs in tobacco hazard communication, the use of picture-based MH KT with children – but none evaluating if emotions and other psychological constructs such as depression can be accurately represented in images with North American adults. Emotions and psychological states are subjective and harder to represent than the effects of tobacco consumption which are concrete and easy to photograph. Additionally, the images that were rated as most effective in this SR were the ones which depicted external health effects and the impact of smoking on others [39]. As such, the outcomes cannot be generalized to other types of MH KT such as the PicMH-U. Further, how exactly to develop (what imagery to use) and validate (what variables to measure) a picture-based MH KT tool of that type was unaddressed by the included articles. Emojis/emoticons have been used for several decades to communicate psychological states, but no research that met our inclusion criteria used them. This gap in the research remains. Notwithstanding, this SR provides information on the ways communication strategies are compared, what subject is most often researched, what gaps are in the literature, and what

limitations existing studies have, while positioning the development and validation of the PicMH-U as relatively novel.

As reported by the studies in the SR, Canada was the first country to implement cigarette PWLs in 2001 [49]. These PWLs spurred similar initiatives (and subsequent research) on their effects, especially in comparison to the text-based status quo. Despite this, no experimental studies were retrieved that compared PWLs to TWLs using a Canadian sample. One study used an international sample with 5.81% of participants being from Canada [44] but no conclusions can be made on such a small sample. The fact that these warnings were first used in Canada would suggest there would be a body of research to validate it, but the results of this SR suggest the tobacco industry's legal resistance to the implementation of PWLs in USA is what spurred this type of research. In fact, most studies included in the SR mentioned the legal battle in the United States in either the Background, Introduction or Discussion sections of their articles and most used FDA approved or proposed warnings as stimuli. If there was no pushback to PWLs in the United States, would this body of research exist? And, why is it that other picture-based MH communication tools have not been validated with a NA adult population?

Several other SRs have been conducted in the field of picture-based health communication, a section of graphic medicine. Many systematic reviews in the field of graphic health communication were retrieved but none exclusively on mental health communication [See 50, 51, 52 for examples]

Of particular interest to the authors was Houts et al. [53]. It provided a list of search terms, some a priori outcomes, and prompted the authors to look outside of mental health/psychology for relevant studies. They conducted a SR in general health communication

and created evidence-based guidelines for their use. They found 19 studies in the field of health communication, and several hundred in the fields of education, psychology, and marketing responding to the same research question. This gave us the idea that while searching for something very specific, perusing other related fields may provide more comprehensive results. Hence, nursing, sociological, communication, art, and medical databases, as well as psychological ones were searched. Houts et al. [53] used McGuire's Information Processing Theory (IPT [54]) to organise their results. Eight of the 13 output variables in IPT were outcomes of this SR: attention, liking (User Perception in this SR), cognitive elaboration (Effect on Attitudes and Cognitions), memory and retrieval (Recall), decision making (Intention), acting on the decision (Adherence), and proselytizing (Conversations and Information Sharing).

Houts et al.'s [53] results support the existence of a Pictorial Superiority Effect: the superiority of images when used in a practical context. Pictures were shown to be five times better than text alone or audio alone in delayed recall tests and this recall superiority held over time. Pictures also increased whether written information given to patients was read or not (attention). Furthermore, pictures can provide access for low-income, minority, and low education populations. The present SR has comparable results to Houts et al. [53] on certain measures: pictures had increased recall (depending on emotionality), especially over time; pictures demonstrated increased attention; and Hammond et al. [39] found that pictures were rated as more effective by low and medium education sub-samples. Interestingly, despite it being a study that came up repeatedly in the database searches and PubMed stating that it had been cited over 1,100 times as of September 14, 2019, none of the articles in this SR on mental health communication cited it.

Strengths

First, multiple and diverse databases were searched. Touching on different aspects of the research question, work from psychology, medicine, nursing, art, advertising, and communication was included. Sensitivity was prioritized over specificity in the initial search; the search was wide and used general health communication terms, but only included studies that matched the limited inclusion criteria. This took research from disparate fields of study and unified them within KT. As is recommended in health research, a stakeholder from the target population was integrated into the research team. The search strategy was developed and overseen by a team of researchers with varying experience levels and was applied uniformly to all databases. The details of the search and inclusion protocol were reported in detail, contributing to the transparency and replicability of the research process [26]. Assessments of the quality and risk of bias of the articles were done using the Cochrane Collaborations standards at the time. PRISMA reporting guidelines were used and the PRISMA checklist was completed afterwards to ensure all necessary information was included.

Limitations

The SR was comprehensive but conducted within an 8-month time span and articles were limited to those published in English and French. Grey literature, systematic reviews, and theses were excluded in order to concentrate on experimental, peer-reviewed articles. This exclusion criterion may increase selection bias. Due to this factor and focusing on NA samples, some studies were excluded that may have been interesting to assess, including one on the validation of the picture-based version of a textual psychometric test. Finally, the database search and

analysis of the articles was done by only one researcher, though the search strategy, the inclusion criteria, and data analysis were created and reviewed by other members of the research team.

Conclusion

This systematic review sought to collect and synthesize experimental studies comparing the effectiveness of pictures to text for the communication of mental health research to North American adults. The results conclude that PWLs spurred more negative affect and more conversations about HWLs, were rated as more effective at encouraging quitting, increased intentions to quit, and increased actual quit behaviors. Future systematic reviews could assess the use of picture-based mental health knowledge transfer in other regions of the world, possibly comparing the results of the different localized systematic reviews.

Funding and Conflict of Interest Declaration

Neither the authors nor the larger research team are employed by or affiliated with an organization that may have a vested interest (financial or otherwise) in the results or the conclusions of the article. The research detailed in the article is not funded by an outside organization or agency. We do not have any competing financial or other (personal, political, academic, or other) interests in the article. We confirm that any present or past affiliations or other involvement in any organization or entity with an interest in the article that might lead us to have a real or perceived conflict of interest is declared here.

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References

1. Stewart, J. 16 Famous First Photographs in History: From the Oldest Photo Ever to the World's First Instagram Available at https://mymodernmet.com/first-photograph-photography-history/. Accessibility verified May 14, 2021.

2. Centre for Disease Control. Coughs and Sneezes. Available at https://www.cdc.gov/healthywater/hygiene/etiquette/coughing_sneezing.html. Accessibility verified May 14, 2021.

3. Helfand, W.H. Art in the service of public health: The illustrated poster. Caduceus, 1990;6(2), 1–37.

4. O'Malley, C.D. Andreas Vesalius of Brussels, 1514-1564. Berkeley: University of California Press, 1964.

5. Scott Library. Sidney Kimmel Medical College. Available at https://jefferson.libguides.com/c.php?g=736076&p=5352191. Accessibility verified May 14, 2021.

6. Fonds de recherche du Québec – Société et culture. (2011). Plan d'action en matière de transfert des connaissances 2011-2014. Gouvernement du Québec. Available at http://www.frqsc.gouv.qc.ca/documents/11326/449030/plan-action-transfert-connaissances_2011-2014.pdf/9e2bba77-6bc0-435a-92e8-81717ed3a435. Accessibility verified May 14, 2021.

7. Nedd, A. 21 Things Nobody Tells You About Being Depressed. Available at http://www.buzzfeed.com/alexisnedd/things-nobody-tells-you-about-being-depressed#.kneb13GQq. Accessibility verified May 14, 2021.

8. Brosh, A. Hyperbole and a Half: Unfortunate Situations, Flawed Coping Mechanisms, Mayhem, and Other Things That Happened. 2013, Touchstone Books.

9. Wright, S. Here's an Easy way to Understand Anxiety. Available at https://hopeinpain.tumblr.com/post/80643105355/ahavti-heres-an-easy-way-to-understand-anxiety. Accessibility verified May 14, 2021.

10. Purple Clover. Insomnia Jeopardy. Available at https://www.facebook.com/purpleclvr/photos/a.375609882543951.1073741828.369508529820753/612113408893596/?type=1. Accessibility verified May 14, 2021.

11. Paper For Breakfast. Positive Reconceptualization. Available at https://paperforbreakfast.tumblr.com/post/112431079792/abcd-141-positive-reconceptualization. Accessibility verified May 14, 2021.

12. Labelle, B. Assignée garçon. Available at http://assigneegarcon.tumblr.com/. Accessibility verified May 14, 2021.

13. WikiHow. 5 Ways to Explain Autism to People. Available at https://www.wikihow.com/Explain-Autism-to-People. Accessibility verified May 14, 2021.

14. Deneweth, C. Schizophrenia: An Insider's Point of View [Comic Strip]. Available at http://everydayfeminism.com/2015/07/insider-view-schizophrenia/. Accessibility verified May 14, 2021.

15. Scott, L. Doodle Diary of a New Mom: An Illustrated Journey Through One Mommy's First Year. New York: Running Press. 2015.

16. Forney, E. Marbles: Mania, Depression, Michelangelo, and Me: A Graphic Memoir. Penguin. 2012.

17. Innocent, J. Can Mental Health Education Using a Storybook Reduce Mental Illness Stigma in Children? Queen's University. 2013. Available at https://qspace.library.queensu.ca/handle/1974/8101. Accessibility verified May 14, 2021.

18. Grimshaw, J. A Guide to Knowledge Synthesis. Available at http://www.cihr-irsc.gc.ca/e/41382.html. Accessibility verified May 14, 2021.

19. Hwang, W, Myers, H, Abe-Kim, J & Ting, J. A conceptual paradigm for understanding culture's impact on mental health: The cultural influences on mental health (CIMH) model. Clin Psy Review. 2008;28(2): 211-227. https://doi.org/10.1016/j.cpr.2007.05.001.

20. Canadian Institutes of Health Research. Knowledge translation. Canadian Institutes of Health Research. Available at https://cihr-irsc.gc.ca/e/29418.html. Accessibility verified May 14, 2021.

21. Van Eerd, D & Saunders, R. Integrated Knowledge Transfer and Exchange: An Organizational Approach for Stakeholder Engagement and Communications. Scholarly and Research Communication. 2017;8. 10.22230/src.2017v8n1a274.

22. Babbie, E. The Practice of Social Research. 8th ed. Detroit: Wadsworth Publishing Company; 1998.

23. American Psychiatric Association, & American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-5. Washington, DC: American Psychiatric Association; 2013.

24. Kirkpatrick, E. An experimental study of memory. Psychological Review, 1894;1(6), 602.

25. Cochrane Collaboration. Chapter 8: Assessing risk of bias in included studies. Editors: Julian PT Higgins, Douglas G Altman and Jonathan AC Sterne on behalf of the Cochrane Statistical Methods Group and the Cochrane Bias Methods Group. Available at: https://handbook-5-1.cochrane.org/index.htm#chapter_8/8_assessing_risk_of_bias_in_included_studies.htm. Accessibility verified May 14, 2021.

26. Belur J, Tompson L, Thornton A, Simon M. Interrater Reliability in Systematic Review Methodology: Exploring Variation in Coder Decision-Making. Sociological Methods & Research. 2021;50(2):837-865. doi:10.1177/0049124118799372.

27. McHugh ML. Interrater reliability: the kappa statistic. *Biochem Med (Zagreb)*. 2012;22(3):276-282.

28. Morgan JC, Southwell BG, Noar SM, et al. Frequency and Content of Conversations About Pictorial Warnings on Cigarette Packs. Nicotine & Tobacco Research : Official Journal of the Society for Research on Nicotine and Tobacco. 2018 Jun;20(7):882-887. DOI: 10.1093/ntr/ntx180.

29. Morgan, JC, Golden, SD, Noar, SM et al. Conversations about pictorial cigarette pack warnings: Theoretical mechanisms of influence. Social science & medicine (1982), 2018;218, 45–51. https://doi.org/10.1016/j.socscimed.2018.09.063.

30. Hall, G, Mendel, JR, Noar, SM, & Brewer, NT. Why smokers avoid cigarette pack risk messages: Two randomized clinical trials in the United States. Social science & medicine 2018;213, 165–172. https://doi.org/10.1016/j.socscimed.2018.07.049.

31. Westfall, PH On Using the Bootstrap for Multiple Comparisons. Journal of Biopharmaceutical Statistics. Nov/Dec2011, Vol. 21 Issue 6, p1187-1205. 19p.

32. Strasser, A, Tang, K, Romer, D, Jepson, C & Cappella, J. Graphic Warning Labels in Cigarette Advertisements Recall and Viewing Patterns. American journal of preventive medicine. 2012;43. 41-7. doi: 10.1016/j.amepre.2012.02.026.

33. Skurka, C, Kalaji, M, Dorf, MC, et al. Independent or synergistic? Effects of varying size and using pictorial images in tobacco health warning labels. Drug and alcohol dependence, 2019;198, 87–94. https://doi.org/10.1016/j.drugalcdep.2019.01.034.

34. Klein, EG, Quisenberry, AJ, Shoben, AB, Cooper, S, Ferketich, AK, Berman, M., Peters, E, & Wewers, ME. Health warning labels for smokeless tobacco: The impact of graphic images on attention, recall, and craving. Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco, 2017;19(10), 1172–1177. https://doi.org/10.1093/ntr/ntx021.

35. Brennan, E., Maloney, EK., Ophir, Y., & Cappella, JN. Potential effectiveness of pictorial warning labels that feature the images and personal details of real people. Nicotine & Tobacco Research, 2017;19(10), 1138–1148.

36. Romer, D, Ferguson, SG, Strasser, AA, et al. Effects of Pictorial Warning Labels for Cigarettes and Quit-Efficacy on Emotional Responses, Smoking Satisfaction, and Cigarette Consumption. Annals of Behav Med 2018;52(1), 53–64. https://doi.org/10.1007/s12160-017-9916-y.

37. Peters, E, Shoots-Reinhard, B, Evans, AT, et al. Pictorial Warning Labels and Memory for Cigarette Health-risk Information Over Time. Annals of behavioral medicine : a publication of the Society of Behavioral Medicine, 2019;53(4), 358–371. https://doi.org/10.1093/abm/kay050.

38. Shi Z, Wang AL, Emery LF, Sheerin KM, Romer D. The Importance of Relevant Emotional Arousal in the Efficacy of Pictorial Health Warnings for Cigarettes. *Nicotine Tob Res*. 2017;19(6):750-755. doi:10.1093/ntr/ntw322.

39. Hammond, D., Thrasher, J., Reid, JL., Driezen, P., Boudreau, C., & Santillán, EA. Perceived effectiveness of pictorial health warnings among Mexican youth and adults: a population-level intervention with potential to reduce tobacco-related inequities. Cancer causes & control : CCC, 2012;23 Suppl 1(0 1), 57–67. https://doi.org/10.1007/s10552-012-9902-4.

40. Strasser, AA, Orom, H, Tang, KZ, Dumont, RL, Cappella, JN, & Kozlowski, LT. Graphic-enhanced information improves perceived risks of cigar smoking. Addictive behaviors, 2011;36(8), 865–869. https://doi.org/10.1016/j.addbeh.2011.03.005.

41. Popova L, Owusu D, Jenson D, Neilands TB. Factual text and emotional pictures: overcoming a false dichotomy of cigarette warning labels [published online ahead of print, 2017 Apr 20]. *Tob Control*. 2017;tobaccocontrol-2016-053563. doi:10.1136/tobaccocontrol-2016-053563.

42. Malouff J, Gabrilowitz D, Schutte N. Readibility of health warnings on alcohol and tobacco products. Am J Public Health 1992;82(3):464.

43. CREATEC Market Studies. Effectiveness of health warning messages on cigarette packages in informing less-literate smokers, final report. Prepared for Communication Canada. Available at http://tobacco.cleartheair.org.hk/wp-content/uploads/2017/03/Canada-2003-Effectiveness-of-

Health-Warning-Messages-on-Cigarette-Packages-in-Informing-Less-literate-Smokers-Government-Report.pdf. Accessibility verified May 14, 2021.

44. Van Dessel, P, Smith, CT, & De Houwer, J. Graphic cigarette pack warnings do not produce more negative implicit evaluations of smoking compared to text-only warnings. PloS one, 2018;13(3), e0194627. https://doi.org/10.1371/journal.pone.0194627.

45. Hall, MG., Sheeran, P., Noar, SM., Ribisl, KM., Bach, LE., & Brewer, NT. Reactance to Health Warnings Scale: Development and Validation. Annals of behavioral medicine: a publication of the Society of Behavioral Medicine. 2016;50(5), 736–750. https://doi.org/10.1007/s12160-016-9799-3.

46. LaVoie, NR., Quick, BL., Riles, JM., & Lambert, NJ. Are Graphic Cigarette Warning Labels an Effective Message Strategy? A Test of Psychological Reactance Theory and Source Appraisal. Communication Research, 2017;44(3), 416–436. https://doi.org/10.1177/0093650215609669.

47. Popova, L, Thrul, J, & Glantz, SA. Effects of Large Cigarette Warning Labels on Smokers' Expected Longevity. American journal of health behavior, 2018;42(2), 85–92. https://doi.org/10.5993/AJHB.42.2.8.

48. Anonymous – Redacted for Double-Blind Review. 2015.

49. Tobacco Labelling Resource Centre. Available at https://tobaccolabels.ca/countries/canada. Accessibility verified May 14, 2021.

50. Lühnen, J., Steckelberg, A., & Buhse, S. Pictures in health information and their pitfalls: Focus group study and systematic review. Zeitschrift fur Evidenz, Fortbildung und Qualitat im Gesundheitswesen, 2018;137-138, 77–89. https://doi.org/10.1016/j.zefq.2018.08.002.

51. Lor M, Koleck TA, Bakken S. Information visualizations of symptom information for patients and providers: a systematic review. *J Am Med Inform Assoc*. 2019;26(2):162-171. doi:10.1093/jamia/ocy152.

52. Trevena, LJ, Davey, H M, Barratt, A, Butow, P, & Caldwell, PA. Systematic review on communicating with patients about evidence. Journal of evaluation in clinical practice, 2006;12(1), 13–23. https://doi.org/10.1111/j.1365-2753.2005.00596.x

53. Houts PS, Doak CC, Doak LG, Loscalzo MJ. The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence [published correction appears in Patient Educ Couns. 2006 Dec;64(1-3):393-4]. *Patient Educ Couns*. 2006;61(2):173-190. doi:10.1016/j.pec.2005.05.004.

54. McGuire, MJ. Constructing social psychology: creative and critical processes. Cambridge University Press, 1999.

Appendices

TABLE 1. Database Search Terms

Health Terms	KT Terms	Picture Terms
Prescription	Education	Emoji
Medic* (medical, medicinal, medication)	Instruction*	Picto* (Pictorial, pictograph, pictogram)
Discharge	Information	Emoticon
Patient	Communication	Cartoon*
Emotional	Message	Logo
Care	Decision aid	Graphic
Psych* (psychology, psychologists, psychological, psychiatric, psychiatry, psychosocial)	Knowledge tr* (knowledge transfer, knowledge translation)	Visual Art
Wellness	Knowledge mobili*	Comic
Wellbeing	Content	
Health	Material	

When searching the databases, each row was combined with OR and each column was combined with AND to find articles that pertained to picture-based knowledge transfer in health.

Figure 1. PRISMA Flowchart of Results

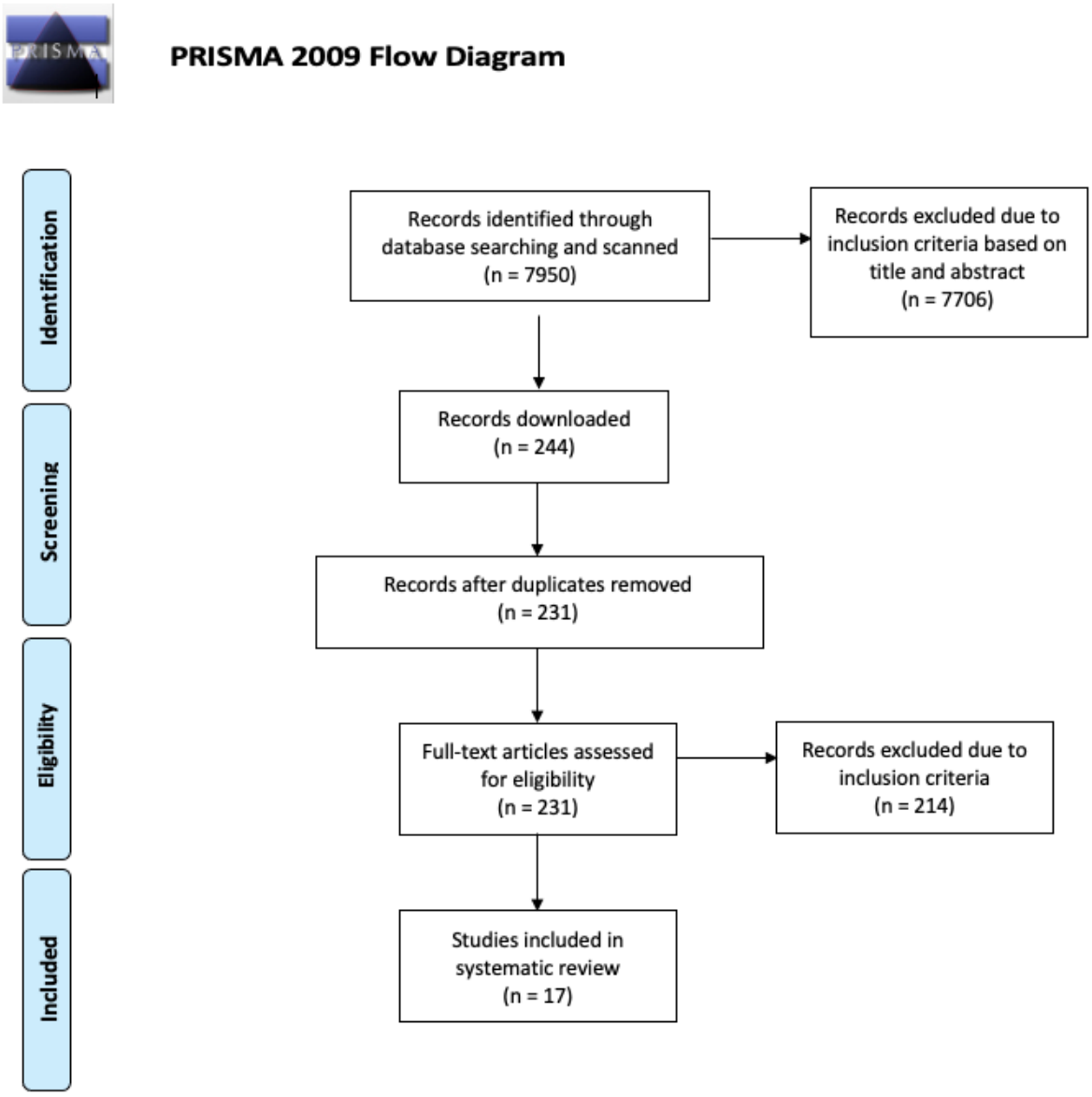

TABLE 2. Data Extraction Form

Article title and Authors:

Date published: conducted:

Source:

Purpose:

Keywords:

Study Design:

Population:

Knowledge transferred:

Hypothesis or Hypotheses:

Variables measured and how:

Analyses:

Attention

Emotional Elicitation:

Intention:

Adherence to the Message/Behaviour change (Quit Attempts, Cigarette Reduction, Soliciting Information):

Recall:

Conversations and Information Sharing:

User Perception of Materials:

Other interesting information from article:

Conclusions (from authors):

Limitations mentioned:

Mention of FDA legal battle?

Types of possible bias: Selection, Detection, Performance, Attrition, Reporting, Other

- random sequence generation:
- allocation concealment:
- blinding of participants and personnel:
- blinding of outcome assessment:
- incomplete outcome data:
- selective reporting:

- other bias and limitations not reported:

TABLE 3. Summary of Included Articles

Reference	Objective(s)	Sample Population	Design	Brief Excerpt of Results
1. Hall, Sheeran, Noar, Ribisl, Bach & Brewer, 2016	*To see if reactance to health warnings had impact on behavioural measures; validate tool*	US adult smokers; 1413 (online) and 46 (in person)	2 cnds. Online sample: view 1 of 5 warnings once. In-person sample : 1 warning for 5 weeks on their regular pack.	Smokers rated PWLs as being able to motivate quitting more than TWLs. 5 reactance scale factors weakened the warnings' impact (anger, exaggeration, government, manipulation, and personal attack).
2. Shi, Wang, Emery, Sheerin & Romer, 2017	*To see if effect of PWLs were due to emotionally evocative imagery or if the images need to be congruent to have effect.*	US adult smokers; 514, 1-week follow-up: N = 320	3 cnds: FDA PWLs, TWLs and irrelevant image PWLs; with 8 stims per cnd and 1-week re-test. Online RCT.	Compared to the irrelevant PWLs and TWLs, FDA PWLs were seen as more believable, better able to motivate quitting, produced lower CPD, worse feelings about smoking, and more memory for warning information; controlling for age and baseline CPD.

3. Strasser, Tang, Romer, Jepson & Cappella, 2012	*To examine differences in recall and viewing patterns of HWLs and the association between viewing patterns and recall.*	US current adult smokers: 200	2 cnds. In person, eye-tracking study.	- Recall was better for PWLs than TWLs. - Time to first viewing of the GWL and dwell time duration (i.e., time spent looking) on the graphic image were significantly associated with correct recall.
4. Klein, Quisenberry, Shoben, Cooper, Ferketich, Berman, Peters, Wewers, 2017	*To evaluate the attention paid to PWLs compared to TWLS embedded within smokeless tobacco advertisements*	US past-month, male smokeless tobacco users: 142	2 cnds. In person: viewed 7 on-screen ads with the 2 cnds embedded	PWLs: 1) significantly greater proportion of their ad viewing time on HWL itself; 2) increased recall of warning message, 3) Self-reported craving after advertisement exposure was lower but not significant
5. Brennan, Maloney, Ophir & Cappella, 2017	*How do testimonial PWLs compare to non-testimonial PWLs or TWLs?*	US adult smokers; 924	4 cnds: TWL, testimonial TWL, PWL, testimonial PWL; view 5	All PWLs elicited stronger emotional responses, intentions to quit and forgo cigs, and avoid HWLs. Only testimonial PWL generated a greater amount of

			HWLs with 5-week follow up. Online RCT.	quitting activity in the weeks following exposure.
6. Strasser, Orom, Tang, Dumont, Cappella & Kozlowski, 2011	*Do graphics enhance existing text-based cigar hazards information?*	US current smokers, 102	2 cnds. In person: HWLs hidden within other stims, presented on computer monitor.	PWLs increase understanding of health risks and likeliness to share information.
7. Peters, Shoots-Reinhard, Evans, Shoben, Klein, Tompkins, Romer & Tusler, 2018	*To investigate memory-consolidation of high- versus low-emotion warnings test a mediational model of HWL effects through memory on risk perceptions and quit intentions.*	3 representative samples of smokers (U.S. adults, Appalachian adults, and U.S. teen smokers and vulnerable to	3 cnds: FDA text, text+high emo image, text+low emo image; viewed the same set of nine warnings four times over 2 weeks+6-week follow-	- Recall of TWLs was low across the samples. - Low-emotion PWLs: highest immediate recall but most decline over time, with lowest recall after 6 weeks. - 6-week recall was similar for High-emotion PWLs and TWLs. - Greater recall was associated with higher risk perceptions and greater

		smoke, N= 1932	up. Online RCT	quit intentions and mediated part of warning-label effects. -High-emotion PWLs had additional non–memory-related effects on risk perceptions and quit intentions compared to TWLs.
8. Van Dessel, Smith & De Houwe, 2018	*To see whether PWLs influence implicit evaluations of smoking.*	Worldwide english-speaking volunteers; 5833	2 cnds; each participant saw 1 warning, once. Online RCT	Viewing a PWL did not produce more negative implicit evaluations of smoking for daily smokers, occasional smokers, or non-smokers; effects were in the direction of evaluations of smoking being more positive after certain participants (i.e., daily and occasional smokers) viewed a PWL.
9. Morgan, Southwell, Noar, Ribisl, Golden & Brewer, 2018	*To better understand social interactions elicited by pictorial cig*	US, 2 samples (North Carolina and California) adult current	2 cnds. In person: Added to their cig packs, weekly follow-ups with modified	PWLs: 1) more conversations and info sharing than TWLs; 2) more likely to discuss the health effects of smoking, whether the warnings would make them want to quit and whether the warnings would make

	pack warnings.	smokers, 2149	packs. Computer administration of tests.	others want to quit; 3) more likely to describe warnings as scary, gross, or depressing and gloomy during conversations.
10. Popova, Owusu, Jenson & Neilands, 2018a	*To test the differences in perceived informativeness and emotion between TWLs and PWLs*	US adults (smokers, non-smokers, trying to quit), 1838	3 cnds: text only, image only, and image+ text; saw 3 warnings once each (per cnd). Online RCT.	- There were no significant differences in perceived informativeness between PWLs and TWLs. - TWLs evoked slightly less emotion than pictorial labels and perceived informativeness and emotion were strongly correlated.
11. Skurka, Kalaji, Dorf, Kemp, Safi, Byrne, Mathios, Avery & Niederdeppe, 2019	*To test whether less restrictive HWL – smaller HWLs and/ or text-only HWLs—may be sufficient to promote outcomes.*	US low-income smokers, 1072 (from 2 samples, 1 online, 1 in-person)	5 cnds: no-HWL control, text+image at 50%, text+image at 30%, text only at 30%, text only at 50%. 9-image	- PWLs increased negative affect but not risk belief acceptance, cognitive elaboration about smoking harms, or quit intentions compared to TWLs. - No evidence for interaction effects between the pictorial and size manipulations.

			slideshow with 10 s exposure.	
12. Romer, Ferguson, Strasser, Evans, Tompkins, Macisco, Fardal, Tusler & Peters, 2017	*To examine the emotional and cognitive effects of warning information on smoking satisfaction and self-efficacy for quitting.*	US adult smokers, 2 sites, 244	3cnds: TWL, FDA PWL, PWL with extra text. In person: stims on real packs. Trial 1 (4 weeks): in person. Follow-up by phone interview.	- Stronger emo responses to PWLs than TWLs predicted reduced satisfaction with smoking during the trial and lower cig consumption at follow-up among those continuing to smoke. -Those with moderate efficacy reported the greatest reduction in consumption at follow-up.
13. Hammond, Thrasher, Reid, Driezen,	*To fill research gap on effective types of message*	Mexico City, 2 samples: N= 544 adult	5cnds: text-only, graphic PWL,	- PWLs were rated as more effective than TWLs.

Boudreau & Santillán, 2012	*content and socio-demographic effects.*	smokers and N= 528 youth.	testimonial PWL, lived experience PWL, and symbolic PWL. In-person interview data collection, computer viewing.	- Graphic PWLs of disease were significantly more effective than symbolic PWLs or experiences of human suffering. - Adding testimonial information to HWLs increased perceived effectiveness. - PWLs rated as more effective by low and mid-education participants.

14. Morgan, Golden, Noar, Ribisl, Southwell, Jeong, Hall, Brewer, 2018	*To assess whether and how smokers' conversations explain the effect of PWLs on quit attempts.*	US, 2 samples (North Carolina and California) adult current smokers, 2149	2 cnds. In-person: had PWLs or TWLs added to their cig packs for four weeks. Computer administration of tests.	- PWLs increased conversations, which led to greater cognitive elaboration, which led to greater quit attempts. - Social norms did not explain the influence of conversations on quit attempts.

15. LaVoie, Quick, Riles & Lambert, 2017	*To examine psychological reactance to HWLs, using validated measures*	US, Midwest, undergraduate students at 1 site; N= 435	2 cnds. In person: on real cig packs.	PWLs resulted in higher freedom threat perceptions, negative cognitions, and source domineeringness; associated with reactance indirectly.
16. Hall, Mendel, Noar, Brewer, 2018	*To assess whether reactance or fear and other negative affect explains message avoidance and whether avoidance was associated with more forgoing or butting out of cigarettes.*	US, 2 samples (North Carolina and California) adult current smokers; N= 2149	2 cnds. In person with computer testing: Stims added to cig packs; weekly follow-ups	- PWLs: greater message avoidance; elicited greater negative affect, which in turn was associated with greater avoidance. The effect of reactance differed across trials. - Avoidance was associated with more forgoing or butting out of cigarettes.

17. Popova, Thrul, and Glantz, 2018b	*Does the type of warning label have an effect on participants' assessments of lifespan?*	US adult smokers (daily and non-daily); N= 1200	3 cnds. TWL, PWL and control, 4 labels per condition. Online RCT	-Both TWL and PWLs reduced participants' expected longevity compared to control. - Differences between text and pictorial conditions were not statistically significant.

Abbreviations for Table 3:

- Cig: cigarette
- Cnd: condition
- CPD: cigarettes per day
- Emo: emotion
- HWL: Heath Warning Label
- PWL: Picture Warning Label aka Graphic Warning Label, image condition
- Stims: stimuli
- TWL: Text Warning Label aka Text-only Warning Label, text condition

Chapter 4: Knowledge Tools: Article 2

Is a Picture Worth a Thousand Words? The Development and Validation by Randomized Controlled Trial of a Picture-Based Mental Health Knowledge Transfer Tool for University Students

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Abstract

Pictures have been used in a variety of formal and informal communication contexts, including for knowledge transfer/mobilization/translation. A picture-based mental health tool was developed and validated. A text-based tool was also developed and used as a control condition. A sample of students from a Canadian university (N= 213) were tested on measures of user satisfaction, intention to use resources, actual use of resources, short-term prompted recall, short-term free recall, and long-term prompted recall via an online longitudinal randomized controlled trial (RCT) with a 4-to-6-week delay between Time 1 and Time 2. There were no significant differences between conditions on user satisfaction, intention to use resources, and actual use of resources. The picture condition had significantly superior results than text on 20 of the 22 recall items. Despite testing being done in text format, the picture condition increased recall both immediately and at follow-up. The PicMH-U can be implemented as is or modified and then validated, with the same or different target audiences and content.

** N.B: The terms image (most accurate term) and picture (most often used in the literature) will be used interchangeably throughout this article.

Keywords: health communication, knowledge transfer, knowledge mobilization, pictorial superiority, mental health, images, emojis

General Audience Summary

Pictures and images (for example, drawings, infographics, billboards) are widely used in a range of situations. The use of pictures for communicating scientific research is a growing practice, including in the fields of knowledge transfer and health communication. However, no single image will be effective in all contexts or with all types of people. This means that pictures used for communication should be tested with its target population before it is used in the real world. This population – or group of people – is often referred to as stakeholders and is an essential part of evaluating the effects of a communication strategy or tool. This research describes the development and evaluation of two such communication tools with Canadian university students as stakeholders. One of the tools is picture-based (the PicMH-U) and the other is text-based (TextMH-U). Both tools communicate information about university student mental health, along with a list of public mental health resources they can access. Measures of User Satisfaction, Intention to Use mental health resources, Actual Use of resources, and three types of memory were used to evaluate the tools. Each tool was tested twice with different students in order to see changes over time. Both tools garnered good scores on User Satisfaction, Intention to Use and Actual Use of resources. The PicMH-U had significantly better results on the three types of memory. The measures used and the results are explained clearly, both in statistical terms and in plain language for ease of understanding. The article ends with ways to improve the tools and their evaluation.

Introduction

Knowledge Transfer (KT) is a vast and ever-evolving field, defined as "all the actions dedicated to recognizing and making known the activities and results of research in social and human sciences, in Arts, and in Letters, in order for them to be used by practice settings, decision-makers, and the public at large" (Translated from Fonds de recherche du Québec – Société et culture, FRQSC, 2011). In this definition the word "knowledge" refers to research, but in others, it can also comprise evidence-based skills, tools, and ideas. "Transfer" describes the process by which the knowledge is applied to a practical setting or is used by stakeholders, such as when research is used by decision makers, practitioners and consumers (Graham et al., 2006). The processes of Knowledge Transfer can go by many names – knowledge mobilization, knowledge translation, knowledge exchange, implementation science, etc. – therefore the term knowledge transfer and the abbreviation KT will be used throughout this paper to reduce confusion.

KT encourages the development and validation of diverse types of knowledge to inform research and practice; it can serve as a connection between the two, with one informing the other or them multidirectionally informing each other (Canas et al., 2019). Unfortunately, studies show that research is under-utilized in practice (Nutley& Awad, 2011).

The tools used for KT vary greatly, with visual tools being widespread (Bennett & Jessani, 2011). Television, newspapers, print ads, infographics, billboards, PowerPoint presentations, conferences, webinars, workshops, social media, comics and cartoons, theatre, policy briefs, poster presentations, websites, video, and flyers are all visual Knowledge Tools that have been used and evaluated in the health domain (Langer et al., 2016; Bennett & Jessani,

2011; Fraser & al Sayah, 2011; Buljan et al., 2017; Hébert, 2018). No single tool or implementation strategy is effective in all contexts or with all populations, thus making situational evaluations of KT processes necessary (Siron et al., 2015).

Popular usage, experimental research, and systematic reviews yield strong support for picture-based methods of communicating information. Illustrated posters and advertisements were used during World War I and following conflicts to alert people to certain infectious diseases and to discourage behaviour that could increase their spread (Helfand, 1990; Centre for Disease Control, 2016). Currently, pictures are ubiquitous in demonstrating health behaviours such as proper coughing and sneezing techniques (The Lung Association of Canada, 2009; Alberta Health Services, 2019). This field is now termed Graphic Medicine (Scott Library, 2018).

Named the Picture Superiority Effect in cognitive research and the Pictorial Superiority Effect in applied settings, pictures have been shown to increase recall in a variety of contexts (e.g. Kirkpatrick, 1894, Anderson, 2009; Ally & Budson, 2007; Nelson, et al., 1976; Barros et al., 2014; Lor, 2018). Houts et al. (2006) conducted a systematic review of the literature on the role of pictures in health communication and created evidence-based guidelines for their use. They found pictures were shown to be five times better than text alone or audio alone in delayed recall tests and this recall superiority holds over long periods of time. There is greater brain activation when participants were presented with pictures as compared to text. Pictures also increased whether written information given to patients was read or not. They can provide access for low income, cultural minority, and low education populations, while reducing the complexity of text information only benefited people with strong reading skills. Pictures plus audio had

similar results to pictures plus text, suggesting that the differences found are due to the pictures themselves and not the activation of visual processing alone.

Houts et al. (2006) found that color pictures as compared to black and white, and line and cartoon drawings as compared to shaded drawings or photographs had the best results in general. Drawings increased comprehension, compared to photographs. Participants preferred culturally sensitive, realistic materials and representations of people similar to themselves. The authors suggest that text should be used as a supplement to pictures, to caption and explain the pictures and should be relatively close to the images. Prompts such as circles and arrows can be used to draw the reader's attention to specific information when using complex pictures. Adherence is influenced by the emotions elicited by the stimuli; negative emotions may decrease the behavior. Finally, the authors recommend that before a picture-based tool is used, the pictures should be field tested.

According to Langer et al.'s systematic reviews of reviews (2016), KT communication activities that ease access to knowledge by providing opportunity and motivation for research uptake have reliable evidence of effectiveness. Their findings prioritize simple strategies that are educational and persuasive (as opposed to passive and/or conceptually unclear interventions). Their second review, a scoping review, supports the use of social science to improve decision-making KT strategies, including: using internet and mobile technologies, creating appealing and accessible tools and resources, tailoring the strategy to the target population, prompting or creating behavioural norms around evidence-use, and using theory of change models.

A systematic review by Birchwood and Dagenais (submitted) indicates that experimental studies of this type are limited. Of the 7950 articles retrieved, 17 responded to the research question of experimental studies comparing pictures to text for the KT of mental health (MH)

information to North American adults. All 17 of those articles focused on tobacco interventions, considered a Substance Use Disorder in the Diagnostic and Statistics Manual (DSM-5; APA, 2013). The systematic review concluded that picture-based tools prompted more discussions, elicited more negative emotions, were rated by participants as more effective at encouraging quitting, increased quitting behavior, and increased avoidance of tobacco products. Unfortunately, the results cannot necessarily be generalized to other forms of MH KT due to being limited to tobacco consumption. The factors that discourage someone from picking up cigarettes are likely very different from the ones that encourage someone to pick up a phone when in crisis. In the first situation, a resistance to the urge/addiction needs to be generated whereas in the latter the urge itself needs to be generated. Therefore, the current research seeks to expand the experimental research on image-based MH KT to North American adults by creating tools that communicate psychological content, while also putting forth a validation process for such tools.

PicMH-U: Development

The KT tools developed for this research were summaries of the Enquête sur la santé psychologique étudiante (ESPE) conducted at a Canadian university in 2016. This translates to "Survey on Student Mental Health" in English. The issues targeted by the ESPE include substance (mis)use, financial difficulties, psychological distress, isolation, lack of support at school, unhealthy eating, suicide ideation and attempts, sleep difficulties, depressive symptoms, burnout, and excessive workload. The ESPE was summarized into text excerpts to create the TextMH-U. With a graphic designer, the research team transformed the TextMH-U into the PicMH-U: a series of images representing SMS messages between two students, accompanied by statistics from the ESPE. Two messages of hope/support were included to counter the effect of

negative emotional valence decreasing behaviour (Houts et al., 2006). A list of crisis resources accessible in the Greater Montreal Area were included in both tools (see Annex 1). Findings from Houts et al. (2006) and Langer et al. (2016) were used to create the PicMH and evaluate both tools. Two formal consultations with stakeholders were completed in the development phase, one with a non-random sample of 17 students and the second with a non-random sample of seven. Comments from participants were used to make modifications to the tools. The KT tools were developed from 2016 to 2018, with the online RCT described in this article done in 2019 at approximately the same time of the year as the ESPE, the beginning of the winter semester.

Canadian university students were used as the stakeholder sample for these tools due to the ESPE being conducted recently, thus providing the Knowledge and an implicit need to communicate it to the audience it concerns. Picture-based health communication has been shown to increase comprehension among low-income and low-education populations (Houts et al, 2006; Hammond et al. 2012), so there was interest in how image-based tools fared among this higher education group.

PicMH-U: Validation

The validation process was a longitudinal RCT comparing the PicMH-U to the TextMH-U with a sample of Canadian university students. Once the PicMH-U and TextMH-U were finalized, two identical versions of an online questionnaire were created, with the only difference being the condition stimuli. Testing was done online through Google Forms, a free program that is accessible through computer and mobile phone. All information, whether written or imaged, was presented in French as the university sampled is francophone. English translations of the experimental content are provided in this article.

Participants were randomly assigned to one of two conditions using a third-party computer program in which the researchers had no influence (http://mathstatic.co.nz/auto). The link for each questionnaire (text condition and image condition) was entered into the random-assignment program, a unified link was created, and that link was turned into a shortened URL using Google URL Shortener. The random assignment function - along with other aspects of the questionnaire - were tested by seven beta-testers who resembled the target population (francophone or bilingual, university students, in Québec, 18-35 years old) on both cellular phones and computer screens. Beta-testers were asked (in French): 1. The amount of time it took to complete the study, 2. Any moments in which they lost interest or concentration, and 3. Any mistakes or redundancies they saw. Comments were used to make the same modifications to both questionnaires. Both questionnaires were then read and compared by three researchers at separate times and places. It took testers 10-15 minutes to complete the questionnaire and make comments, irrespective of condition.

This study has a Causality-Comparative question: Which of the conditions yield better results in terms of user satisfaction, short-term recall, long-term recall, prompted recall, free recall, subjective and objective intention to access resources, and self-reported use of resources as compared to the other KT tool? There are no hypotheses for this experiment as it is exploratory; research of this type is an emergent field (Birchwood & Dagenais, submitted)).

Methods

Sample and Recruitment

Participants were students at a Canadian university who volunteered their time. The only inclusion criterion is that they currently studied at one of the schools or campuses of that

university. Participants were recruited through posters displayed in every pavilion of the main campus and through emails to the student affairs staff of individual departments. In order to achieve a Power of .80, with alpha = 0.05, and assuming a medium effect size on ANOVA and t tests with two independent groups, there needs to be ≥ 64 participants per condition (Cohen, 1992), thus a minimum of 128 participants were needed for this experiment with two conditions. As the PicMH-U and TextMH-U are practical KT tools, a medium effect size was chosen as to represent a meaningful difference between the conditions. Being able to detect a small effect size may be statistically interesting, but would mean little in pragmatic terms in the field of KT.

Protocol

This online RCT was longitudinal with slightly delayed evaluation (Time 1) and a four-to-six-week delay (Time 2). An ethics certificate was obtained from Université de Montréal's Comité d'éthique de la recherche en arts et en sciences prior to testing (Certificate number : CERAS-2017-18-050-D). Participants were not informed there were two conditions, nor were they made aware which condition they were in as they were all given the same URL. They were presented with each material listed below on a separate page, in order, with no option of returning to the previous page. Questionnaires were administered between stimulus exposure and recall tests in order to align this experiment with the delayed recall experiments described in Houts et al. (2006). At the end of Time 1, they were thanked for their participation and invited to provide their email if they either wanted to be contacted for Time 2 or wanted the research results.

Four to six weeks later, the ones who indicated their interest in participating in Time 2 were contacted through email with a link to Time 2. All participants completed the same questionnaire for Time 2, as they were already randomly assigned to different conditions in Time

1. They were asked to provide their email so their responses from Time 1 and Time 2 could be linked.

Materials and Analyses

Materials are presented below in the order they were administered.

Time 1

Consent Form. It included a description of the experiment, what the data will be used for, how confidentiality will be protected, their freedom to participate or not, and contact information for the two primary researchers.

Previous Familiarity. One multiple choice question was posed to assess participants' familiarity with the knowledge transferred in this experiment: "Have you heard about the Study or the Report on Student Mental Health done by FAÉCUM in 2015-2016?". This variable was included to assess the reach the original ESPE and promotion campaign had, while serving as a possible covariable. Previous familiarity is a categorical variable with seven response options, analyzed through Chi Square.

Condition stimuli. The two conditions consist of the same information, presented in different formats (PicMH-U and TextMH-U). The knowledge being transferred is some of the clinical conditions the ESPE found to affect students at this Canadian university, along with a list of psychosocial resources participants can access. External resources were included due to stakeholders expressing a lack of suitable resources at the university as well as countering the negative affect of the KT tools with a supportive message.

User Satisfaction Questionnaire. This questionnaire was adapted from a study which compared a plain-text summary to a Cochrane-style infographic (Buljan et al., 2017). It was translated into French and references to the information they mobilized were changed or eliminated. For example, the question "I think I could explain the benefits of the ECV procedure to someone using the information from this text only." was changed to "I think I could explain the factors that affect student mental health with only the information presented". The scale for responses was adjusted to have the same range and anchor points as the Inventaire d'Attitudes Envers le Recours aux Services de Santé Mentale (IARSSM): a 5-point Likert scale, with "Do not agree at all" earning a 0 and "Completely agree" earning a 4, with half the items being reverse coded. The brief questionnaire assesses personal satisfaction and subjective comprehension of the information in the stimuli. The same questionnaire was used for both conditions. User Satisfaction is a discrete continuous variable with 10 items. It was analyzed using Independent t-tests.

Sociodemographic Questionnaire. A sociodemographic questionnaire collected information on characteristics of the sample and possible mediators while acting as a distraction between administration of the stimuli and testing. Responses were categorical and were analyzed with Chi Square except Age, which was analyzed using Independent t-tests as it is a continuous variable.

Inventaire d'Attitudes Envers le Recours aux Services de Santé Mentale (IARSSM). A modified version of the IARSSM (L'heureux, 2015) was used. The IARSSM utilises the Theory of Planned Behaviour (TPB) to assess if the right conditions are in place for participants to access mental health resources. TPB postulates that there are three elements that influence a person's intent to exhibit a target behaviour: attitudes, subjective norms, and perceived

behavioural control determine motivation. If a person assesses the proposed behavior as positive (attitude; the social desirability of the behaviour), they perceive their friends/family/coworkers/society – depending on the behavior and context – as wanting them to perform the behavior (subjective norm), and they believe they are able to perform that behavior (perceived behavioral control) they will have a higher intention (motivation) to perform the behaviour and they are more likely to follow through. This theory is well-validated and has been applied to behaviours in many different contexts (for meta-analyses of the use of TPB in the health domain see: Godin & Kok, 1996; Carron et al., 1997). One review found that TPB can account for 20% of the variance found in whether people followed through on their planned behaviours (Armitage & Conner, 2001).

The IARSSM is the French version of the Inventory of Attitudes Toward Seeking Mental Health Services (IATSMHS; Mackenzie et al., 2004). The IARSSM was created by translating the IATSMHS into French, then an Anglophone translator who was blind to the original version, translated it back to English. Based on his findings, L'heureux (2015) proposes slight changes to the wording in order to improve the IARSSM: simplifying the statement in Item 7, removing the word "soulagement" from Item 8, and changing "conjoint" to "mon entourage" in order to be applicable to single people. Along with changing "professionel/aide professionnelle" to "ressource psychosociale" and "problèmes psychologiques" to "difficultés psychosociales", these wording changes were made to improve the IARSSM and adapt it to the context of this experiment.

L'heureux's (2015) research confirms the 3-factor model found for the IATSMHS, with an internal consistency within each factor as 0.71 for psychological openness and 0.76 for both indifference to stigma and help-seeking propensity, demonstrating good psychometric properties.

It is unlikely that an intervention as brief and as passive as viewing the KT tools will have a meaningful impact on participants help-seeking attitudes, but comparing participants subjectively intended, objectively intended and actual help-seeking behavior could provide valuable information for future research and intervention with this population. Between 70% and 80% of individuals with mental health problems do not receive professional help (Burke, 2002; Lin et al., 1996; Norquist & Regier, 1996, as cited in Mackenzie et al., 2004). The IARSSM takes into account psychosocial factors that influence accessing care, including mental health stigma, which people have indicated is often worse than the disorder itself (Mental Health Commission of Canada, 2013). The IARSSM is a discrete continuous variable with 24 items on a 5-point Likert scale with same anchors as User Satisfaction (0-4) and 24 items. It was analyzed using Independent t-tests.

Multiple Choice Resource Questionnaire. Recall and subjective intention to use the resources included in the stimuli were measured using a multiple-choice questionnaire. It had the following options: 1) No, I have never heard of this resource; 2) No, I have not heard of this resource and it is not relevant to me; 3) No, I have not heard of this resource but is relevant to me; 4) No, I have not heard of this resource but I plan on using it in the next six weeks; 5) Yes I have heard of this resource before but I have never used it; 6) Yes I have heard of this resource before and have used it for myself or others; 7) Yes I have heard of this resource before and I intend to use it in the next six weeks. Twenty resources were listed in the stimuli. Intention to use is a categorical variable dichotomized into Intend and Not Intend. Recall of resources is categorical, dichotomized into Heard and Not Heard. Both were analyzed with Chi Square.

Free Recall Open-ended Questions. Three open-ended, fill-in-the-blank questions were asked in order to assess participants' free (unprompted) recall of the knowledge within the

PicMH-U and TextMH-U. The questions are as follows: 1) “According to the information provided, what percentage of the student population experiences moderate to severe depressive symptoms?”, 2) “According to the information provided, what percentage of the student population experiences significant psychological distress?”, and 3) “What were the other psychosocial difficulties mentioned in the information provided?”. Free Recall of Depressive Symptoms and Psychological Distress statistics are continuous variables calculated from the distance between the participant’s response and the correct response. Mann-Whitney was used as the variables were non-parametric (Field, 2009). The third question was not analysed; it was included to parallel the following prompted recall questions.

Prompted Recall Multiple Choice Stimuli Questionnaire. In order to test prompted/cued recall, the same three questions above were posed but with answer options. This took the form of three multiple choice questions, akin to exam questions students are familiar with. The options for Question 1 were 20%, 34%, 52%, 60% and None (52% being the correct answer) and the options for Question 2 were 64%, 34%, 52%, 79%, and None (the correct answer being 64%). Prompted Recall of Depressive Symptoms and Psychological Distress Statistics were conceptualized as correct or incorrect and tested with Chi Square as it was categorical. Odds ratios were also calculated. The options for Question 3 were: financial precarity, post-traumatic stress, interpersonal difficulties and lack of support, divorce and separation, unhealthy eating, sleep difficulties, conflict with parents, burnout, poor dental health, excessive workload, physical abuse, suicide ideation and attempts, legal problems, loneliness, substance use, and schizophrenia. The options were given in the order presented above. Each condition had foils that were not in the other condition for a total of eight possible correct answers and eight foils per condition. The Prompted Recall Multiple Choice Stimuli

Questionnaire has 10 items in total. Prompted Recall of Psychosocial Difficulties was calculated by subtracting the number of incorrect responses from the number of correct responses, giving an overall score on eight analyzed with Mann-Whitney as it was non-parametric. Spearman's rho was used to correlate IARSSM and User Satisfaction scores to the three Prompted Recall variables.

Time 2

Consent Form. The same consent form was used from Time 1.

Accessing ESPE Report. Whether the participants accessed the report on the ESPE between Time 1 and Time 2 was assessed with the same question as Previous Familiarity, but with the following options: 1) No, I have never read the report, 2) Yes, I read the report between Time 1 and Time 2, and 3) Yes, I read the report before Time 1. It is a categorical variable coded as Not Read, Read between Time 1 and Time 2, and Read before Time 1; assessed with Chi Square. This variable was included to evaluate if being provided information from the report encouraged participants to read it between time trials and if that differed between conditions.

Self-reported Use of Resources. Participants were provided the list of 20 psychosocial resources from Time 1 and asked to check the boxes of ones they used in the past six weeks. This assessed their use of psychosocial resources between time trials. If they accessed a different resource than one on the list, they could add it in the "Other" slot. Use of resources is a categorical variable coded as No Resources Used, Resource from the List used, and Other Resource Used. The majority of cells had a count less than five, so frequency analysis was used instead of Chi Square. These options were also dichotomized into Used Resources and Not Use Resources, for which frequency and Chi Square analyses were used. Spearman's rho was used to

correlate IARSSM, Prompted Recall in Time 2 and User Satisfaction scores to the Use of Resources variable.

Prompted Recall of Stimuli. Participants were asked the same prompted recall questions as Time 1, but with different response options as to reduce the effect of order of presentation on prompted/cued recall. Serial recall is a type of memory, but the intention in this experiment is to remember the information in the stimuli, not the order of the options used to test. The Prompted Recall Multiple Choice Stimuli Questionnaire has 10 items. Recall of Depressive Symptoms and Psychological Distress Statistics are dichotomous variables tested with Chi Square and Odds Ratios. Recall of Psychosocial Difficulties was a continuous variable analyzed with an Independent t test. McNemar tests were used to compare the conditions on recall of Depressive Symptoms and Psychological Distress Statistics over time trials. A Two-Way Repeated Measures ANOVA was used to compare the text and picture conditions in recall of Psychosocial Difficulties across times.

Results for Time 1

A summary of results for Time 1, divided by condition, is in the Tables section (Appendix 1). A total of 213 people participated in Time 1 (N=100 text condition, N=113 image condition). With this sample size, an effect size of d=0.39 at the 0.05 level with a power of 80% can be detected. Due to the participants being randomly assigned using a third-party internet program, (formerly http://mathstatic.co.nz/auto, now https://teaching.statistics-is-awesome.org/tools/random-redirector/), it can be speculated that the uneven sample size between the two conditions was due to drop out or other factors, however, the exact reason for the unequal group sizes is unknown. The randomization file the program used is not available, but

randomization was working properly in beta testing. A sensitivity power calculation (G*Power) for a two independent group t test reports 80% power to detect an effect size of 0.342 at an alpha level of 0.05, with the unequal groups and the calculation reporting the same sensitivity when done with 106 participants per group. There were no duplicates found in the data from Time 1. This was assessed by using the search function in Microsoft Excel to look for the email address participants provided.

Of the 213 participants in Time 1, 86.9% identified as women, 12.2% as men, .9% who preferred not to say, and no participants identified themselves as non-binary. The mean age was 25.12 and 70% of the sample were in an undergrad program, 18.3% in Master's, 10.8% in doctoral programs, and .9% in Post-doctoral or independent studies. The sample comprised 167 people (78.4%) in psychology, social work or psychoeducation. The first languages of participants were French (84.5%), Arabic (3.3%), Spanish (2.8%) and other (9.4%). Nearly the entire sample (95.8%) use French as the language they speak most often, with 2.5% indicating English and other languages accounting for 1.7%. One-hundred-and-fifty-three participants (71.8%) do not identify as a visible minority, with 17.8% indicating they do and 10.4% not wanting to disclose.

Previous Familiarity

In terms of baseline familiarity with the ESPE report and campaign, reading the report was dichotomized in to read and not read, because too few people read the entire report to be analyzed as a separate group in Chi Square analyses. Twenty-two participants (10.33%) said they had read the report, N = 6 (6%) of the text condition and N = 16 (14.16%) of the picture condition. As for participating in the ESPE questionnaire in 2016, 155 (72.8%) did not

participate and 26 participants (12.21%) did, N = 10 (10%) of the text condition and N = 16 (14.16%) of the picture condition. There were no significant group differences in these variables.

User Satisfaction

The user satisfaction questionnaire had a good overall Cronbach's alpha of 0.768. All alphas would decline if an item was removed. The range of possible scores was from 0 to 4. No significant difference between the text (M= 2.6; SD= 0.55) and picture (M=2.59; SD= 0.7) conditions were found on this variable, t (211) = 0.23, p = 0.82, effect size d = 0.02.

Intention to Use Resources as Measured by the IARSSM

Cronbach's alpha for the questionnaire was 0.838, with all alphas declining if any item was removed. An independent samples t-test was used to compare the mean IARSSM score between the text (M = 2.89; SD = 0.47) and the picture (M = 2.81; SD = 0.55) conditions. The range of possible scores was from 0 to 4. No significant differences were found between conditions, t (211) = 1.12, p = 0.26, effect size f = 0.16.

Recall of Resources

This dependent variable was dichotomized into Having Heard of and Not Having Heard of the resource. As each resource was mentioned in the stimulus for both conditions, if the participant retained information on the resources, they should have indicated that they have heard of it. However, recall was low across conditions for all resources. Some resources had higher overall proportions of Having Heard of compared to Not Having Heard of (Centre pour les victimes d'agression sexuelle de Montréal N= 120, TelÉcoute N= 151, TelJeunes N=143, GaiÉcoute N=111) but they were in the minority. When assessing with Chi-square tests, there were no significant associations between conditions and having heard or not about a resource,

except for L'Autre Maison Sud-Ouest de Montréal: $\chi 2(1) = 4.48$, $p = 0.03$, phi = 0.15. Eight people in the text condition (28.6%) and 20 in the picture condition (71.4%) report having seen the resource. Since recall of the other 19 resources does not appear to be dependent on the experimental manipulation and that resource was not highlighted in any way, it can be assumed that the group difference in recall was due to outside factors not assessed in this study, such as geographical location of the resource or a promotion/campaign we are unaware of.

Subjective Intention to Use Resources

Intention to use the resources mentioned was also analyzed using chi square tests as it is a categorical variable. However, too few participants indicated wanting to use resources in both groups to be analysed; the chi square test requires at least five responses per cell to be effective. Therefore, overall frequencies were assessed. The resources favored for potential use within the four-to-six-weeks after testing were sexual assault interventions: Le Centre pour les victimes d'agression sexuelle de Montréal (CVASM; N = 5 out of 213 participants) and The Sexual Assault Centre of the McGill Students' Society (SACOMSS; N = 3 out of 213 participants). The crisis centre Appoint and the crisis line Ligne pour Parents each had two participants intending to use the resources. For the other resources, the frequencies varied from 0 to 1 for the two groups combined. Eleven of the resources have already been used by the participants, with Tel-Jeunes (N= 33) and Tel-Écoute (N= 11) being the most popular.

Free Recall

Free recall of the Depressive Symptoms and the Psychological Distress statistics were assessed by calculating the distance between participant's response and the correct answer. Non-numeric responses such as "I can't remember" were assigned the response of 0. Mann-Whitney

U tests were used to compare the means of both conditions as neither variable met the assumption of normality necessary for t-tests. The Mann-Whitney U test showed that there was a significant difference (U = 3728, p = 0.00, Effect size = -0.29) between the text (M= -15.46, SD = 22.22) and the picture (M = -1.68, SD = 16.54) conditions on the Depressive Symptoms Free Recall variable. The Mann-Whitney U also showed a significant difference (U = 3840, p = 0.00, Effect size = -0.28) between the text (M = -26.06; SD = 25.25) and the picture (M = -11.04; SD = 18.9) conditions for Free Recall of the Psychological Distress statistic.

Prompted Recall for Time 1

Prompted Recall of the Depressive Symptoms and the Psychological Distress statistics were coded as either correct or incorrect. Chi-square test reveals a significant association between the text and picture conditions for the Prompted Recall of the Depressive Symptoms variable, $\chi 2(1) = 14.89$, p = 0.00, phi = 0.26, OR = 2.98, 95% CI [1.7, 5.2]. In the picture condition, 66 participants (58.4% of picture condition) correctly identified the statistic, while 32 participants (32% of the text condition) in the text condition identified the correct answer. The chi-square test for the Psychological Distress statistic was also significant, $\chi 2(1) = 14.89$, p = 0.00, phi = 0.26, OR = 2.98, 95% CI [1.7, 5.2] with the same percentages of correct answers within groups as for the Depressive Symptoms variable.

Prompted Recall of Other Psychosocial Difficulties mentioned in the stimuli was coded by the amount of correct and incorrect (foil) difficulties each participant checked from the list. Sixteen options were available, eight correct and eight incorrect per condition. The number of incorrect responses was subtracted from the number of correct responses to give an overall score per participant because assessing just the correct responses could be tainted by a participant selecting all 16 responses available. Group means were then calculated and compared. The

Mann-Whitney U test shows a significant difference (U = 3959, p = 0.00, Effect size = -0.26) between the text (M= 5.08, SD = 2.03) and the picture (M = 5.93, SD = 2.19) conditions.

The differences in this variable due to condition are particularly striking because the questionnaire used to assess recall of psychosocial difficulties was text-based, using the same wording as the TextMH-U. The difficulties were not stated as directly in the PicMH-U, largely taking the form of an emoji or a brief description of the difficulty, using informal wording. For example, excessive workload was listed as "Elevated workload" in the recall questionnaire, "Elevated workload" in the TextMH-U, and in the PicMH-U as one friend asking "Too much work?" and the other responding with emojis of a stack of books, a person juggling, and a pencil and paper.

There were no significant associations between IARSSM scores and the three Prompted Recall variables (Depressive Symptoms: $F_{(211)} = 0.67$, p = 0.41; Psychological Distress: $F_{(211)} = 0.67$, p = 0.41; Other Psychosocial Difficulties $r_s = -0.03$, p = 0.67, N = 213). There were also no significant associations between User Satisfaction scores and the three Prompted Recall variables (Depressive Symptoms: $F_{(211)} = 0.00$, p = 0.97; Psychological Distress: $F_{(211)} = 0.00$, p (two-tailed) = 0.97; Other Psychosocial Difficulties $r_s = 0.05$, p (two-tailed) = 0.45, N = 213).

Results for Time 2

A summary of results for Time 2, divided by condition, is in the Tables section (Appendix 2). At the end of Time 1, 143 participants indicated they would like to be contacted for Time 2 (67% of N for Time 1), 66 people responded to Time 2 before sending a reminder 2 weeks later. Initial N for Time 2= 82 (57% of those who said they were interested and 38% of Time 1 sample). There were eight duplicates found in the data for Time 2. This was assessed by

using the search function in Microsoft Excel to look for the email address they provided. It is unclear why there were duplicates – perhaps participants forgot they had already responded to the questionnaire when a reminder was sent – but the second score from those eight participants were eliminated. There was also one score in Time 2 for which its match in Time 1 was not found. It was also eliminated, giving us N=73 for Time 2. There were 35 participants in the text condition and 38 in the picture condition.

Most participants in Time 2 – subsample of Time 1 – identified as women (86.3%) with 13.7% identifying as men, and most did not identify as a visible minority (82.5%). The mean age was 25.12 and 67.1% of the sample were in an undergrad program, 16.4% in Master's, 15.1% in doctoral programs, and 1.4 in Post-doc or independent study. The sample was 82.2% students in psychology, social work, or psychoeducation with the rest in other fields. The first languages of participants were majority French (86.3%). Nearly the entire sample (95.9%) use French as the language they speak most often, with 2.7% indicating English and other languages accounting for 1.4%. Summary tables of demographics are in the Tables section (Appendix 2).

Accessing the ESPE

In regard to reading the report, 26 in the text and 23 in the picture condition never read the report, one in the text and four in the picture condition read the report in the 4-6-week delay between Time 1 and Time 2, and five in the text and seven in the picture condition read the report before Time 1. Chi-square tests were not possible as the cell count was less than 5.

Self-reported Use of Resources

Twenty-six participants in the text and 23 in the picture condition accessed no resources, one participant in the text and three in the picture condition accessed one of the 20 resources

provided in Time 1, and eight in the text and 12 in the picture condition used resources that were not on the list of resources provided. A total of 24 participants – 32.88% of the Time 2 sample – accessed resources in the 4-6 week delay. Of the list, the resources used were Appoint (N=1), Ligne pour Parents (N=1), Tel-Jeune (N=2) and Transit (N=1). Only three participants provided information as to what other resources they used: one stated a private psychologist, one a psychologist at the university sampled, and one mentioned subreddits.

Use of resources was dichotomized into Use and Not Use and analyzed with chi-square. Nine participants in the text condition and 15 in the picture condition used resources within the 4-6 week delay. No significant associations were found $\chi2(1) = 1.56$, $p = 0.21$, phi = 0.146, OR = 1.88, 95% CI [0.69, 5.12] based on condition. Spearman's rho was used to correlate two independent variables in which at least one is non-normal. There were no significant differences on measures of User Satisfaction ($F_{70} = 0.16$, $p = 0.7$) or IARSSM ($F_{70} = 2.8$, $p = 0.1$) based on who used resources or not, meaning there was no association between satisfaction with the tools nor IARSSM scores on accessing resources.

Prompted Recall for Time 2

The Prompted Recall of Depressive Symptoms for Time 2 was analyzed via chi-square tests. Though more participants in the picture condition correctly identified the statistic (N= 7; 20% for text and N=15; 39.47% for picture), the association was not statistically significant, $\chi2(1) = 3.28$, $p = 0.07$, phi = 0.21, OR = 2.61, 95% CI [0.91, 7.5]. The same trend was found for Prompted Recall of Psychological Distress: N=5 correct in text condition (14.29%) and N=8 in picture condition (21.05%), but not statistically significant ($\chi2(1) = 0.57$, $p = 0.45$, phi = 0.09, OR = 1.6, 95% CI [0.47, 5.5]).

Prompted Recall of Other Psychosocial Difficulties for Time 2 was assessed using an Independent Samples t-test. The t-test revealed a significant difference (t (71) = -4.81, p = 0.00, Hedges' g effect size = 1.13) between the text (M = 3.51, SD = 1.58) and the picture (M = 5.21, SD = 1.44) conditions. The PicMH-U performed better than the TextMH-U on this variable.

Using chi square, there was no association between recall of the Depressive Symptoms ($\chi 2(1) = 1.47$, p = 0.26, phi = -0.14, OR = 0.5, 95% CI [0.16, 1.56]) or Psychological Stress Statistics in Time 2 ($\chi 2(1) = 0.32$, p = 0.86, phi = -0.21, OR = 0.89, 95% CI [0.24-3.24]) and Resource Use. There was, however, a significant association between Resource Use and recall of the Other Psychosocial Difficulties in Time 2 using Spearman's rho ($F_{71} = 14.19$, p = 0.00; Use Resources: M = 6.33, SD = 0.87; Not Use Resources: M = 5.45, SD = 1.82).

When comparing Time 1 to Time 2 for Prompted Recall of Depressive Symptoms, a McNemar test showed that out of the 44 participants in Time 2 who correctly identified the statistic in Time 1, 13 participants in the picture condition correctly identified the Depressive Symptoms statistic both times, while three in the text condition did. This reflects a significant change in the picture condition (p = 0.00) and non-significant change in the text condition (p = 0.18) over time. When comparing the proportion of correct responses over time, a McNemar test reveals a significant association between conditions, p = 0.00. There was a statistically significant change in responses on this variable over time (two-tailed p = 0.001).

For Prompted Recall of Psychological Distress between Time 1 and Time 2, a McNemar test showed a significant change in both the text (p = 0.04) and picture condition (p = 0.00). When comparing the proportion of correct responses over time, a McNemar test reveals that out of the 44 participants in Time 2 who correctly identified the statistic in Time 1, seven participants in the picture condition correctly identified the Psychological Distress statistic both

times, while three in the text condition did, a significant association between conditions ($p = 0.00$) and a significant change in responses over time ($p = 0.00$).A Two-way Repeated Measures ANOVA was used to compare Prompted Recall of Other Psychosocial Difficulties between Time 1 and Time 2. Within-Subjects effects of this test show a statistically significant effect of Time ($F(1) = 28.393$, $p = 0.00$, $Eta^2 = 0.286$), but not of the interaction between condition and time ($F(1) = 0.80$, $p = 0.38$, $Eta^2 = 0.011$), meaning that the number of correct responses changed over time for one condition but not the other. The Between Subjects effects show a significant effect of condition ($F(1)= 23.201$, $p = 0.00$, $Eta^2 = 0.246$), meaning that there were group differences between the picture and text condition on this measure.

Discussion

The objective of this study was to compare a text-based summary of mental health research to a picture-based summary and assess which summary provided better results on tests of user satisfaction, intention to use resources, short-term free (unprompted) recall, short-term prompted recall, actual use of resources, and long-term prompted recall. There were no significant differences between conditions on measures of user satisfaction, intention to use resources and actual use of resources. In spite of recall tests being performed in text format, requiring no information transformation between stimulus exposure and assessment in the text condition, the PicMH-U had significantly superior results than TextMH-U on four types of recall: short-term, long-term (for eight of 10 items), prompted, and free recall. Thus, the Pictorial Superiority Effect was confirmed.

Participants subjectively rated the TextMH-U and PicMH-U the same with respect to satisfaction as a learning and memory item for the subject at hand. Nonetheless, recall of

information is essential for memory and comprehension. For example, it would be impossible to explain student mental health to someone with no experience in the subject – one of the User Satisfaction questions – if you cannot remember what factors affect student mental health. Even though participants *felt* they could recall, understand, and communicate the information presented, objective tests reveal they may not have acquired and retained the content as well as they think. This difference between subjective and objective measures could be useful in creating more accurate assessments of communication tools.

Recent research affirmed that there were no differences in knowledge acquisition between text summaries and an image-based infographic (Buljan et al., 2017). Despite participants preferring the infographic, researchers concluded that text summaries are best because the communication methods had equivalent recall (i.e. knowledge acquisition) and infographics supposedly cost more to produce.

However, several methodological limitations were identified in that study (Mc Sween-Cadieux et al., 2018). The picture and text conditions were not equivalent. The infographic condition had different data than the plain-text condition, with more text, numbers, and details. This may have created a cognitive overload in the picture-based infographic condition. It appears that Buljan et al. (2017) did not consult with any stakeholders in regards to the content and presentation of the three communication methods, an essential step in KT. Neither long-term recall/retention nor participants' previous knowledge of the information presented in the communication tools was assessed. Moreover, the knowledge transferred in Buljan et al. (2017) was about a physical health procedure – external cephalic version for breech presentation at term – differentiating it from this present study.

Attention was aimed at correcting the non-equivalency error by summarizing the ESPE in text format, "translating" it to images, then assuring the information in the recall tests, resources and other details of the PicMH-U were also in the TextMH-U. Both conditions used additional text to contextualize the information presented. The input of several stakeholders was sought from the early conceptualisation of this study through to the final format of both KT tools and the experiment itself. The participants' previous familiarity with the information presented was assessed and a four-to-six-week follow-up to test long-term recall was included. Simultaneously drawing from limited MH research comparing text to image KT, the experiment improved on previous designs. This present research had contradicting results to Buljan et al. (2017); they found that participants' User Satisfaction was higher in the picture condition but there were no statistical differences between conditions on Recall measures, while this present study found no difference in User Satisfaction, but Recall was higher in the picture condition. However, the knowledge transferred in both studies are quite different. The Pictorial Superiority Effect has been repeatedly demonstrated in physical health communication (see Houts et al., 2006; Lühnen et al., 2018; Lor et al., 2019; Trevena et al., 2006 for systematic reviews on this subject) so Buljan et al.'s (2017) results can be contextualized within existing literature, but more research comparing text and picture MH KT tools is required to evaluate their efficacy in communicating psychological content.

Hiring a graphic designer to create the original images and make several modifications over time cost approximately 150CAD. This step was not essential as many free websites and applications exist for creating eye-catching, effective infographics (CopyPress, 2018). As the maximum amount of stakeholder engagement was sought in every phase of the KT process, it was considered beneficial to employ a university student to conceptualize and create culturally-

relevant images for the tool. Therefore, finances are not a legitimate reason to exclude picture-based KT summaries as the cost was low, added benefits, and free options are available.

There were differences in the sample sizes between groups. As mentioned, it is unclear why this happened. However, the small difference in the number of participants (100 vs 113) could not seriously affect the results considering that the two group sizes were over a hundred participants. A third-party program was used to manage random assignment, so it is possible, though unlikely, that a problem in the program caused the different group sizes. A third-party program was used so that researchers were blind to which condition participants were in. The random assignment function was tested in the beta stage and was working properly, but future research could use a random assignment procedure that is controlled by the researchers as to eliminate that possibility. Another possible explanation is that one condition had more drops out (or, conversely, higher retention) than the other. One stakeholder in the text condition of the beta tests said that they quickly scrolled through the block of text containing the stimulus material, then was unable to answer the recall assessment questions so they closed the questionnaire window. Unfortunately, as incomplete questionnaires were not submitted, it is unknown if this same process occurred with the actual participants, leading to the picture condition accumulating more complete responses before the text condition. Future research should collect incomplete responses as they could provide a wealth of additional information.

Despite recall of the resources being low and IARSSM scores being moderate (M = 2.85 out of 4 across conditions), use of resources was relatively high. Nearly a third of the second sample accessed MH resources during the delay, compared to the previously reported statistic of 70-80% of people in need of MH care who do not seek it. This cannot be explained by recall, IARSSM, User Satisfaction, nor experimental condition. Research by Henderson, Evans-Lacko

and Thornicroft (2013) state that the factors that increase MH treatment avoidance or delay are: 1) a lack of knowledge in how to detect mental illness, 2) lack of knowledge of how to access care, 3) prejudice and stigma against people with mental illnesses, and 4) expecting people with mental illnesses will be discriminated. This present research addressed the first factor by describing the psychosocial difficulties that this population faces and addressed the second factor by providing a list of free MH resources in the area. Factors three and four were assessed by the IARSSM and were found to not relate to using resources. MH assessments such as the Beck Depression Inventory, the Overall Anxiety Severity and Impairment Scale (OASIS) or the Patient Health Questionnaire (PHQ-9; which was used in the ESPE) could be used to understand more about who needed care and who sought it. The ESPE found that student participants had higher rates of depressive symptoms, psychological distress, and suicidal ideation and attempts compared to the general population (FAÉCUM, 2016), which may explain these students' higher help-seeking, but they would be included in the population of "people who need it". It is unknown if the students in this particular sample were similarly distressed as the ESPE sample. Stress and pain can have deleterious effects on various forms of memory and learning (Schwabe & Wolf, 2010; Scott & Gans, 2020; Anderson et al., 2021; Tyng et al., 2017) so recall results could also be contextualised with MH scales.

It would be interesting to know why participants did or did not find a particular resource relevant. Did they indicate that they would not use a certain resource in the next 4-to-6 weeks because they are not experiencing mental health difficulties, because the location is inconvenient, because they are not the intended demographic of the resource, etc? Time 2 indicates that approximately a third of participants were in enough distress to seek immediate MH care, but not much is known about their other motivations. It is also unclear why the majority of participants

did not recall seeing the resources mentioned. If they read that part of the stimulus/tool, there should be recall of the resources. Did they scroll through that part like the beta tester did? Did they not read that information because they were not in need of help? Were they at a point of information overload and therefore did not retain information on resources? As the sample was primarily students in MH fields, the resources could be of interest to them whether they were in distress or not. Additional questions/options could be added to the Resources questionnaire as to obtain that information. Follow-up interviews could also be used to collect this information, while being another form of knowledge creation that also uses a different data collection method: qualitative data.

The resources in the picture condition were presented in a stylized but text-dominant way. This may have affected recall of the resources, rendering the two conditions similar in the means they used to communicate that information. At the time, emoji options were limited so it was difficult to represent the resources using the same theme from the first page of the PicMH-U. Prospective versions of the PicMH-U should add more emoticons/images – such as a child emoji for Tel-jeunes, a rainbow flag for the 2LBGTQ* resources, and a parent holding a baby emoji for Ligne des Parents – to this section of the tool in order to better differentiate it from the TextMH-U.

Recall testing was also text-based, which may favour the text condition. Forthcoming research could compare text-based, picture-based, and combined testing and their interactions with the two conditions.

Online testing facilitates data collection as participants can access the experiment at any time, from anywhere; compared to having to schedule an appointment with the researcher and commute to the research lab. This may have increased or changed who participated in this study

compared to in-person testing. As the questionnaires were completed unsupervised, there is the possibility that two or more people answered the questionnaires together and saw both conditions or that participants discussed the study after completing it. Researchers were not blind to the existence of two conditions, but there was no interaction with participants and analyses were planned in advance, so this should not have influenced results.

Another limitation was the lack of a representative sample. A convenience sample of volunteers from a Canadian university was used. Despite recruitment posters being displayed in every pavilion of the university sampled by staff blind to the intention of the study and emails being sent to each department and school, the Time 1 sample was 78.4% students in psychology, social work and psychoeducation. Additionally, 86.9% of participants in Time 1 identified as women. However, these skews in a sample population are common when using university students as participants (Dickinson et al., 2012). It is possible the topic of the research interested some more (ex. people in psychology and social work) than others (ex. people in engineering and chemistry). Hopefully this possibility was accounted for by assessing participants' familiarity with the knowledge transferred and using random assignment.

Other data could also be collected to elucidate participants' views on mental health. Assessments of recall over time were included, but not one's attitude change. Future research could administer the IARSSM prior to and after stimulus exposure, such as during longitudinal testing, to see if attitudes towards seeking mental health care also changed over time.

In terms of User Satisfaction, both tools were rated just above the median score of 2 (2.59 for the PicMH-U and 2.6 for the TextMH-U) indicating that both tools could be improved. It would be interesting for future research to adopt a Within-Subjects design and compare User

Satisfaction of both tools with the same participants. This could also help clarify what exactly needs to be changed in each tool for them to be more satisfying.

Conclusion

This study found that the picture-based tool produced significantly greater short-term, long-term, free, and prompted recall compared to the text-based tool but had similar results as the text-based tool on ratings of user satisfaction, subjective intention to use resources, objective intention to use resources as measured by the IARSSM, and actual use of resources.

This study contributes to the field of cognition by being the first of its kind to demonstrate the Picture Superiority Effect (PSE) with complex psychological images and North American adults as the target population. Studies comparing the recall of text and pictures have predominantly focused on either simple images or complex images of physical health conditions. A systematic review was conducted in 2019 with the question of "Are pictures more effective than text for communicating mental health information to a North American adult population?". It found 17 experimental articles answering that question, but they all focused on the physical health effects of tobacco consumption, a substance use disorder. This experiment is unique in showing that the PSE is also present with elaborate images depicting psychological/emotional content. It is also significant that the picture condition demonstrated superior recall with a highly educated and unilingual group as one of the reasons picture-based tools are used in graphic medicine is to make information accessible to low-education and minority groups.

This study adds to the growing field of graphic medicine by providing experimental results to validate picture-based KT, validating a picture-based MH KT tool in North America outside of tobacco interventions, and testing the tool with a highly-educated population. The

intention is for modification and uptake of the KT tools created and future research that elaborates on ways pictures can be used for mental health research communication with adults.

In the discussion section, several ways in which future studies can expand on this RCT were generated. The tools validated by this research are designed to be flexible and adapted. The tools could be tested with other populations, for example, younger students, university staff instead of students, or with the general population. Within the tools, data from the Canadian university sampled was used. This information – such as the prevalence statistics – could be easily replaced or modified with data from other universities or regions and tested among those populations. The language of the text could be translated to English or any other language that uses emojis/emoticons in their digital communication. Furthermore, the tools have yet to be implemented. The first draft of the tools, along with the research validating them, leaves a wealth of future research that can be done to improve the tools, expand their applications, and use different methods of validation.

References

American Psychiatric Association, & American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington, DC: American Psychiatric Association.

Bennett, G., & Jessani, N. (2011). *The knowledge translation toolkit: Bridging the know-do gap: A resource for researchers*. IDRC.

Birchwood, C. C. & Dagenais, C. (submitted). The Use of Pictures for Mental Health Knowledge Transfer with North American Adults: A Systematic Review.

Buljan I., Malički M., Wager E., Puljak L., Hren D., Kellie F., West H., Alfirević Ž., Marušić A. (2018). No difference in knowledge obtained from infographic or plain language summary of a Cochrane systematic review: Three randomized controlled trials, *Journal of Clinical Epidemiology*, doi: 10.1016/j.jclinepi.2017.12.003

Canas, E., Lachance, L., Phipps, D., Birchwood., CC. What makes for effective, sustainable youth engagement in knowledge mobilization? A perspective for health services. *Health Expectations*. 2019; 22: 874– 882. https://doi.org/10.1111/hex.12918

CopyPress (2018). *The Benefits of Infographics for Education.* https://www.copypress.com/kb/infographics/the-benefits-of-infographics-for-education/

Dickinson, E.R., Adelson, J.L. & Owen, J. (2012) Gender Balance, Representativeness, and Statistical Power in Sexuality Research Using Undergraduate Student Samples. *Archives of Sexual Behavior* 41, 325–327 (2012). https://doi.org/10.1007/s10508-011-9887-1.

Fédération des associations étudiantes du campus de l'Université de Montréal (FAÉCUM, 2016).

Enquête sur la Santé Psychologique Étudiante. http://www.faecum.qc.ca/ressources/documentation/avis-memoires-recherches-et-positions-1/enquete-sur-la-sante-psychologique-etudiante

Field, A. (2009). *Discovering statistics using SPSS*. Sage Publications

Fonds de recherche du Québec – Société et culture. (2011). *Plan d'action en matière de transfert des connaissances 2011-2014*. Gouvernement du Québec. http://www.frqsc.gouv.qc.ca/documents/11326/449030/plan-action-transfert-connaissances_2011-2014.pdf/9e2bba77-6bc0-435a-92e8-81717ed3a435.

Fraser, K. D., & al Sayah, F. (2011). Arts-based methods in health research: A systematic review of the literature. *Arts & Health*, *3*(2), 110-145, https://doi.org/10.1080/17533015.2011.561357.

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *Journal of Continuing Education in the Health Professions*, *26*(1), 13-24, DOI: 10.1002/chp.47.

Hebert, C. (2018). *La vidéo comme outil de transfert de connaissances en santé publique au Burkina Faso: comparaison de trois genres narratifs.* [Masters dissertation, Université de Montréal]. Papyrus : Institutional Repository. http://hdl.handle.net/1866/22735.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling* ,*61*(2), 173-190, DOI: 10.1016/j.pec.2005.05.004.

Langer, L. & Tripney, J. & Gough, D. (2016). The science of Using Science: Researching the Use of Research Evidence in Decision-Making. Technical Report. https://www.alliance4usefulevidence.org/assets/Science-of-Using-Science-Final-Report-2016.pdf

L'heureux, F. (2015). Validation française de l'inventaire d'attitudes envers le recours aux services de santé mentale. *Canadian Journal of Behavioural Science / Revue canadienne des sciences du comportement*, *47*(4), 333-336. doi:10.1037/cbs0000020.

Mackenzie, C. S., Knox, V. J., Gekoski, W. L., & Macaulay, H. L. (2004). An adaptation and extension of the Attitudes Toward Seeking Professional Psychological Help Scale. *Journal of Applied Social Psychology, 34,* 2410–2433. http://dx.doi.org/10.1111/j.1559-1816.2004.tb01984.x

Mc Sween-Cadieux, E., Fillol, A., Ridde, V., & Dagenais, C. (2018). Letter to the editor in response to "No difference in knowledge obtained from infographic or plain language summary of a Cochrane systematic review: three randomized controlled trials" by Buljan et al. (2017). *Journal of clinical epidemiology*, *100*, 132–133.

Mental Health Commission of Canada. (2013). *Opening Minds: Interim report*. Retrieved from http://www.mentalhealthcommission.ca/English/system/files/private/document/opening_minds_interim_report.pdf.

Nutley, S., & Awad, N. (2012). Commentaires de Sandra Nutley dans Le transfert des connaissances dans le domaine social (DAGENAIS, Christian, et Émilie ROBERT), pp. 201-209. Les Presses de l'Université de Montréal, Montréal.

Siron, S., Dagenais, C., & Ridde, V. (2015). What research tells us about knowledge transfer

strategies to improve public health in low-income countries: a scoping review. *International journal of public health*, *60*(7), 849–863. https://doi.org/10.1007/s00038-015-0716-5.

Appendices

Appendix 1. Time 1 summary tables by condition (within group percentages)

Gender	Woman	Man	Nonbinary	Prefer not to say
Text	91 (91%)	9 (9%)	0 (0%)	0 (0%)
Picture	94; (83.2%)	17 (13.8%)	0 (0%)	2 (1.8%)

$\chi 2(2) = 3.731$, $p = 0.155$, phi = 0.132

Visible Minority	Yes	No	Prefer not to say
Text	20 (20%)	72 (72%)	8 (8%)
Picture	18 (15.9%)	81 (71.7%)	14 (12.4%)

$\chi 2(2) = 1.483$, $p = 0.476$, phi = 0.083

Field of study	Psychology or Social Work	Medical Sciences	Sociology, history, political science	Education and Public Health	Engineering, Chemistry, Biology (STEM)	Fine Arts, Music, Theatre	Other
Text	79 (79%)	1 (1%)	6 (6%)	1 (1%)	0 (0%)	0 (0%)	13 (13%)
Picture	88 (77.9%)	1 (0.9%)	10 (8.8%)	6 (5.3%)	2 (1.8%)	1 (0.9%)	5 (4.4%)

$\chi 2(6) = 10.859$, $p = 0.093$, phi = 0.226

Degree	Undergraduate	Master's	PhD	Post-doctorate	Independent Study
Text	69 (69%)	21 (21%)	9 (9%)	1 (1%)	0 (0%)
Picture	80 (70.8%)	18 (15.9%)	14 (12.4%)	0 (0%)	1 (0.9%)

$\chi 2(4) = 3.349$, p = 0.501, phi = 0.125

First Language	French	Arabic	Spanish	Other
Text	86 (86%)	3 (3%)	4 (4%)	7 (7%)
Picture	94 (83.2%)	4 (3.5%)	2 (1.8%)	13 (11.6%)

$\chi 2(9) = 9.741$, p = 0.372, phi = 0.214

Language Most Used	French	English	Other
Text	97 (97%)	0 (0%)	3 (3%)
Picture	107 (94.7%)	5 (4.4%)	1 (0.9%)

$\chi 2(5) = 8.729$, p = 0.12, phi = 0.202

Age	Mean	Standard Deviation	Standard Error of Mean
Text	25.32	6.85	0.685
Picture	24.94	5.8	0.545

$t(211) = 0.44$, p (2-tailed) = 0.662

Time 1	Read Report	Participate in Survey	User Satisfaction	IARSSM	Free Recall Depression	Free Recall Stress
Text	N = 6; 6%	N = 10; 10%	M=2.6; SD= 0.55	M = 2.89; SD = 0.47	M= -15.46; SD = 22.22	M = -26.06; SD = 25.25
Picture	N = 16; 14.16%	N = 16; 14.16%	M=2.59; SD= 0.7	M = 2.81; SD = 0.55	M = -1.68; SD = 16.54	M = -11.04; SD = 18.9

	Prompted Recall Depression (within group %)	Prompted Recall Stress (within group %)	Prompted Recall Other Difficulties	Perfect Score on Recall of Other Difficulties (within group %)
Text	N = 32; 32%	N = 32; 32%	M = 5.08; SD = 2.03	N = 5; 5%
Picture	N = 66; 58.4%	N = 66; 58.4%	M = 5.93; SD = 2.19	N = 30 26.5%

Appendix 2. Time 2 summary tables by condition (within group percentages)

Gender	Woman	Man	Nonbinary	Prefer not to say
Text	33 (94.3%)	2 (5.7%)	0 (0%)	0 (0%)
Picture	30; (78.9%)	8 (21.1%)	0 (0%)	0 (0%)

$\chi 2(1) = 3.626$, $p = 0.057$, phi = 0.223

Visible Minority	Yes	No	Prefer not to say
Text	3 (10%)	27 (90%)	8 (8%)
Picture	8 (24.2%)	25 (75.8%)	14 (12.4%)

$\chi 2(1) = 2.212$, $p = 0.137$, phi = 0.187

Field of study	Psychology or Social Work	Medical Sciences	Sociology, history, political science	Education and Public Health	Engineering, Chemistry, Biology (STEM)	Fine Arts, Music, Theatre	Other
Text	30 (85.7%)	0 (0%)	2 (5.7%)	0 (0%)	0 (0%)	0 (0%)	3 (8.6%)
Picture	30 (78.9%)	1 (2.6%)	10 (8.8%)	3 (7.0%)	0 (0%)	0 (0%)	0 (0%)

$\chi 2(4) = 7.556$, $p = 0.109$, phi = 0.322

Degree	Undergraduate	Master's	PhD	Post-doctorate	Independent Study
Text	22 (62.9%)	10 (28.6%)	3 (8.6%)	0 (0%)	0 (0%)
Picture	27 (71.1%)	18 (5.3%)	8 (21.1%)	0 (0%)	1 (2.6%)

$\chi 2(3) = 9.008$, $p = 0.029$, phi = 0.351

First Language	French	Arabic	Spanish	Other
Text	32 (91.4%)	0 (0%)	0 (0%)	3 (8.7%)
Picture	31 (81.6%)	1 (2.6%)	1 (2.6%)	5 (13.1%)

$\chi 2(7) = 6.9$, $p = 0.44$, phi = 0.308

Language Most Used	French	English	Other
Text	34 (97.1%)	0 (0%)	1 (2.9%)
Picture	36 (94.7%)	2 (8.3%)	0 (0%)

$\chi 2(2) = 2.939$, $p = 0.23$, phi = 0.20

Age	Mean	Standard Deviation	Standard Error of Mean
Text	26.2	8.803	1.488
Picture	24.9	5.321	0.863

$t(71) = 0.757$, p (2-tailed) = 0.452

	Accessing the Report during 4-6 week delay	Use of Resources	Prompted Recall Depression	Prompted Recall Stress	Prompted Recall Other Difficulties
Text	N = 1 0.73%	N = 9; 25.8%	N= 7; 20%	N = 5; 14.29%	M = 3.51; SD = 1.58
Picture	N = 4 10.53%	N = 15; 39.5%	N=15; 39.47%	N = 8; 21.05%	M = 5.21, SD = 1.44

Depression

		Picture		Text	
		Time 2		*Time 2*	
		Correct	**Incorrect**	**Correct**	**Incorrect**
Time 1	**Correct**	13	18	3	10
	Incorrect	2	5	4	18

Stress

		Picture		Text	
		Time 2		*Time 2*	
		Correct	**Incorrect**	**Correct**	**Incorrect**
Time 1	**Correct**	7	24	3	10
	Incorrect	1	6	2	20

Chapter 5: Thesis Discussion

The goal of this thesis was to develop and validate a picture-based MH KT tool for adults. Using Graham's (2006) Knowledge-to-Action framework, this thesis went through each phase sequentially to ensure necessary elements were included and to maximize the research's benefits to stakeholders. Graham and colleagues (2006) characterize KT processes in the funnel as one of refinement, leading to Knowledge Creation: "As knowledge moves through the funnel, it becomes more distilled and refined and presumably more useful to stakeholders". Outside of the funnel are an interacting, non-linear cycle of KT Actions which lead to Knowledge Application/Implementation. As previously mentioned, practical application of the Knowledge Tools is outside of the scope of this already extensive thesis. Therefore, this Discussion section will address each KT Action, giving information and process for future researchers or practitioners to implement the Knowledge created. The General Discussion will go through the processes of Knowledge Creation; Identifying the Problem; Identifying, Reviewing, and Selecting Knowledge; Knowledge Application; Adapting Knowledge to Context; Assessing Barriers to Knowledge Use; Selecting Tailoring and Implementing Interventions; Evaluating Outcomes; Monitoring Knowledge Use; and Sustaining Knowledge Use. This also provides the elements required of a knowledge transfer plan. Some information may be redundant, but its repetition is done to centre research within clear, replicable KT processes. Article 1 will be henceforth referred to as "the SR" and Article 2 will be referred to as "the RCT".

Knowledge Creation

A wealth of knowledge was created throughout the development and validation process. The processes of Knowledge Inquiry, Knowledge Synthesis and Knowledge Tools are forms of

Knowledge Creation in and of themselves (Graham et al., 2006). Knowledge Inquiry is collecting a mass of raw, unprocessed data, which was done in the introduction to this thesis. Knowledge Synthesis usually takes the form of systematic reviews or meta-analyses and is used to make sense of the Knowledge amassed. This was addressed by conducting a systematic review of the literature answering the question of "do pictures work better than text for MH KT to NA adults". Knowledge Tools are used to present Knowledge in a clear and user-friendly format, usually with the intention of influencing stakeholder behaviour and/or encouraging Knowledge uptake. This was completed through the development and validation of the KT Tools.

Though there were no experimental evaluations of a Knowledge Tool like the PicMH-U, disparate information on the use of images for KT with adults was collected, collated, and synthesized. This information was sometimes hard to find and was spread across many different fields of study and practice. All these results were recontextualized within the domain of KT; unifying what was previously scattered while also identifying gaps. Additionally, Knowledge was created through formal and informal consultations with stakeholders and by generating a list of 20 off-campus crisis resources in the area. These resources have not been joined in a list before. Information on which resources are relevant, which are already known, and which have been used by this population was documented through the RCT.

Something that was not found in the SR nor in other SRs on health communication was use of "knowledge transfer" or other related terms. The articles included in the SR created tools to communicate/transfer scientific information to targeted populations, the *push* model of KT (Institute for Work and Health, 2006). Subsequent researchers and practitioners now have a summary of this body of literature that was amassed through both non-systemic and systemic

means. Additionally, a list of keywords/search terms relevant to this type of research was generated. These terms could be used in ensuing studies to allow future researchers and other interested parties easier access to scientific findings on picture-based MH KT. These knowledge management actions created a compendium of studies evaluating picture-based communication.

Furthermore, the development and validation actions of the PicMH-U and TextMH-U contribute to the field of KT by serving as a guide for how to create and test a tool of this sort, something that was not found in the existing literature. The process is clearly detailed so it can be replicated or modified. Additionally, it is now known that complex psychological content can be effectively transferred using images, a question that remained after the SR. The Pictorial Superiority Effect (PSE) has been extensively demonstrated with physical health information, but the RCT is relatively unique in showing that the PSE is also present with elaborate images depicting psychological/emotional content. Another important outcome of the RCT is that the picture condition demonstrated superior recall with a highly educated and largely unilingual group. One of the reasons picture-based tools are used in graphic medicine is to make information accessible to low-education and minority groups so validating its use with a high-education, majority group is important for generalizability.

Identifying the Problem

The problem addressed by this thesis came from practice communities: picture-based MH communication with adults was frequently used for art therapy (self-expression through art) and for certain forms of diagnosis, but no relevant research was retrieved on MH KT tools. This is the quintessential gap between research and practice that often drives KT (Graham et al., 2006).

Identifying, Reviewing, and Selecting Knowledge

Through systematic and non-systematic reviews of the literature, relevant research was identified, selected, and analysed. Though experimental research similar to that described in this thesis had not been retrieved, an abundance of converging support emerged from the Knowledge Inquiry and Synthesis processes. The thesis employed frequently researched and applied theories such as the Theory of Planned Behaviour (TPB) and Information Processing Theory (IPT), along with information from the SR, community practices, and cognitive research to design and validate novel KT tool**s** while avoiding some of the limitations expressed in the literature. Grey literature – the ESPE – was selected as the source of Knowledge to transfer in order to fill the aforementioned gap between research and practice.

Knowledge Application

However, "the creation of new knowledge often does not on its own lead to widespread implementation or impacts on health" (CIHR, 2016) so further Knowledge Application is required. Knowledge from this thesis could be applied in several ways, contributing to new research. Some of those options were mentioned in the discussion section of the two articles, others are detailed in this and following sections.

The SR found no experimental studies done in North America which compared pictures to text for communicating psychological or emotional content to adults. The search terms and procedure used in the SR could be used with different eligibility/inclusion criteria to conduct SRs with different target populations (teens, children), in different regions, with different sources (grey literature, conferences), and with different designs (qualitative, mixed methods), thus creating a unique SR. It would be interesting for future SRs in this field to compare the results in this thesis with their own. Differences and similarities could highlight important variations and remaining gaps in the literature.

Results from the consultations with stakeholders and the RCT validation in Article 2 could help determine where to allocate resources to alleviate MH concerns. For example, participants primarily intended to use sexual assault resources after exposure to the KT tools. Sexual assault was not mentioned in the tools aside from in the list of resources. This indicates that sexual assault resources are relevant and needed by this population. Various universities are currently educating the population about sexual assault, sometimes mandatorily (Chabot, 2019). The RCT results support the pertinence of sexual assault interventions, though research needs to be completed to assess the effectiveness of the particular strategies used by universities, as well as the actual use of sexual assault resources.

Stakeholders mentioned a backlog of services at the university sampled. The university has since implemented many MH resources of both a preventative and reactive nature. These interventions have been designed with the involvement of doctoral students in workplace and organisational psychology and at the behest of student groups, but other stakeholder involvement is not known (FAÉCUM, 2019). Stakeholder engagement is crucial to designing and implementing effective strategies, especially in the health domain (Hartzler et al., 2013). The goal of stakeholder involvement in health research is to create evidence (Knowledge) that is optimally useful and pertinent to decision-makers and practitioners with the intention of increased dissemination and uptake in practical settings (Scientific Resource Centre, 2014). Considering that the majority of stakeholders consulted did not know of and had not read the ESPE report indicates that uptake by stakeholders may be low. The university could involve stakeholders who are not also practitioners to assess if their implemented and planned interventions are useful to them. Stakeholders could also be consulted as to what images and messages are used to reach the target population so reactions like those in the First Consultation

of this thesis can be avoided. As said, consultations with stakeholders outside of student groups and practitioners may have been conducted, but that information is not retrievable. Publishing the results of their consultations could encourage future researchers and other institutions to engage stakeholders while giving an example of how it can be done.

The PicMH-U's development and validation processes were limited by using convenience samples. Future research could use representative samples of students and engage them in more structured consultations. Doing exclusively formal consultations with stakeholders would have made this thesis project excessively long and the information communicated would have lost relevance over time (Keown et al., 2008) but future research can use these methods.

The results of the RCT support the existence of the Pictorial Superiority Effect with complex psychological images. PSE can still not be categorized as universal; validation of the PicMH-U with more populations and replication of results are required.

The conversation between friends represented in the PicMH-U may model talking about mental health. This representation can be of interest to campaigns such as Bell's Let's Talk which encourages people to discuss mental health in general and their personal difficulties specifically. The fake phone number in the tool could be replaced with the real phone number of a resource – with changes to the formality of the language in the tool – and used as a promotion for the resource. The second draft of the PicMH-U had a conversation style that stakeholders felt represented a conversation between a student and a carer/resource, so the old wording could be used by resources and institutions.

The tools themselves can also be applied/implemented as a form of KT. As mentioned in the discussion of the RCT, the PicMH-U's user satisfaction should be improved and validated

before implementation. Some of the ways the tools can be adapted are detailed in the following section. The second last section, “Evaluating Outcomes”, has suggestions on how to evaluate some of these implementation options.

Adapting Knowledge to Context

The PicMH-U is highly adaptable. Statistics taken from the ESPE could be replaced with statistics from other sources. For example, the University of California has also done mental health surveys among their student population. They found 47% of PhD students and 37% of Master’s students met criteria for depression (Graduate Assembly, 2015). These statistics and their corresponding pie charts could replace the ones used in this version of the PicMH-U. Though a specific institution is referenced in the heading of the PicMH-U, it could be omitted or replaced with the relevant target population or organization the data is collected from. The content within the phones only references factors that have been shown to affect mental health (nutrition, sleep, stress, workload, substance use, loneliness, social support). It does not reference any person or organization, so could remain unchanged. The original PicMH-U is in French but could be translated to any language that uses emojis in its digital communication.

More emphasis could be placed within the PicMH-U on preventative and educational strategies. The list of resources could be expanded, as suggested by participants in the second formal consultation with stakeholders. The PicMH-U contains the image of a cell phone that has a link that could be modified to include a larger compendium of psychosocial resources. Food banks, long-term services, on-campus resources, specialized care, and self-help materials could be included in this larger list without crowding the PicMH-U itself.

The image-based tool in this thesis is the PicMH-U, the U standing for university. Several new iterations of the tool could be made such as PicMH-Q with mental health information about the general population of Quebec or the PicMH-I specific to indigenous populations. Like the PicMH-U, new versions should use language and images that stakeholders from the target population prefer and should be evaluated with that group before implementation. Resources can be changed accordingly.

Aside from the tools, the Knowledge created in this thesis can be adapted. Publication of results in the form of articles allows the information to be accessed by other researchers and practitioners. Open-access publication widens the audience by giving full, free access to anyone with an internet connection and suitable device. Theses are often published in an open-access format through institutions, but the length of the document and the language used may render it inaccessible to most.

Popularization and summarization can be done to increase uptake. Participants in the RCT were asked to provide their emails if they would like the results of the study. Transferring the thesis as well as an easy-to-understand summary of results can be a way to both adapt the knowledge and disseminate/apply it.

Assessing Barriers to Knowledge Use

Identifying and assessing barriers to knowledge use tends to be qualitative and/or observational (Grimshaw et al., 2012). As mentioned in Chapter 2, there was difficulty collaborating with other researcher-practitioners in the university: the FAÉCUM and Centre de santé et de consultation psychologique (CSCP). One party cited bureaucratic difficulties in involving “third parties” (ex. confidentiality, systems already being in place) and one party was

simply not interested in KT at all. We falsely assumed that university representatives would want evidence-based methods for diffusing their research content, especially since it would either involve little extra work on their part or even reduce some tasks they had as the candidate would be responsible for developing and testing KT strategies. Free KT training was offered so they could develop their own evidence-based communication actions to no avail. Future research in a university setting should expect these barriers and use documented KT strategies to overcome them. Assessing an institution or organisation's representatives' views on and familiarity with KT – termed professional barriers – can prevent them (Grimshaw et al., 2012). Evaluating stakeholder attitudes and capacities may be met with the same rejection but an attempt should still be made to assess facilitators and barriers to KT in context.

Different barriers to knowledge use exist. Organizational barriers such as a clash or lack in the skills of members of an organisation and lack of physical resources; structural barriers such as available finances; professional-patient interaction barriers that make communication and information sharing between those parties difficult; and peer group barriers such as stigma, current standards of care differing from evidence-based practice, geographic limitations, and mistrust (Greer et al., 2019; Grimshaw et al., 2012). Some of these barriers, along with professional barriers, have been found to come from difficulty working between and across health professions (Davies et al., 2007).

Other barriers relate to knowledge management, such as the volume of evidence on a particular subject, difficulty accessing that evidence, and the time and skills (e.g. reading level, familiarity with research methods and statistical analyses) needed to search for and understand the evidence (Grimshaw et al., 2012). As ways to overcome knowledge management barriers, Grimshaw and colleagues (2012) list systematic reviews, practice guidelines (summaries around

how to use the evidence), publicly available libraries and electronic databanks, and skills training. An attempt was made at the latter suggestion and the others were integrated into the thesis with the intention of reducing barriers for other researchers and practitioners. Facilitators to knowledge use can be evaluated while assessing barriers or can be applied as interventions to counteract barriers (Graham et al., 2006).

Selecting, Tailoring, Implementing Interventions

At the beginning of the research process in 2015, the PicMH-U was conceptualized to be presented as two sets of centrefold pages of the student agenda distributed by the university sampled (two facing pages for the ESPE data and two facing pages of resources). This was chosen to increase the visibility of resources as student services were located at the end of the agenda in small font. Its final version was presented online to facilitate data collection and reach as many stakeholders as possible. However, the possibility of publishing it in the student agenda or similar format was maintained by columnizing the Knowledge and having a midline in the tool. Magazines, books, and some newspapers use the same bi-fold as the agenda and could be another place the PicMH-U is implemented. Options like tv screens, billboards, posters, emails, and other forms of picture-based KT mentioned in the Introduction could also be used for KT Tool Implementation.

Through the RCT, participants' levels of MH stigma, awareness of non-emergency crisis services, and which resources are favoured are now known. The resources participants actually used - Appoint, Transit, Tel-Jeune, Ligne pour parents, private psychologist, school psychologist and online message boards - could be looked at as MH supports for this population. They could be better promoted or funded, though additional research should be conducted.

Monitoring Knowledge Use

Monitoring knowledge use is an essential part of implementation. As implementation has not already happened, it is difficult to know how exactly use will be monitored. Some possibilities based on proposed implementation strategies are through the number of times the articles are cited, having the Knowledge on a website that counts the number of visitors or downloads, and documenting when researchers or practitioners contact the candidate to use or adapt the KT tools and when they use the Knowledge.

Evaluating Outcomes

Due to KT tools like the PicMH-U being absent from the literature, research from other domains needs to be used to evaluate outcomes from its development and validation processes. The tool itself was evaluated through consultation with stakeholders and the RCT, but the methodology and outcomes have not been assessed. The following section details attempts at KT evaluation through scientific literature and ways future research could evaluate similar KT tools.

In the introduction to this thesis, it was reported that images are processed and stored in a particular way by the human brain. Brady et al. (2008) found participants could store over 2,500 images in their working memory, allowing them to identify visual objects with high accuracy. The images they used were simple and contained only one object per image, differentiating it from the present thesis and the 17 articles in the SR, while bolstering the idea that images have a powerful impact on memory. Coupling it with research from Potter et al. (2014) may shed some light on the RCT; though the context of their research was a cognitive RCT using emotionally neutral or positive images, their conclusions may explain part of the differing effects of the TextMH-U and PicMH-U. When the purpose/theme of stimuli exposure is presented before

seeing the stimuli, selective attention and expectation increases recall and visual object recognition (Evans et al., 2011; Cukur et al., 2013). However, in the RCT, participants were only given the organizing theme after the fact. They were presented with a series of relatively complex pictures, with no blank screen between, and asked them to make subsequent meaning of the images. The questions in the recall questionnaires forced participants to go through the mass of image and text input provided and extract understanding from it several minutes after exposure (known as retrieval). The only organizing information given to them prior to stimuli exposure was to say that the RCT is related to developing a tool for student mental health. Participants were unaware they would be tested on the information they perceived, nor did they know how they would be tested. As such, they were required to capture and store visual information with only their individual cognitive organization processes. This is similar to the "after" condition in Potter et al. (2014).

Contrary to research predating Potter et al. (2014), the RCT affirms that unprimed (free) recall and comprehension of complex images is possible. Future research could combine complex emotional images – such as those in the PicMH-U – with speed-processing to assess how much time is necessary for participants to understand and remember that type of image. This could inform implementation of picture-based KT tools. For example, if only seconds are needed to remember and retrieve such information, the tool could be formatted as a .gif or other fast-moving image. In a practical context, the Canadian university sampled uses television screens across campus to display information relevant to their population. The information is shown on a single screen for a short time before the next set of content is displayed. If the PicMH-U (and other complex pictures) only need a few seconds to be understood and remembered, they could be integrated into the information communicated to the university

population through this method. If buying ad time on television, knowing how little time is needed for the information to be comprehended can reduce the cost of implementation.

In order for participants to make sense of the PicMH-U, they would have needed to use both semantic/verbal processing and visual/image processing as there were both text and pictures. This differentiates the RCT from that of Potter et al. (2014), Brady et al. (2008) and other cognitive experiments that used image-only stimuli. This is why the SR focused on experiments that compared text KT *tools* to image-based KT *tools*. The Dual Coding theory of PSE relies on both forms of processing to explain the significantly increased recall of pictures compared to text. This improved recall was confirmed in the RCT.

What is not known is if the supplemental words used to contextualize the images in the PicMH-U added to recall, giving effects in excess to that of images alone. Some studies from the SR may provide partial answers. Brennan et al. (2017) manipulated the content of the text included in HWLs to either be "factual" (a short declaration of a research conclusion) or "testimonial" (with personal information) and compared them to a text-only "factual" HWL and a picture-only PWL. The testimonial styles are similar to the conversational and personally revealing communication method used in the PicMH-U. While they did not assess recall directly, they did do a 5-week follow up on several behavioral measures. Recall/long-term retrieval of information is necessary for long-term changes in behavior (Zogg, et al. 2012). Both this thesis and Brennan et al. (2017) used an online RCT format, measured intentions towards a behavioral action, and assessed the direct behavioural impact of the stimuli after measuring intentions, but their target outcome was the intention to quit smoking and the RCT's was the intention to use services. As mentioned, intention to stop an anchored behaviour is different than the intention to start a (potentially new) behavior. To overcome this difference, the Theory of Planned

Behaviour, adapted to MH help-seeking, was assessed by the RCT. However, actual use of resources (adherence to the message) was shown not to be associated with the IARSSM. Its association with long-term recall is unclear as there were no significant associations between recall of Depressive Symptoms and Psychological Distress statistics, but there was with recall of Other Psychosocial Difficulties. Perhaps the statistics were not well-remembered over time or perhaps they are not motivators for help-seeking, but remembering the factors that affect student mental health are. More research is needed to understand those associations.

Brennan et al. (2017) found no significant differences between non-testimonial HWLs, whether they be text or image based, except that the picture versions elicited more negative emotions. The two testimonial PWLs triggered more negative emotions and more intentions to quit than the TWL. The testimonial PWL without additional text about the person spurred two times as many quit attempts as the TWL. Houts et al. (2006) found that negative emotions can reduce the target behavior, but that effect was not present in Brennan et al. (2017). If strong negative emotions reduce adherence (Houts et al., 2006) and reduce immediate recall (outcome from the SR), because adherence and short-term recall were high in the picture condition, emotional elicitation must be relatively low. However, this is not known conclsively as the emotions evoked by the two tools were not explicitly evaluated. This can be done in subsequent evaluations of similar KT tools.

The benefits of testimonial-style information are supported by another study included in the SR: Hammond et al. (2012). While “lived experience” PWLs were rated as effective as “symbolic” PWLs and less effective than “graphic” PWLs, PWLs with testimonial text were significantly more effective than those with standard FDA text. Future research could do similar manipulations to the PicMH-U by using “factual” or “testimonial” accompanying text and

compare it to factual and testimonial text-only tools to see if the effects of Brennan et al. (2017), Hammond et al. (2012), and the RCT generalize to these variations.

More psychologically focussed research has found that knowing there are others who experience similar difficulties can normalize those feelings, thus contact-based methods are common among anti-stigma MH campaigns (Commissaire à la santé et au bien-être du Gouvernement du Québec, 2012; Mental Health Commission of Canada, 2013; Innocent, 2013). This, coupled with the efficacy of testimonial style HWLs may partially explain why MH stigma was relatively low and willingness to seeking help was high in the RCT sample (as measured by the IARSSM, M= 2.84). In the future, the IARSSM could be administered both pre and post to assess changes in attitudes towards seeking MH care relative to the KT Tools.

Comparing the efficacy of and stakeholder reaction to the tools with results from other studies strengthens the understanding of the findings. Houts et al. (2006) was spotlighted instead of other SRs because it searched fields outside of health communication and provided guidelines for image-use. This thesis responds directly to their suggestions by using drawings instead of photographs, cartoons (emojis) instead of shaded drawings, using colored images, employing realistic and culturally-relevant pictures, and tempering the negative emotional content of the images with hopeful messages. Text was also used to caption images and images to elucidate text, placing them near each other. As suggested, the PicMh-U was field tested through several consultations with stakeholders. Measures of adherence that include both attitudinal (the IARSSM) and action-based (actual use of services after stimuli exposure) assessments were integrated.

The thesis findings parallel those from Houts et al. (2006). Participants in the second formal consultation liked the cartoon-style emojis used. They stated the colors used for the

images and text were captivating and engaging, increasing attention. Participants found the PicMH-U culturally relevant as they do most emotional communication through text message on their cell phones. They stated that they use a variety of emojis to convey their affective states and found the ones chosen reflected their current situation. They liked that some racialized emojis were used instead of the standard but inhuman yellow. The text used to caption the emojis and the pictures used to elaborate on the text clearly informed the other and they suggested how that effect could be increased. Lastly, the intention of the KT Tool (to communicate results from the ESPE, including what factors impact student MH) was accurately captured. The RCT used elements of IPT employed by Houts and colleagues as outcomes/dependent variables. Liking (User Satisfaction), comprehension through questions in the User Satisfaction questionnaire, memory (Free and Prompted immediate Recall), decision making (Subjective Intention and IARSSM), acting on the decision (Adherence in the form of using resources), and retrieval (Long-term Recall) align the RCT with other research on information processing.

Subsequent research could use other systematic reviews of picture-based health communication along with Houts et al. (2006) to develop and validate their tool. They could also develop and publish their own guidelines based on their context-based findings, adding to the field of Graphic Medicine and KT.

Measures of long-term, short-term, free, and prompted recall were included in the RCT but working memory and prospective memory (remembering to remember) are also important parts of decision-making and behaviour exhibition (Zogg, et al. 2012; Xie et al., 2020). Assessments of working memory and prospective memory could help elucidate why certain participants accessed certain resources beyond the Theory of Planned Behaviour and MH stigma measured by the IARSSM.

Future research can adapt and implement the tools then evaluate different aspects of effectiveness when used in a real-life setting. This is similar to the naturalistic exposure of some of the studies included in the SR. The same outcomes from the SR could be used to evaluate effectiveness while aligning it with the results of the SR. For example, as mentioned in the Knowledge Application section, the PicMH-U may model discussing MH with others. This can be evaluated by assessing conversations and information sharing, like studies in the SR did. Conversely, the IPT elements included in the RCT could be used to compare experimental efficacy with real-world effectiveness. Of course, a variety of other outcomes can be assessed as well or instead. It would be interesting for future research to do qualitative interviews after stimulus exposure to receive more information on what participants liked and did not like about the KT tools, how it has impacted them in the long term, the utility they see in such KT tools, where they would like to see the tool implemented, what resources are more pertinent to them, and how to better encourage resource use.

An example of a naturalistic implementation strategy for the KT Tools is a large poster displayed on campus. Some ways this naturalistic implementation could be evaluated is through counting visits to the poster; observing who, what, when, where and how people interact with the tool; documenting how long people interact with the poster; providing pen and paper with the poster and observing how many people document information from it; surveying the population in which the poster was implemented to assess awareness, comprehension, use and other outcomes; and approaching people who interacted with the poster to ask them questions (like the ones in the previous paragraph) immediately after exposure.

Sustain Knowledge Use

This action refers to the sustainability or longevity of Knowledge use. Graham et al. (2006) describe it as the final phase or action which prompts a feedback loop, returning to the beginning of the KT action phases. Sustainability needs to be planned and managed by the future users of the Knowledge created by assessing their particular barriers and facilitators, adapting the Knowledge, monitoring use of their Knowledge created and evaluating its outcomes. Sustainability can be encouraged by the candidate by imploring successive users of the Knowledge to learn, understand, and adopt evidence-based KT strategies.

Chapter 6: Thesis Conclusion

The purpose of this thesis was to detail the development and validation processes of a novel picture-based mental health knowledge transfer tool for a university student population. The course of action began with the naturalistic observation of the ways picture-based communication was being used in practice settings. As the doctoral candidate amassed content related to image-based health communication and consulted with stakeholders as to the utility they see in this practice (Knowledge Inquiry), a student group at the university began surveying students on their mental health (Knowledge Creation). These events converged to create an implicit need: students expressed struggles with their mental health in both the survey and in personal image-based expression, but the research on student struggles was not getting to the students who wanted it, nor was the information on this form of expression getting to scientific communities. Closing these two gaps was done by merging practice and research; the knowledge in one setting closes the gap in the other.

A stepwise, KT-based process inspired by Graham et al. (2006) was used for closing these research and practice gaps. The systematic review of this thesis involved Knowledge Inquiry and Knowledge Synthesis with new knowledge being created through these processes. Unfortunately, all KT Tools assessed in the SR communicated tobacco risk information. This showed how wide the gap between research and practice was concerning image-based MH KT with North American adults.

The development and validation of the PicMH-U involved Knowledge Synthesis and the production of Knowledge Tools (the PicMH-U and the TextMH-U) with more Knowledge Creation being the end result. This thesis adds new content to the body of research and evidence-

based practices on picture vs text processing, which communication method university students prefer, which psychosocial resources they use, attitudinal measures for behavioral intentions, KT for mental health, student openness to seeking mental health support, stakeholder engagement, KT Tools in the university context, Pictorial Superiority Effect, and KT processes. As the SR illustrates, a study like this has not been done. The intention is that this thesis serves as a catalyst for future KT and picture-based mental health communication.

Chapter 7: Thesis References

Alberta Health Services, (2019). *Cover Your Cough.* https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-cover-your-cough-general.pdf

Ally, B. A., & Budson, A. E. (2007). The worth of pictures: Using high density event-related potentials to understand the memorial power of pictures and the dynamics of recognition memory. *NeuroImage*, *35*(1), 378-395.

Anderson, J.R. (2009). Cognitive Psychology and its Implications: Seventh Edition. Worth Publishers, New York.

Arcia, A., Suero-Tejeda, N., Bales, M. E., Merrill, J. A., Yoon, S., Woollen, J., & Bakken, S. (2016). Sometimes more is more: iterative participatory design of infographics for engagement of community members with varying levels of health literacy. *Journal of the American Medical Informatics Association: JAMIA*, *23*(1), 174–183. https://doi.org/10.1093/jamia/ocv079

Bader, G. E., & Rossi, C. A. (1998). *Focus groups: A step-by-step guide*. Bader Group.

Bennett, G., & Jessani, N. (2011). *The knowledge translation toolkit: Bridging the know-do gap: A resource for researchers*. IDRC.

Bowman, M. (2012). *Intergrating vision with the other senses*.

Brady, T. F., Konkle, T., Alvarez, G. A., & Oliva, A. (2008). Visual long-term memory has a massive storage capacity for object details. *Proceedings of the National Academy of Sciences*, *105*(38), 14325-14329.

Broers, N., Potter, M.C., & Nieuwenstein, M.R. (2018). Enhanced recognition of memorable pictures in ultra-fast RSVP. *Psychonomic Bulletin & Review, 25*, 1080-1086

Brosh, A. (2013). *Hyperbole and a Half: Unfortunate Situations, Flawed Coping Mechanisms, Mayhem, and Other Things That Happened*. Simon and Schuster

Brown, C. (1999). *Louis Riel: a comic-strip biography*. Drawn and Quarterly.

Buljan I., Malički M., Wager E., Puljak L., Hren D., Kellie F., West H., Alfirević Ž., Marušić A. (2018). No difference in knowledge obtained from infographic or plain language summary of a Cochrane systematic review: Three randomized controlled trials, *Journal of Clinical Epidemiology*, doi: 10.1016/j.jclinepi.2017.12.003

Canas, E., Lachance, L., Phipps, D., Birchwood., CC. What makes for effective, sustainable youth engagement in knowledge mobilization? A perspective for health services. *Health Expectations*. 2019; 22: 874– 882. https://doi.org/10.1111/hex.12918

Casile, A., Victor, J. D., & Rucci, M. (2019). Contrast sensitivity reveals an oculomotor strategy for temporally encoding space. *eLife*, *8*, e40924. https://doi.org/10.7554/eLife.40924

Canadian Institutes of Health Research (CIHR). (2016). *About knowledge translation.* http://www.cihr-irsc.gc.ca/e/29418.html

Canadian Mental Health Association. (n.d.). *Fast Facts about Mental Illness.* http://www.cmha.ca/media/fast-facts-about-mental-illness/#.VggxkH1DTVI

Centre for Disease Control (2016). *Coughs and Sneezes.* https://www.cdc.gov/healthywater/hygiene/etiquette/coughing_sneezing.html

Chabot, A. (2019, October 17) *Formation obligatoire à la suite de l'entrée en vigueur de la politique sur les violences sexuelles.* Université de Montréal.

Children's Hospital Boston. (2009, May 4). *Human Brain Can Recognize Objects Much Faster Than Some Have Thought*. ScienceDaily. www.sciencedaily.com/releases/2009/04/090429132231.htm

Clua, A. (2017, June 6). The anatomy of an infographic: Six essential elements. *L&T.* https://landt.co/2017/06/the-anatomy-of-an-infographic/

Colindres, E. (2016, February 26). Sonder le bien-être mental. *Le Quartier libre!* [Montreal], http://quartierlibre.ca/sonder-le-bien-etre-mental/.

ComicsResearch. (n.d.). *Doctoral Dissertations & Theses*. http://www.comicsresearch.org/ComicsDissertations.html

Commissaire à la santé et au bien-être. (2012). *Rapport d'appréciation de la performance du système de santé et de services sociaux 2012.*

Community First: Impacts of Community Engagement (2014, November 24). *So What the Heck is Knowledge Mobilization and Why Should I Care?*

http://researchimpact.ca/so-what-the-heck-is-knowledge-mobilization-and-why-should-i-care/

Crick, K., & Hartling, L. (2015). Preferences of knowledge users for two formats of summarizing results from systematic reviews: Infographics and critical appraisals. *PloS one*, *10*(10), e0140029. https://doi.org/10.1371/journal.pone.0140029

Çukur, T., Nishimoto, S., Huth, A. G., & Gallant, J. L. (2013). Attention during natural vision warps semantic representation across the human brain. *Nature neuroscience*, *16*(6), 763–770.

Dagenais, C., & Robert, É. (Eds.) 2012. Le transfert des connaissances dans le domaine social. Montréal: Presses de l'Université de Montréal. doi:10.4000/books.pum.8776, https://doi.org/10.1038/nn.3381.

Davies, H., Powell, A. & Rushmer, R. (2007). Healthcare professionals' views on clinician engagement in quality improvement: A literature review. *Health Foundation.*

Deneweth, C. (2015, July 1). *Schizophrenia: An Insider's Point of View* [Comic Strip]. http://everydayfeminism.com/2015/07/insider-view-schizophrenia/

Deverka, P. A., Lavallee, D. C., Desai, P. J., Esmail, L. C., Ramsey, S. D., Veenstra, D. L., & Tunis, S. R. (2012). Stakeholder participation in comparative effectiveness research: Defining a framework for effective engagement. *Journal of Comparative Effectiveness Research*, *1*(2), 181–194. https://doi.org/10.2217/cer.12.7

Di Lollo V. (2012). The feature-binding problem is an ill-posed problem. *Trends in Cognitive Sciences*, *16*(6), 317–321. https://doi.org/10.1016/j.tics.2012.04.007

Eliot and Associates (2005). *Guidelines for Conducting a Focus Group.* Retrieved from:

https://irep.olemiss.edu/wp-content/uploads/sites/98/2016/05/Trinity_Duke_How_to_Conduct_a_Focus_Group.pdf

Evans, K. K., Cohen, M. A., Tambouret, R., Horowitz, T., Kreindel, E., & Wolfe, J. M. (2011). Does visual expertise improve visual recognition memory?. *Attention, perception & psychophysics*, *73*(1), 30–35. https://doi.org/10.3758/s13414-010-0022-5

Fédération des associations étudiantes du campus de l'Université de Montréal (FAÉCUM, 2016).

Enquête sur la Santé Psychologique Étudiante. http://www.faecum.qc.ca/ressources/documentation/avis-memoires-recherches-et-positions-1/enquete-sur-la-sante-psychologique-etudiante

Fédération des associations étudiantes du campus de l'Université de Montréal (FAÉCUM, 2019). *Ça va aller.* http://www.faecum.qc.ca/campagne/ca-va-aller

Fonds de recherche du Québec – Société et culture. (2011). *Plan d'action en matière de transfert des connaissances 2011-2014*. *Gouvernement du Québe*c. http://www.frqsc.gouv.qc.ca/documents/11326/449030/plan-action-transfert-connaissances_2011-2014.pdf/9e2bba77-6bc0-435a-92e8-81717ed3a435.

Forney, E. (2012). *Marbles: Mania, Depression, Michelangelo, and Me: A Graphic Memoir*. Penguin Publishing.

Fraser, K. D., & al Sayah, F. (2011). Arts-based methods in health research: A systematic review of the literature. *Arts & Health*, *3*(2), 110-145.

Gagliardi, A. R., Kothari, A., & Graham, I. D. (2017). Research agenda for integrated knowledge translation (IKT) in healthcare: what we know and do not yet know. *Journal of epidemiology and community health*, *71*(2), 105–106. https://doi.org/10.1136/jech-2016-207743

Gillet, R. (2014, September 18). *Why We're More Likely To Remember Content With Images And Video (Infographic).* FastCompany. https://www.fastcompany.com/3035856/why-were-more-likely-to-remember-content-with-images-and-video-infogr

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *Journal of continuing education in the health professions*, *26*(1), 13-24.

Greer, A.M., Amlani, A., Burmeister, C., Scott, A., Newman, C., Lampkin, H., Pauly, B., & Buxton, J.A. Peer engagement barriers and enablers: insights from people who use drugs in British Columbia, Canada. *Can J Public Health. 2019 Apr;110(2):227-235*. doi: 10.17269/s41997-018-0167-x. Epub 2019 Jan 4. PMID: 30610564; PMCID: PMC6964581.

Grimshaw, J.M., Eccles, M.P., Lavis, J.N., Hill, S.J., Squires, J.E. (2012). Knowledge translation of research findings. *Implementation Sci 7, 50.* https://doi.org/10.1186/1748-5908-7-50.

Harris, R. (2008). *The Happiness trap: How to Stop Struggling and Start Living*. Trumpeter Books.

Hartzler, A., McCarty, C., Rasmussen, L., Williams, M.S., Brillant, M., Botwten, E., Clayton, E., Ferryman, K., Field, J.R., Fullerton, S.M., Horowitz, C.R., Koenig, B.A., McCormick, J.B., Ralston, J.D., Sanderson, S.K., Smith, M.E. & Trinidad, S.B. (2013). Stakeholder engagement: a key component of integrating genomic information into electronic health records. *Genet Med* 15, 792–801. https://doi.org/10.1038/gim.2013.127.

Healthy Aboriginal Network. (2014). *We create illustrations, posters, video and comic books on health and social issues for youth*. www. thehealthyaboriginal.net/

Helfand, W.H. (1990). *Art in the service of public health: The illustrated poster.* Caduceus, 6(2), 1–37.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient education and counseling* ,*61*(2), 173-190.

How to Explain Autism to People. (2015, March 22). *WikiHow.* http://autism.ehoow.net/?p=105

Innocent, J. (2013). Can Mental Health Education Using a Storybook Reduce Mental Illness Stigma in Children.

Institute for Work and Health, (2006). *From Research to Practice: A Knowledge Transfer Planning Guide.* https://www.iwh.on.ca/sites/iwh/files/iwh/tools/iwh_kte_planning_guide_2006b.pdf

Keown, K., Van Eerd, D., & Irvin, E. (2008). Stakeholder engagement opportunities in systematic reviews: knowledge transfer for policy and practice. *The Journal of continuing education in the health professions*, *28*(2), 67–72. https://doi.org/10.1002/chp.159

Kirkpatrick, E. A. (1894). An experimental study of memory. *Psychological Review*, *1*(6), 602.

Langer, L. & Tripney, J. & Gough, D. (2016). The science of Using Science: Researching the Use of Research Evidence in Decision-Making. Technical Report. https://www.alliance4usefulevidence.org/assets/Science-of-Using-Science-Final-Report-2016.pdf

Lamme V. A. (2006). Towards a true neural stance on consciousness. *Trends in cognitive sciences*, *10*(11), 494–501. https://doi.org/10.1016/j.tics.2006.09.001

Lamme, V. A., & Roelfsema, P. R. (2000). The distinct modes of vision offered by feedforward and recurrent processing. *Trends in Neurosciences*, *23*(11), 571–579. https://doi.org/10.1016/s0166-2236(00)01657-x

Madrid, J. & Hout, M. (2018). Eye Spy: Why we need to move our eyes to gather information about the world. *Frontiers for Young Minds.* 6. 10.3389/frym.2018.00071

McGuire, W. J. (1968). Personality and attitude change: An information processing theory. In A. G. Greenwald, T. C. Brock, and T. M. Ostrom (eds.), *Psychological foundations of attitudes* (pp. 171-196). San Diego, CA: Academic Press.

Medina, J. (2008). *Brain rules: 12 principles for surviving and thriving at work, home, and school*. Pear Press.

Nedd, A. (2014, July 9). 21 *Things Nobody Tells You About Being Depressed.* http://www.buzzfeed.com/alexisnedd/things-nobody-tells-you-about-being-depressed#.kneb13GQq

Nelson, D. L., Reed, V. S., & Walling, J. R. (1976). Pictorial superiority effect. *Journal of experimental psychology. Human learning and memory*, *2*(5), 523–528.

Oates, J. M., & Reder, L. M. (2010). Memory for pictures: Sometimes a picture is not worth a single word.

Ontario Health Promotion. (2005). *The Healthy Aboriginal Network - Comic Books on Aboriginal Youth Health Issues* (434). Retrieved from www.ohpe.ca/node/6890

Paulin, D., & Suneson, K. (2012). Knowledge transfer, knowledge sharing and knowledge barriers—Three blurry terms in KM. *Electronic Journal of Knowledge Management, 10*(1), 81–91.

Paivio, A (1986). *Mental representations: a dual coding approach*. Oxford. England: Oxford University Press.

Paivio, A. & Csapo, K. (1973). Picture superiority in free recall: Imagery or dual coding? Cognitive Psychology, 5(2) 176-206.

Paivio, A. (1971). Imagery and verbal processes. New York: Holt, Rinehart, and

Paivio, A. (1986). Mental representations: a dual coding approach. Oxford. England: Oxford University Press.

Paivio, A. (1991). Images in the Mind, the Evolution of a Theory. Harvester Wheatsheaf, New York.

Paivio, A., Rogers, T.B., & Smythe, P.C. (1968). Why are pictures easier to recall than words? *Psychonomic Science*, 11, 137-138.

Popova, L., Owusu, D., Jenson, D., & Neilands, T. B. (2017). Factual text and emotional pictures: overcoming a false dichotomy of cigarette warning labels. *Tobacco control*, tobaccocontrol-2016-053563. Advance online publication. https://doi.org/10.1136/tobaccocontrol-2016-053563

Potter, M. C., Wyble, B., Hagmann, C. E., & McCourt, E. S. (2014). Detecting meaning in RSVP at 13 ms per picture. *Attention, Perception & Psychophysics*, *76*(2), 270–279. https://doi.org/10.3758/s13414-013-0605-z

Purple Clover (2014, November 7). *Timeline Photos | Facebook.* https://www.facebook.com/purpleclvr/photos/a.375609882543951.1073741828.369508529820753/612113408893596/?type=1.

Queuille, L., Ridde, V., Glez, D., (2015). Financement et accès aux soins en Afrique de l'Ouest : Empirique et satirique ! Available from http://www.equitesante.org/wp-content/uploads/2015/01/AlbumDessins_Acc%C3%A8sSoinsFS_HELPCHUM_2014_Fr_Screen.pdf

Redsicker, P. (2014, May 13). Social Photos Generate More Engagement: New Research. Retrieved from http://www.socialmediaexaminer.com/photos-generate-engagement-research/

Ridde, V. (2015, December). Les chercheurs ont-ils les compétences pour faire du transfert? In Association francophone pour le savoir (Chair), *À table avec le transfert de connaissances.* Round table discussion at the 94th General Assembly of the Association francophone pour le savoir, Montreal, Qc.

Sacco, J. (2004). *The Fixer: A Story from Sarajevo*. Jonathan Cape

Sacco, J. (2013). *The Great War: July 1, 1916: The First Day of the Battle of the Somme.* W. W. Norton & Company

Sacco, J. (2014). *Palestine Collection.* Fantagraphics Books

Satrapi, M. (2007). *The Complete Persepolis*. New York: Pantheon Books.

Scott, L. (2015). *Doodle Diary of a New Mom: An Illustrated Journey Through One Mommy's First Year*. New York: Running Press.

Scott Library (2018). Sidney Kimmel Medical College. Retrieved from: https://jefferson.libguides.com/c.php?g=736076&p=5352191

Scientific Resource Centre (2014). Defining the Benefits of Stakeholder Engagement in

Systematic Reviews. *Agency for Healthcare Research and Quality.* Retrieved from: https://www.ncbi.nlm.nih.gov/books/NBK196180/pdf/Bookshelf_NBK196180.pdf

Segue Creative Team (2014, April 4). *What are Infographics and When Should you use Them?* https://www.seguetech.com/infographics/

Serre, T., Oliva, A., & Poggio, T. (2007). A feedforward architecture accounts for rapid categorization. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(15), 6424–6429. https://doi.org/10.1073/pnas.0700622104

Spiegelman, A. (1986). *Maus I: A Survivor's Tale.* Pantheon Graphic Library.

Thorpe, S., Fize, D., & Marlot, C. (1996). Speed of processing in the human visual system. *Nature, 381,* 520–522.

The Graduate Assembly. (2014). *Graduate student happiness & well-being report*. Retrieved from University of California, Berkeley website: http://ga.berkeley.edu/wellbeingreport

The Lung Association of Canada. (2009). *How to wash your hands properly*. https://www.lung.ca/sites/default/files/media/handwashing_2009_e.jpg.

Trafton, A. (2014, January 16). In the blink of an eye. *MIT News Office.* http://news.mit.edu/2014/in-the-blink-of-an-eye-0116

Van Eerd, D. & Saunders, R. (2017). Integrated knowledge transfer and exchange: An organizational approach for stakeholder engagement and communications. *Scholarly and Research Communication 8(1),* https://doi.org/10.22230/src.2017v8n1a274

Vogel, D., Lehman, J., & Dickson, G. (1986), "THE IMPACT OF GRAPHICAL DISPLAYS ON PERSUASION: AN EMPIRICAL STUDY". *ICIS 1986 Proceedings*. 5. https://aisel.aisnet.org/icis1986/5

Vogt, S., & Magnussen, S. (2007). Long-term memory for 400 pictures on a common theme. *Experimental psychology*, *54*(4), 298-303.

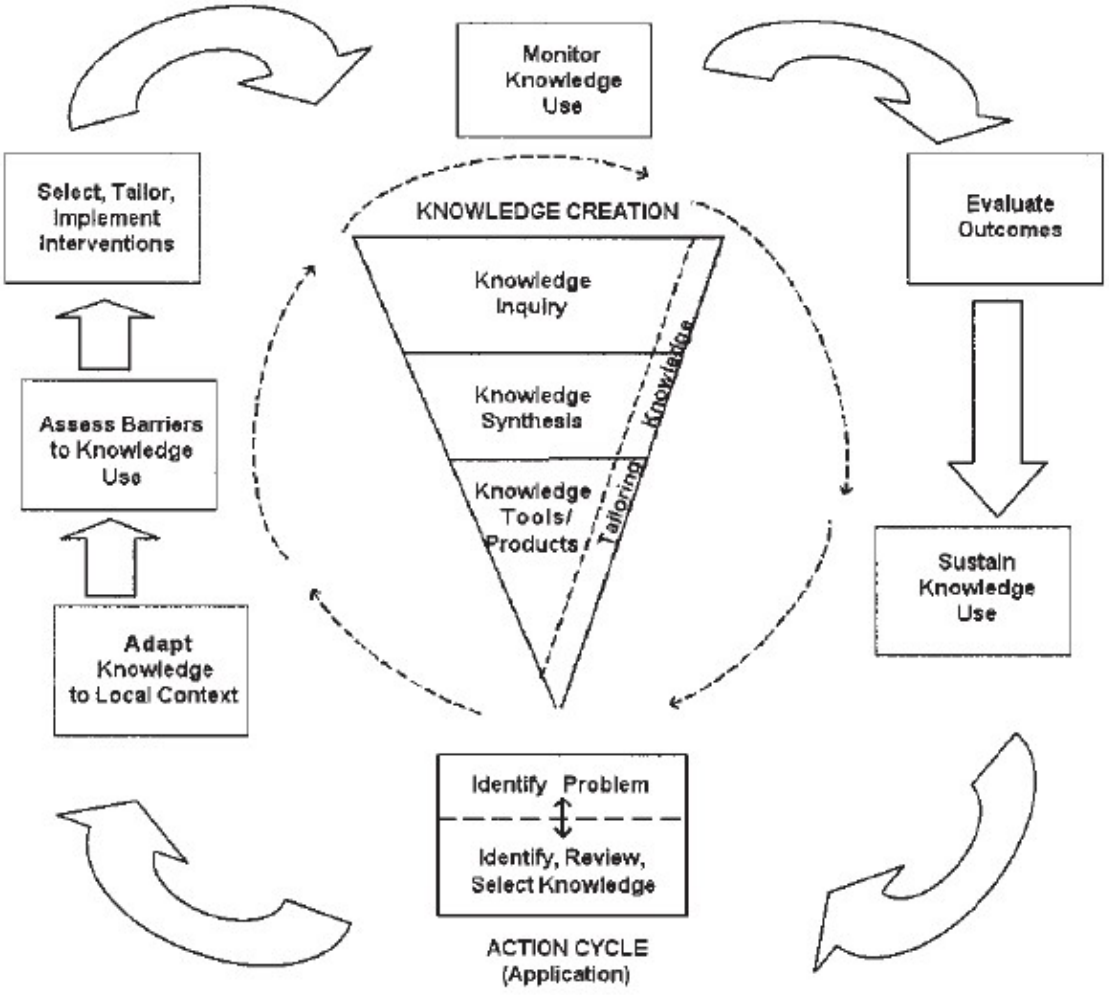
Wright, S. (2013, March 24). [Comic Strip]. http://themetapicture.com/heres-an-easy-way-to-understand-anxiety/

Xie, W., Campbell, S. & Zhang, W. (2020). Working memory capacity predicts individual differences in social-distancing compliance during the COVID-19 pandemic in the United States. *Proceedings of the National Academy of Sciences*, Jul 2020, 117 (30) 17667-17674; DOI: 10.1073/pnas.2008868117

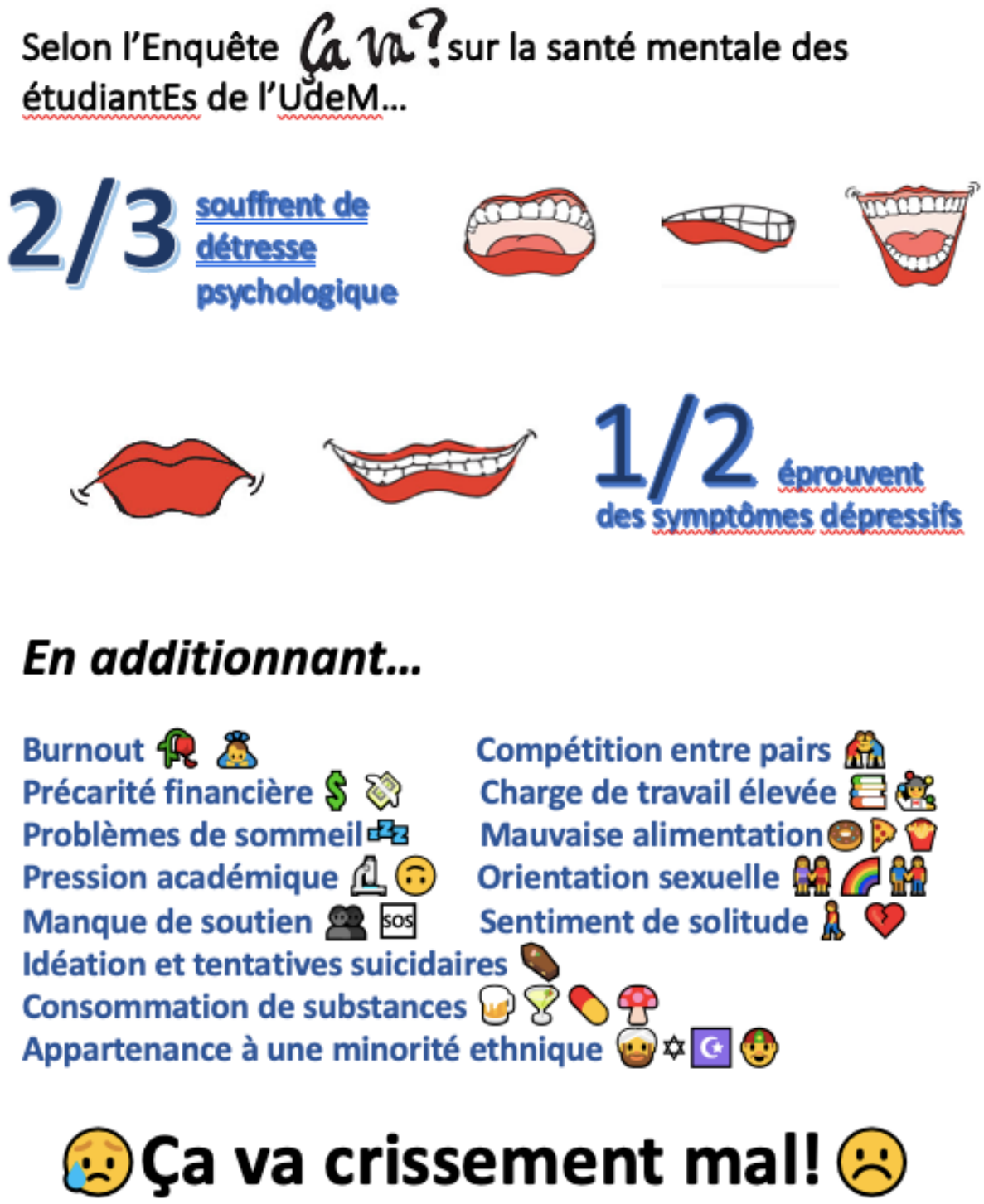
Zogg, J. B., Woods, S. P., Sauceda, J. A., Wiebe, J. S., & Simoni, J. M. (2012). The role of prospective memory in medication adherence: a review of an emerging literature. *Journal of behavioral medicine*, *35*(1), 47–62. https://doi.org/10.1007/s10865-011-9341-9

7. Annexes

Figure 1. Graham et al. (2006)'s Funnel Model of KT



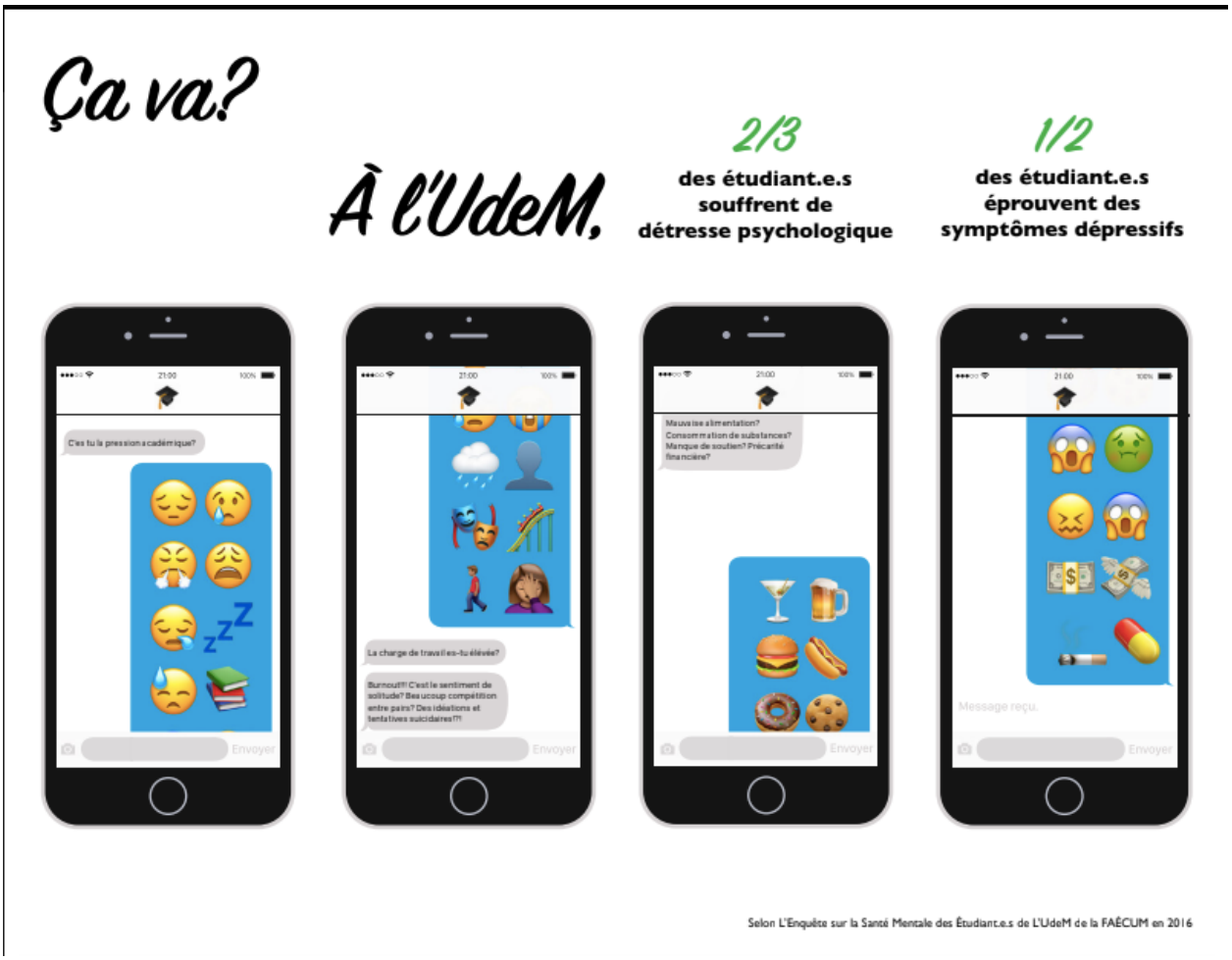
Appendix 1. The first draft of the PicMH-U



Mais nous sommes ici pour vous aider

- Bureau de l'aide financière: baf.umontreal.ca3
- Bureau de l'ombudsman : ombuds.umontreal.ca
- Bureau des étudiants internationaux: bei.umontreal.ca
- Bureau d'intervention en matière de harcèlement : harcelement.umontreal.ca
- Centre de santé et de consultation psychologique: cscp.umontreal.ca
- Centre étudiant de soutien à la réussite: cesar.umontreal.ca
- Clinique universitaire de psychologie: psy.umontreal.ca/ressources-services/clinique-universitaire-de-psychologie
- Fédération des associations étudiantes du campus de l'Université de Montréal (FAÉCUM) : www.faecum.qc.ca
- Groupe d'action trans : transumontreal.com
- L'Alternative - Association LGBTQIA* : www.alternative.umontreal.ca
- Services aux étudiants (SAÉ) : www.sae.umontreal.ca
- Soutien aux Étudiants en situation de handicap: bshesh.umontreal.ca
- Regroupements étudiants reconnus à l'UdeM : http://www.ahc.umontreal.ca/groupes_interet/groupes_membres.htm

Appendix 2. Versions of the PicMH-U for the Second Consultation



Ça va $%#*@^?!# mal?

Centres de Crises – 24/7

Centre de crise l'Appoint
Offre des services d'intervention téléphonique, un suivi de crise en externe ainsi que des services d'orientation et de référence.
514 351-666 **centredecrise.ca/lappoint**

Équipe mobile de crise Résolution (18+)
Offre des services d'intervention téléphonique, un suivi de crise en externe ainsi que des services d'orientation et de référence.
514 351-9592

Centre de crise Tracom
Ligne d'écoute, hébergement pour personnes en crise, service de référence, soutien et information pour les proches, Service mobile et suivi de crise, Intervention auprès d'une personne non-volontaire.
Tel : 514-483-3033 **tracom.ca**

Centre de crise de Québec
Intervention téléphonique, entrevue externe, équipe mobile; hébergement de crise, hébergement temporaire, soutien post-crise
418-688-4240 (Québec) **centredecrise.com**
1-866-411-4240 (Portneuf et Charlevoix)

Centre pour les victimes d'agression sexuelle de Montréal (18+)
Services de soutien et d'intervention bilingues pour les victimes d'agression sexuelle. Services médicaux et juridiques. Thérapie individuelle.
1-888-933-9007. **cvasm.org**

Association IRIS
Initiative de réinsertion sociale Centre d'intervention de crise, services d'hébergement pour homme en détresse, programme de soutien à la vie en logement, services résidentielles.
Tél : 514 381-8026 **associationiris.ca**

L'Autre Maison & Centre de périnatalité Longueuil
Urgences pédiatriques pour enfants 18 mois et moins, suivi médical, soirées prénatales adaptées, échanges et soutien en allaitement, rendez-vous de soutien individuel ou pour couple en personne.
450-332-9833 ou 514-768-7225 **lautremaison.ca**
450 286.1893 (urgence pédiatrique)

Autre Maison (Sud-Ouest de la Grande Montréal)
L'intervention téléphonique, l'intervention dans le milieu, l'hébergement temporaire, l'intervention post-traumatique, orientation et référence.
514 768-7225 **arrondissement.com/montreal/autremaison**

Centre de crise de l'Ouest-de-l'Île de Montréal (18+)
Services aux adultes en état de détresse psychologique ou psychosociale, ainsi qu'à leur entourage; l'intervention téléphonique, le service mobile d'intervention, l'hébergement temporaire.
514 684-6160 **arrondissement.com/montreal/centredecrisedelouestdelilledemontreal**

Centre de crise Le Transit au Centre-Est de Montréal
Soutien téléphonique, l'intervention sur les lieux de la crise, l'hébergement de courte durée, le suivi de crise, un service de référence, services aux personnes sourdes et aveugles et les joueurs pathologiques.
514 282-7753 **arrondissement.com/montreal/centredecriseletransit**

Centres D'Écoute

Tel-Aînés (60+)
Services pour toute personne de 60 ans et plus ainsi qu'à ses proches aidants naturels, un service téléphonique gratuit, anonyme et confidentiel d'écoute active, de prévention du suicide et de référence.
514 353-2463 **24/7**

Tel-écoute
Services gratuits, anonymes et confidentiels d'écoute active, de prévention du suicide et de référence.
514 493-4484 **24/7**

Tel- jeunes (20 ans et -)
Ligne de soutien et références pour enfants et jeunes.
1-800-236-2266 **24/7**
514-600-1002 (texto) **teljeunes.com/accueil**

Ligne pour parents
Soutien téléphonique et service de référence pour les parents d'enfants et jeunes âgés de 0 à 2 ans.
1-800-361-5085 **24/7**
fondationteljeunes.org/ligneparents

Sexual Assault Centre of the McGill Students' Society (SACOMSS)
Services anglophones, par telephone et en personne, pour les survivant(e)s de l'agression sexuelle.
514-398-8500 **Heures variables, consultez sacomss.org**

Trans Lifeline
Services de soutien téléphonique et de référence anglophone pour les personnes trans.
1-877- 330-6366 **24/7**
translifeline.org

Ligne de crise bilingue
1.866.996.0991 **24/7**

Gai écoute
Services de soutien anglophones pour les gens LGBTQIA2S+.
1-888-505-1010 **24/7**
514-866-0103 (Montréal) **gaiecoute.org**

LGBT Youthline
Services de soutien anglophones pour jeunes LGBTQIA2S+.
1-800-268-9688 **16h00 à 21h30, dimanche à vendredi**
1-647-694-4275 (texto) **youthline.ca**

GLBT Hotline
Ligne d'écoute anglophone pour des gens LGBTQIA2S+.
1-888-843-4564 **Heures variables, consultez glbthotline.org/hotline**

Ne vous inquiétez pas, on est ici pour vous.

Appendix 3. The PicMH-U and TextMH-U

Ça va $%#*@^?!# mal?

Centres de Crises – 24/7

Centre de crise l'Appoint
Offre des services d'intervention téléphonique, un suivi de crise en externe ainsi que des services d'orientation et de référence.
514-351-6661 centredecrise.ca/lappoint

Équipe mobile de crise Résolution (18+)
Offre des services d'intervention mobile ainsi que des services d'orientation et de référence.
514 351-9592

Centre de crise Tracom
Ligne d'écoute, hébergement pour personnes en crise, service de référence, soutien et information pour les proches. Service mobile et suivi de crise. Intervention auprès d'une personne non-volontaire.
514-483-3033 tracom.ca

Centre de crise de Québec
Intervention téléphonique, entrevue externe, équipe mobile; hébergement de crise, hébergement temporaire, soutien post-crise
418-688-4240 (Québec) centredecrise.com
1-866-411-4240 (Portneuf et Charlevoix)

Centre pour les victimes d'agression sexuelle de Montréal (18+)
Services de soutien et d'intervention bilingues pour les victimes d'agression sexuelle. Services médicaux et juridiques. Thérapie individuelle.
1-888-933-9007 cvasm.org

Association IRIS
Initiative de réinsertion sociale. Centre d'intervention de crise, services d'hébergement pour homme en détresse, programme de soutien à la vie en logement, services résidentielles.
Tél : 514-381-8026 associationiris.ca

L'Autre Maison & Centre de périnatalité Longueuil
Urgences pédiatriques pour enfants 18 mois et moins, suivi médical, soirées prénatales adaptées, échanges et soutien en allaitement, rendez-vous de soutien individuel ou pour couple en personne.
450-332-9833 ou 514-768-7225 lautremaison.ca

L'Autre Maison (Sud-Ouest de Montréal)
L'intervention téléphonique, l'intervention dans le milieu, l'hébergement temporaire, l'intervention post-traumatique, orientation et référence.
514-768-7225 arrondissement.com/montreal/autremaison

Centre de crise de l'Ouest-de-l'Île de Montréal (18+)
Services aux adultes en état de détresse psychologique ou psychosociale, ainsi qu'à leur entourage; l'intervention téléphonique, le service mobile d'intervention, l'hébergement temporaire.
514-684-6160 arrondissement.com/montreal/centredecrisedelouestdelileedemontreal

Centre de crise Le Transit au Centre-Est de Montréal
Soutien téléphonique, l'intervention sur les lieux de la crise, l'hébergement de courte durée, le suivi de crise, un service de référence, services aux personnes sourdes et aveugles et les joueurs pathologiques.
514-282-7753 arrondissement.com/montreal/centredecriseletransit

Centres D'Écoute

Tel-aînés (60+)
Services pour toute personne de 60 ans et plus ainsi qu'à ses proches aidants naturels, un service téléphonique gratuit, anonyme et confidentiel d'écoute active, de prévention du suicide et de référence.
514-353-2463 24/7

Tel-écoute
Services gratuits, anonymes et confidentiels d'écoute active, de prévention du suicide et de référence.
514-493-4484 24/7

Tel-jeunes (20 ans et -)
Ligne de soutien et références pour enfants et jeunes.
1-800-236-2266 24/7
514-600-1002 (texto) teljeunes.com/accueil

Tel-jeunes ligne parents
Soutien téléphonique et service de référence pour les parents d'enfants et jeunes âgés de 0 à 20 ans.
1-800-361-5085 24/7
fondationteljeunes.org/ligneparents

Sexual Assault Centre of the McGill Students' Society (SACOMSS)
Services anglophones, par telephone et en personne, pour les survivant(e)s de l'agression sexuelle.
514-398-8500 Heures variables, consultez sacomss.org

Trans Lifeline
Services de soutien téléphonique et de référence anglophone pour les personnes trans.
1-877-330-6366 24/7
translifeline.org

Ligne de crise bilingue
Ligne de crise bilingue pour la région d'Ottawa-Cornwall. 16+
1-866-996-0991 24/7
crisisline.ca

Gai écoute
Services de soutien anglophones pour les gens LGBTQIA2S+.
1-888-505-1010 24/7
514-866-0103 (Montréal) gaiecoute.org

LGBT Youthline
Services de soutien anglophones pour jeunes LGBTQIA2S+.
1-800-268-9688 16h00 à 21h30, dimanche à vendredi
1-647-694-4275 (texto) youthline.ca

GLBT Hotline
Ligne d'écoute anglophone pour des gens LGBTQIA2S+.
1-888-843-4564 Heures variables, consultez glbthotline.org/hotline

Tu n'es pas seul.e.

LES VARIABLES LIÉES À LA SANTÉ PSYCHOLOGIQUE

Ses sources de stress et ses ressources peuvent lui être personnelles (ex. : situation financière) ou être liées à son environnement (ex. : relation avec ses pairs).

Précarité financière et niveau d'endettement

La précarité financière et le niveau d'endettement ont été rapportés comme une des sources de stress et de tracas des étudiants et des étudiantes universitaires.

Sentiment de solitude

Le sentiment de solitude était l'une des trois variables les plus associées aux idéations suicidaires. Les deux autres variables étaient le désespoir et l'impuissance, mais ces dernières n'ont pas été mesurées, car elles ressemblent aux mesures de dépression et de burnout déjà présentes dans l'enquête.

Consommation de substances (alcool et drogues)

La consommation d'alcool et de certaines drogues est une pratique assez répandue chez la population en âge de fréquenter l'université. La consommation abusive d'alcool est étroitement liée à la dépression et au suicide. L'utilisation de drogues de loisir est présente sur les campus. L'utilisation de psychostimulants sans ordonnance est très mal documentée au Québec. Néanmoins, quelques articles de journaux commencent à rapporter qu'une certaine proportion d'étudiants et d'étudiantes en consomment pour augmenter leurs performances académiques.

Soutien de la part des collègues

En milieu de travail, le soutien par les collègues est lié à une diminution du stress vécu en emploi.

Climat psychologique au laboratoire de recherche

Le climat de travail fait référence à la manière dont une employée ou un employé se sent traité par son superviseur ou par sa superviseure. Cette variable est reliée à l'engagement dans son emploi, à l'effort qu'on y mettra et à sa performance. Dans le cadre d'études universitaires aux cycles supérieurs, le directeur ou la directrice de recherche fait office de superviseur ou de superviseure.

Charge de travail élevée, pression pour effectuer des heures supplémentaires et stress relié à l'écriture du mémoire ou de la thèse

Symptômes dépressifs

À l'échelle globale, 14,7 % des personnes ne rapportent pas de symptômes, 33,7 % en rapportent de légers, 29,6 % en rapportent de modérés, 15,8 % en rapportent de modérément sévères et, finalement, 6,2 % rapportent des symptômes sévères. Environ 52% de la population étudiante de l'Université de Montréal présente des symptômes dépressifs importants.

Détresse psycholoqique

Lorsqu'on compare avec les données de l'enquête sur la santé psychologique étudiante, on remarque que 64% des étudiants et étudiantes de l'Université de Montréal rapportent de la détresse psychologique plus importante que la population générale en rapportait en 2008. En effet, 64% de la population étudiante se trouve dans le quintile (20 %) de la population présentant le plus de symptômes de détresse psychologique.

Burn-out/Épuisement professionnel

Il y a trois sous-dimensions à ce syndrome. La première est un sentiment d'épuisement émotionnel si élevé que la personne sent qu'elle ne peut plus s'adonner psychologiquement à son emploi. La seconde est une attitude cynique par rapport à son emploi ou à ses clients et à ses clientes qui, lorsqu'elle s'aggrave, peut apporter un aspect de déshumanisation de ses collègues et/ou de ses clients et de ses clientes. La dernière facette est le fait d'être déçu de soi-même et de s'évaluer négativement par rapport aux autres. L'épuisement professionnel n'épargne pas les étudiants et les étudiantes postsecondaires.

Idéations suicidaires et tentatives de suicide

Les personnes les plus à risque sont celles qui présentent un trouble de l'humeur, par exemple une dépression, qui consomment abusivement de l'alcool ou des drogues et celles qui présentent des troubles mentaux graves, telle la Schizophrénie. Au Québec, le suicide est la cause de décès la plus fréquente chez les personnes de moins de 35 ans.

***Selon l'Enquête sur la santé psychologique des étudiants et étudiantes, FAÉCUM, 2016**

Centres de crise (24 heures par jour et 7 jours par semaine; services gratuits)

Centre de crise l'Appoint : Offre des services d'intervention téléphonique, d'hébergement temporaire, de consultation et soutien. Tél : 514 351-6661. Site web : https://www.centredecrise.ca/lappoint

Équipe mobile de crise Résolution (anciennement l'Entremise) : Offre des services d'intervention téléphonique, un suivi de crise en externe ainsi que des services d'orientation et de référence pour des personnes 18 ans et plus. Tél : 514 351-9592

Centre de crise Tracom : Ligne d'écoute, hébergement pour personnes en crise, service de référence, soutien et information pour les proches, Service mobile et suivi de crise, Intervention auprès d'une personne non-volontaire. Tel : 514-483-3033; Site web : https://www.tracom.ca/

Centre de crise de Québec : Intervention téléphonique, entrevue externe, équipe mobile; hébergement de crise, hébergement temporaire, soutien post-crise. Tél (Québec) 418 688 4240. Tél (Portneuf et Charlevoix) : 1 866 411 4240. Site web : http://centredecrise.com/nos-services/

Centre pour les victimes d'agression sexuelle de Montréal : Services de soutien et d'intervention bilingues pour les victimes d'agression sexuelle. Services médicaux et juridiques (18 ans et plus). Thérapie individuelle (18 ans et plus). Ligne d'écoute (pour toutes âges à Montréal): 514-934-4504. Service d'écoute sans frais (pour toutes âges) : 1-888-933-9007. Courriel: info@cvasm.ca. Site web: www.cvasm.org/

Association IRIS: Initiative de réinsertion sociale : Centre d'intervention de crise, services d'hébergement pour homme en détresse, programme de soutien à la vie en logement, services résidentielles. Tél : 514 381-8026. Site web : http://www.associationiris.ca

L'Autre maison, Centre de périnatalité (Longueuil) : Urgences pédiatriques pour enfants 18 mois et moins, suivi médical, soirées prénatales adaptées, échanges et soutien en allaitement, rendez-vous de soutien individuel ou pour couple en personne, Tél : 450.332.9833 ou 514 768-7225. Urgence pédiatrique: 450 286.1893. Courriel: info@lautremaison.ca. Site web : lautremaison.ca/

Autre maison, Centre de crise pour le sud-ouest de la Grande Montréal : L'intervention téléphonique, l'intervention dans le milieu, l'hébergement temporaire, l'intervention post-traumatique, orientation et référence. Tél : 514 768-7225. Plus d'information : https://www.arrondissement.com/montreal/autremaison

Centre de crise de l'Ouest-de-l'Île de Montréal : Services aux adultes en état de détresse psychologique ou psychosociale, ainsi qu'à leur entourage; l'intervention téléphonique, le service mobile d'intervention, l'hébergement temporaire. Tél : 514 684-6160. Plus d'information : https://www.arrondissement.com/montreal/centredecrisedelouestdeliledemontreal

Centre de crise le Transit (dessert le Centre-Est de Montréal): Soutien téléphonique, l'intervention sur les lieux de la crise, l'hébergement de courte durée, le suivi de crise, un service de référence, services aux personnes sourdes et aveugles et les joueurs pathologiques. Tél : 514 282-7753. Plus d'information : https://www.arrondissement.com/montreal/centredecriseletransit

Lignes d'écoute

Tel-Aînés (24/24, 7/7): Services pour toute personne de 60 ans et plus ainsi qu'à ses proches aidants naturels, un service téléphonique gratuit, anonyme et confidentiel d'écoute active, de prévention du suicide et de référence. Tél : 514 353-2463

Tel-écoute (24/24, 7/7) : Services gratuits, anonymes et confidentiels d'écoute active, de prévention du suicide et de référence. Tél : 514 493-4484

Tel- jeunes (24/24, 7/7): Ligne de soutien et références pour enfants et jeunes âgés de 5 à 20 ans. Ligne sans frais : 1800236 2266. Texto* : 514-600-1002. Par courriel : http://teljeunes.com/questions/poser. Forum : http://teljeunes.com/forums/participez. Site web : http://teljeunes.com/accueil

Ligne pour parents (24/24, 7/7) : Soutien téléphonique et service de référence pour les parents d'enfants et jeunes âgés de 0 à 2 ans. Ligne sans frais : 18003615085. Site web : http://www.fondationteljeunes.org/fr/ligneparents

Sexual Assault Centre of the McGill Students' Society (SACOMSS): Services anglophones, par telephone et en personne, pour les survivant(e)s de l'agression sexuelle. Heures variables, consultez http://www.sacomss.org/wp/ ou https://www.facebook.com/sacomss/?fref=nf pour les disponibilités de la semaine. Tél : 514-398-8500

Trans Lifeline (24/24, 7/7): Services de soutien téléphonique et de référence anglophone pour les personnes trans. Tél (sans frais au Canada): 1(877) 330-6366. Site web : https://www.translifeline.org/

Ligne de crise bilingue (24/24, 7/7, basée en Ottawa): Ligne sans-frais (Canada et États-Unis) : 1.866.996.0991
Gai écoute (24/24, 7/7): tel (Grande Montréal): (514) 866-0103; Ligne sans-frais (Canada et États-Unis) : 18885051010; clavardage en privé : http://www.gaiecoute.org/clavardage/# ; aide par courriel : aide@gaiecoute.org; d'autres services disponibles sur leur site web : http://www.gaiecoute.org/

LGBT Youthline : Services de soutien anglophones pour jeunes LGBT. Heures d'opération: 16h00 à 21h30, dimanche à vendredi. Ligne sans-frais (Canada et États-Unis) : 1-800-268-9688. Par texto : 1-647-694-4275. Par courriel : askus@youthline.ca. Par clavardage : https://m2.icarol.com/ConsumerRegistration.aspx?org=2356. Site web: http://www.youthline.ca/

GLBT Hotline : Ligne d'écoute anglophone (Canada et États-Unis) : Tél : 1-888-843-4564. Courriel : help@GLBThotline.org. Veuillez consulté http://www.glbthotline.org/hotline.html pour les heures d'opération.
Liste de lignes d'écoute anglophones pour personnes LGBT2QAI (Canada et États-Unis) : https://www.ostem.org/crisis-hotlines

Appendix 4. Consent Form

Outil de santé mentale

Bonjour,

Nous sollicitons votre participation à une étude visant à développer un nouvel outil de communication en lien avec la santé mentale pour les étudiant.e.s de l'Université de Montréal. Le développement de ces nouveaux moyens vise à permettre aux étudiants d'avoir une meilleure connaissance des services offerts en santé mentale afin qu'illes puissent mieux les utiliser.

La chercheur.e principal.e est Cherrilyn Birchwood, doctorant.e (PhD) en Psychologie – recherche et intervention à l'Université de Montréal. La recherche est dirigée par Dr. Christian Dagenais, professeur titulaire au Département de psychologie, et par Dr Gilles Dupuis, professeur titulaire au département de psychologie de l'UQAM. La/le chercheur.e principal.e et les directeurs de recherche font partie de l'Équipe RENARD, une équipe de recherche sur le transfert de connaissances.

Si vous acceptez de participer, vous aurez à répondre, en ligne, à une série de questions brèves. Vous n'avez pas à vous déplacer pour participer. Les questions visent à connaître vos perceptions de la santé mentale et les habitudes qui y sont associées. Vous aurez à lire un bref document (d'environ 5 minutes) ainsi qu'à répondre à un questionnaire (d'environ 10 minutes).

Nous vous demandons de faire le tout en une seule fois. Toutes vos réponses demeureront confidentielles et aucune information permettant votre identification ne sera collectée ni diffusée. La seule information d'identification que vous pourriez fournir est votre adresse courriel, dans le cas où vous accepteriez de participer à la deuxième partie de la recherche (un suivi bref à propos de la première partie de la recherche qui aura lieu 4 à 6 semaines plus tard), ou si vous aimeriez obtenir les résultats de cette recherche. Fournir une adresse courriel est complètement optionnel et votre adresse sera conservée séparément de vos réponses.

Vous êtes entièrement libre d'accepter ou non de participer et vous pouvez vous retirer en tout temps de cette tâche. Il n'y a généralement pas d'effets négatifs provoqués par ce type de questionnaire. Cependant, si une des questions vous met mal à l'aise, n'hésitez pas à nous en informer.

Pour toute information complémentaire concernant cette étude et plus particulièrement ce questionnaire, vous pouvez communiquer avec :

Cherrilyn Birchwood, PhD (c)
Doctorant.e en psychologie – Recherche et Intervention
Département de psychologie
Université de Montréal
cherrilyn.birchwood@umontreal.ca

Dr Christian Dagenais
Professeur agrégé
Département de psychologie
Université de Montréal
514-343-5789
christian.dagenais@umontreal.ca

Nous vous remercions de votre attention!

L'Équipe RENARD de recherche sur le transfert de connaissances

Projet approuvé par Comité d'éthique de la recherche en arts et en sciences, Certificat CERAS-2017-18-050-D

Appendix 5. User Satisfaction Questionnaire

Pour chaque proposition, indiquez à quel point vous êtes d'accord ou non en cochant votre réponse, sachant que 0 = pas du tout d'accord, 1 = plutôt en désaccord, 2 = indécis, 3 = plutôt d'accord et 4 = tout à fait d'accord.

1. Je suis satisfait.e de l'apparence générale de l'information présentée. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

2. Je comprendrais mieux l'information présentée s'il y avait plus de texte. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

3. J'aimerais que l'information soit présentée avec plus d'images et de graphiques. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

4. L'information est difficile à suivre. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

5. Je pense que cette méthode de présentation de l'information la rend plus facile à retenir. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

*6. Ce n'est pas facile de me souvenir de l'information. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

7. Je pense que cette information est facile à comprendre pour quelqu'un sans expérience dans ce domaine. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

8. *Ce sujet est impossible à comprendre avec aussi peu d'information *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

9. Je me sens plus informé.e sur la santé psychologique des étudiant.e.s. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

10. Je pense que je pourrais expliquer les facteurs qui touchent la santé psychologique étudiante en utilisant uniquement l'information présentée. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

Appendix 6. Sociodemographic Questionnaire

Questionnaire socio-démographique

Consigne : Veuillez choisir la réponse qui vous décrit le mieux ou écrit votre réponse dans l'espace consacré.

1. Quel âge avez-vous ? *

Your answer

2. Quel est votre genre? *

- ◯ Non-binaire, sans genre, non-genré.e, genre fluide, agenre
- ◯ Homme
- ◯ Femme
- ◯ Je ne souhaite pas le préciser

3. Êtes-vous d'une minorité ethnique visible au Québec (noir, autochtone, asiatique, hispanique, etc)?

- ◯ Oui
- ◯ Non
- ◯ Je ne souhaite pas le préciser

4. Si oui, le(s)quelle(s)?

- ◯ Noir
- ◯ Autochtone, Première Nation, Inuit, Métis
- ◯ Asiatique
- ◯ Latin.e
- ◯ Ethnicité mixte
- ◯ Je ne souhaite pas le préciser

5. Dans quel domaine étudiez-vous? *

- ◯ Psychologie, travail social, psychoéducation, etc
- ◯ Littérature, langues, cultures, etc
- ◯ Beaux-arts, musique, théâtre, etc
- ◯ Éducation, santé publique
- ◯ Sciences médicales (infirmerie, médecine, médecine dentaire, biomédical, veterinaire, etc)
- ◯ Sociologie, histoire, sciences politiques, etc
- ◯ Sciences dures (chimie, génie, physique, astronomie, épidémiologie, etc)
- ◯ Autre domaine

6. Où en êtes vous dans votre parcours académique? *

- ◯ Premier cycle
- ◯ Deuxième cycle
- ◯ Troisième cycle
- ◯ Stage postdoctoral
- ◯ Étudiant.e libre

7. Quelle est votre langue maternelle ? *

- ◯ Français
- ◯ Anglais
- ◯ Langues Créoles
- ◯ Langues Algonquines
- ◯ Inuit
- ◯ Espagnol
- ◯ Farsi
- ◯ Langues Chinoises (ex. Mandarin, Cantonais)
- ◯ Japonais
- ◯ Langues austronésiennes (ex. Tagalog)
- ◯ Arabe
- ◯ Italien
- ◯ Grec
- ◯ Roumain
- ◯ Langues nigéro-congolaises
- ◯ Punjabi
- ◯ Autre

8. Quelle langue utilisez-vous le plus souvent? *

- ◯ Français
- ◯ Anglais
- ◯ Langues Créoles
- ◯ Langues Algonquines
- ◯ Inuit
- ◯ Espagnol
- ◯ Farsi
- ◯ Langues Chinoises (ex. Mandarin, Cantonais)
- ◯ Japonais
- ◯ Langues austronésiennes (ex. Tagalog)
- ◯ Arabe
- ◯ Italien
- ◯ Grec
- ◯ Roumain
- ◯ Langues nigéro-congolaises
- ◯ Punjabi
- ◯ Autre

Appendix 7. IARSSM

Plusieurs affirmations sont présentées ci-dessous. Pour chaque proposition, indiquez à quel point vous êtes d'accord ou non en cochant votre réponse, sachant que 0 = pas du tout d'accord, 1 = plutôt en désaccord, 2 = indécis, 3 = plutôt d'accord et 4 = complètement d'accord.

Le terme « ressource psychosociale » y est employé à plusieurs reprises. Ce terme réfère aux services qui sont disponibles pour répondre aux besoins psychologiques et sociaux des étudiant.e.s.

Le terme « difficultés psychosociales » renvoie aux raisons pouvant amener quelqu'un à consulter les ressources psychosociales. Ce terme inclut les problèmes de santé mentale, difficultés affectives, troubles mentaux et enjeux personnels/interpersonnels. Des exemples de ces difficultés ont été présentés dans l'information que vous avez reçue dans la Section 3.

1. Il y a certains problèmes qui ne devraient pas être discutés en dehors du cercle familial. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

2. J'ai une idée précise de ce qu'il faudrait faire et à qui m'adresser si je décidais de chercher de l'aide pour des difficultés psychosociales. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

3. Si je souffrais de difficultés psychosociales, je ne souhaiterais pas que mon entourage (ami.e.s, famille, amoureux.se...) soit au courant. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

4. Garder l'esprit focalisé sur son travail est une bonne façon d'éviter les soucis et les préoccupations personnelles. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

5. Si de bons amis me demandaient mon avis sur un problème d'ordre psychologique, je leur proposerais de consulter une ressource psychosociale. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

6. Avoir été reconnu comme ayant souffert d'un problème de santé mentale implique de supporter le fardeau de la honte. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

7. Je pense qu'aller consulter une ressource psychosociale me ferait plus de mal que du bien. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

8. Si j'éprouvais une difficulté psychosociale sérieuse, je serais confiant.e de pouvoir trouver de l'aide d'une ressource psychosociale. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

9. Les gens devraient régler seuls leurs problèmes; demander l'aide d'une ressource psychosociale ne devrait être qu'en dernier recours. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

10. Si je devais rencontrer des difficultés psychosociales, je pourrais facilement obtenir de l'aide d'une ressource psychosociale si je le souhaitais. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

11. Si les personnes importantes dans ma vie découvraient que je souffre de difficultés psychosociales, elles auraient une moins bonne opinion de moi. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

12. Les difficultés psychosociales, comme beaucoup de choses, tendent à se régler par elles-mêmes. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

13. Si j'avais des difficultés psychosociales, il serait relativement facile pour moi de trouver du temps pour aller consulter une ressource psychosociale. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

14. Il y a des expériences dans ma vie dont je ne discuterais avec personne. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

15. Si j'étais soucieux.se ou bouleversé.e pendant une période de temps, je souhaiterais obtenir l'aide d'une ressource psychosociale. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

16. Je serais mal à l'aise de chercher l'aide d'une ressource psychosociale pour des difficultés psychosociales car les gens dans mon entourage social ou professionnel pourraient le découvrir. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

17. Avoir été diagnostiqué comme ayant un trouble mental « entache » profondément la vie de quelqu'un. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

18. Il y a quelque chose d'admirable dans l'attitude des gens qui veulent faire face à leurs conflits et à leurs peurs sans avoir recours à l'aide d'une ressource psychosociale. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

19. Si je pensais être en dépression, mon premier réflexe serait de consulter une ressource psychosociale. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

20. J'appréhenderais d'aller consulter une ressource psychosociale à cause du regard de certaines personnes. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

21. Les gens avec un caractère fort peuvent surmonter eux-mêmes leurs difficultés psychosociales et ils ont peu besoin de l'aide d'une ressource psychosociale. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

22. Je confierais volontiers des choses intimes à une personne compétente si je pensais que cela pourrait m'aider ou aider un membre de ma famille. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

23. Si j'avais reçu une intervention pour des difficultés psychosociales, je n'aurais pas le sentiment que cela doit être "caché". *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

24. Je serais gêné.e si mon voisin me voyait entrer dans un service qui s'occupe des difficultés psychosociales. *

	0	1	2	3	4	
Pas du tout d'accord	○	○	○	○	○	Complètement d'accord

Appendix 8. Example of Multiple-Choice Resource Questionnaire

S'il vous plait, dites-nous si vous avez déjà entendu parler, déjà utilisé ou si la ressource pourraient être pertinente ou non, dans votre vie actuelle.

1) Centre de crise l'Appoint *

- ◯ 1) Non, je n'en ai jamais entendu parler
- ◯ 2) Non, je n'en ai jamais entendu parler et cette ressource ne sera pas utile dans mon cas
- ◯ 3) Non, je n'en ai jamais entendu parler, mais je trouve que cette ressource sera utile dans mon cas
- ◯ 4) Non, je n'en ai jamais entendu parler, mais je compte utiliser cette ressource dans les prochaines 6 semaines.
- ◯ 5) Oui, j'en ai entendu parler, mais je n'ai pas utilisé cette ressource
- ◯ 6) Oui, j'en ai entendu parler et j'ai déjà utilisé cette ressource pour moi ou quelqu'un d'autre
- ◯ 7) Oui, j'en ai entendu parler et je compte utiliser cette ressource dans les prochaines 6 semaines.

Appendix 9. Self-Reported Use of Resources

2. S'il vous plait, indiquez si vous avez utilisé une ou plusieurs des ressources ci-dessus dans les dernières 4 à 6 semaines.

- [ ] 1) Centre de crise l'Appoint
- [ ] 2) Centre de crise Tracom
- [ ] 3) Centre de crise de Québec
- [ ] 4) Centre pour les victimes d'agression sexuelle de Montréal (CVASM)
- [ ] 5) Équipe mobile de crise Résolution (18+)
- [ ] 6) Association IRIS
- [ ] 7) L'Autre Maison & Centre de périnatalité Longueuil
- [ ] 8) L'Autre Maison (Sud-Ouest de Montréal)
- [ ] 9) Centre de crise de l'Ouest-de-l'Île de Montréal (18+)
- [ ] 10) Centre de crise Le Transit au Centre-Est de Montréal
- [ ] 11) Tel-Aînés (60+)
- [ ] 12) Tel-écoute
- [ ] 13) Tel-jeunes

- [ ] 14) Ligne pour parents
- [ ] 15) Sexual Assault Centre of the McGill Students' Society (SACOMSS)
- [ ] 16) Gai-écoute
- [ ] 17) Trans LifeLine
- [ ] 18) LGBT Youth Line
- [ ] 19) Ligne de crise bilingue de la Région Ottawa-Cornwall
- [ ] 20) GLBT Hotline (anglophone)
- [ ] J'ai consulté une autre ressource qui n'est pas sur cette liste
- [ ] Je n'ai pas consulté des ressources dans les dernières 4 à 6 semaines
- [ ] Other...