



Master of Philosophy: Biokinetics
Minor Dissertation

WesternCape on Wellness



Creating A Culture Of Wellness Together

**The Evaluation of Social Media to Increase
Engagement Rate, Reach and Health Education:
The case for WoW!**

Feroza Lekota
LKTFER001

Research Centre for Health through Physical Activity, Lifestyle & Sport
Division of Physiological Sciences, Department of Human Biology
Faculty of Health Sciences, University of Cape Town

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

DECLARATION:

I, Feroza Lekota, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

I empower the university to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

Word Count: 18 602

Date: 14.02.22

Signature:

Acknowledgements:

I would like to thank the Western Cape Department of Health and the Westerncape on Wellness Programme for their funding support of my academic bursary, and for the use of their database.

I would also like to thank colleagues for their assistance with the meta-analysis, specifically, Roger Woodruff for assistance with the journal articles screening, and Estelle Lambert for assistance with quality assessment.

I would like to thank Dr. Frederick Marais & Joanna Janse Van Rensburg from the WoW! program for their time and resources in making this research possible.

Table of Contents

ABSTRACT	5
CHAPTER.1	6
Do Facebook driven health campaigns change health behaviour and promote user engagement? A Meta-analysis	6
INTRODUCTION:	
<i>Social media & behaviour Change</i>	6
<i>Social media User Engagement</i>	6
<i>Harnessing Facebook for Health Promotion and Behaviour change</i>	7
METHODS:	
<i>Information sources and search strategy</i>	8
<i>Data extraction</i>	9
<i>Data synthesis</i>	10
RESULTS:	
<i>Trial Identification</i>	11
<i>Characteristics of included studies</i>	11
<i>Theoretical framework</i>	13
<i>Health Education</i>	14
<i>Social support</i>	15
QUANTITATIVE AND NARRATIVE DATA SYNTHESIS	
<i>Risk of methodological bias</i>	15
<i>Intervention and follow-up duration</i>	15
QUANTITATIVE DATA SYNTHESIS: EFFECTIVENESS OF INTERVENTION:	
<i>Two-group analysis (controlled):</i>	16
DISCUSSION	19
LIMITATIONS	20
CONCLUSION	21
CHAPTER.2	
Does the “WoW! Live Well, Be Well” Social media Campaign Change Healthy Lifestyle Behaviour and Increase Engagement...	
INTRODUCTION:	
<i>Mass Media Campaign in Health Sector</i>	44
<i>South African Context</i>	46
<i>Behaviour Lifestyle Change</i>	46
CHAPTER 3	
METHODS:	
<i>Study & context setting</i>	48
<i>Dose delivered</i>	48
<i>Data Source</i>	49
<i>Process Measure and analysis plan</i>	49

<i>Information collection and analysis</i>	50
<u>RESULTS:</u>	
<i>Per Post Analysis</i>	50
<i>Characteristics of Facebook Posts</i>	52
<i>Thematic analysis</i>	54
CHAPTER 4	
<u>DISCUSSION:</u>	
<i>Social media engagement</i>	55
<i>Study limitations</i>	57
<i>Strength & Practical Application</i>	58
<u>CONCLUSION</u>	59
<u>REFERENCES</u>	61

ABSTRACT

Introduction: In 2021, South Africans had a 51.9 percent chance of dying from an NCD. The WesternCape on Wellness (WoW!) program advocates for wellness, through partnership, innovation and policy, including health in communities, worksites and schools. Increasing knowledge and awareness regarding health behaviors and NCD risk factors is an important pathway in preventing and mitigating the problem at hand through a combination of structural and social policy change. Social media provides an unprecedented opportunity and innovative way to provide a solution to the problem. The internet has increasingly become a popular source of health information by connecting individuals with health content, experts, and support. **Aim & Objective:** To use a social media campaign with expert knowledge to change healthy lifestyle actions and increase health knowledge and engagement in a para-social western cape on wellness social media group.

Methods: A mixed methods quantitative and qualitative analysis was undertaken to assess key messages, which were publicly available on the WoW! Facebook group. 60 lifestyle messages were posted on the WoW! Facebook group 5 times a week from Monday through to Friday. Each message was disseminated by a moderator and followed a theme for the day. Three icons were used to measure levels of participant engagement likes, shares, comments. Associated comments were extracted and coded using a codebook based on items from the supportive accountability model and peer social support analysis. The identified search material was reviewed allowing removal of any personally identifying or geographical material in order that that the comments were rendered anonymous.

One-way ANOVA was performed to determine whether level of likes, shares and comments differed between posts. One-way ANOVA was performed to determine whether level of engagement differed between post types, with Tukey-Kramer test used to determine post hoc differences. An independent-samples t-test was conducted to determine whether total engagement differed between moderator-initiated posts and Facebook user-initiated posts.

Results: The most common form of engagement was "likes," and engagement was higher for moderator-initiated rather than participant-initiated posts. Overall traffic to the page increased over the 3 month period from 1083 WoW! Facebook users to 1300. Likes were the most common and easiest form of engagement ($M=7.6$, $SD 9.8$) with comments being the lowest ($m=0.81$, $SD 2.3$). The most engaged with and resonative messages were the #transformationthursday posts. Empirically physical activity behaviour and change in eating patterns did increase over time. The 7 main themes that were identified constituted 53.3% (112/210) of all comments in the pre and during campaign analyses. The most prevalent theme was social cohesion and connectedness at 29% (33/112). The least common theme was developing professional communication and organisational support at 4.5% (5/112). Overall, there were more comments before the campaign ($n=63$), than during ($n=49$). In terms of Geographical proximity most of the comments and posts came from participants in the Metro (58.3%) and rural districts Paarl (48.3%) and George (40%). A proximal or virtual tie to a place adds connection and thus value to the information.

Conclusion: The favourable results of the WoW! Facebook campaign shows promise for future social media-driven health campaigns to educate and prevent lifestyle related chronic conditions. Social media content for knowledge sharing should be created through a well-intentioned process with the support of moderators to facilitate the conversation and drive engagement.

Chapter.1

Does social media driven health campaigns change health behavior and promote user engagement? A Systematic Review and meta-analysis

INTRODUCTION

According to The World Economic Forum, noncommunicable diseases (NCDs) are one of the major health and development challenges of the 21st century (WEF, 2014), in terms of both the harm to the economy and health (LMICs, Abdulkadri et al., 2021). The most useful way of mitigating NCDs is therefore based on preventative behavior. Improving health has become the responsibility of all stakeholders in society. The way forward in public health may be addressed through a combination of structural change and through supporting and promoting positive health behavior change of individuals (Kelly et al., 2016).

Social Media and health behavior change

Recent evidence suggests that health behavior change requires more than knowledge or health education (Arlinghaus et al., 2018). There needs to be additional elements such as social influence, skills, and opportunities to change behavior. Social media provides unprecedented opportunities for increasing knowledge and awareness regarding health behaviors and NCD risk factors. Further, social media has the potential to influence social norms, enhance motivation and increase self-efficacy for behaviour change (Neiger, et al., 2012). Social media, defined here as an internet-based application that allows for the creation and exchange of user-generated content, provides a means for rapidly and inexpensively reaching a broad audience with health information through applications such as Facebook, Instagram, and Twitter (Kaplan et al., 2010). The Internet has increasingly become a popular source of health information by connecting individuals with health content, experts, and support (Song et al., 2016). Creating messages that engage users is critical for enhancing message impact and dissemination (Rus et al., 2016). While doctors and other health professionals contribute to online health information, a growing amount of health information on the Internet originates from individual patients sharing experiences (Ventola et al., 2014).

Research shows there are two types of health information: information produced by the experts and subjective first-hand experiences of health and illness by an individual (Tuckett, et al., 1985). User-generated information emerges from “enormous knowledge assets that reside in collectives and communities” (Metzger, et al., 2011). Using social media to transmit and gain knowledge aids individuals to form online communities through shared experiences. According to Social Learning Theory (Bandura, 1979), an individual's behavior is determined by how they interact with their surroundings. Social media, therefore, offers interactions for communities to share their experiences and develop opportunities to connect for health and social reasons (DeAndrea et al., 2012). In a society where individuals search social media for health information more frequently than they communicate with their doctors (Ventola et al., 2014), understanding the consequences of using online resources is vital for keeping stride with evolving health care and evolving communication strategies. However, concerns of source credibility, the accuracy of source information, and the authoritative voice behind the information cannot be underestimated (Keshavarz, 2020).

Social Media User Engagement

Business Tech (www.businessstech.co.za, 11 July 2021) reported that there were at least 2.24 billion Facebook users, 1.9 billion YouTube users and 1.5 billion WhatsApp users worldwide. During the COVID-19 pandemic, social media, and networking platforms such as Facebook, Twitter, Instagram, Snapchat, YouTube, WhatsApp, and online health support groups, have been used increasingly by the public to gather health information (Tsao et al., 2021). Despite the “digital divide”, the gap between demographics and regions that have access to modern information and communications technology and those that don't, the reality is that most individuals even in low-income communities have access to social media (Shava et al, 2018). These social platforms have become a channel for communication and knowledgesharing amongst family, friends, and communities. Using social media to galvanize communities through engagement can create or influence the social norms required to change behavior (Latkin et al., 2015).

Generating engagement is important because it not only reflects the ability of the content to capture the attention of users but also directly influences the reach of content (Kite et al., 2016). Previous research has found that users of social networking sites such as Facebook primarily share information on these platforms when they believe the information is beneficial to others (Edosomowan et al., 2011). There is a great deal of enthusiasm for, and less information or data on understanding of the connection between online engagement and behavior change (Freeman et al., 2015). Strong evidence (Hair et al., 2017; Lelutiu-Weinberger et al., 2015) “indicates that public health social marketing campaigns conducted through mainstream media can have a direct and positive effect on behavior”. Building the base for implementing health promoting campaigns through social media will require applying what is known to work in traditional media channels and developing new methods that incorporate the unique features of social media (Eysenbach, 2008).

Harnessing social media for health promotion and behavior change

The World Health Organization (WHO, 2016) describes health promotion as “the process of enabling individuals and communities to increase control over, and to improve their health”. While health professionals have an important part to play in nurturing health promotion, intersectional collaboration is important (Corbin et al., 2016). “Health promotion professionals have been quick to recognize the potential of social media for reaching broad audiences in social marketing campaigns and enabling and empowering consumers in their health and health care–related interactions” (Thackeray, Neiger, Hanson, & McKenzie, 2008). To this end, there are examples whereby the Facebook platform has been used to recruit participants for health promotion research, provide online information and education and to offer theory-based, interactive health behavioural interventions (Bosak et al., 2018; Whitacker et al., 2017). Furthermore, Facebook has the capability of creating targeted or specialized groups, with common purpose or goals. The group platform offers the option of a private, convenient, reliable members-only site that can be adapted to motivate and support health behavior change interventions. An advantage of using Facebook to enable health behavior interventions is the high level of individual engagement. This is an important in promoting positive health behavior change.

Therefore, the aim of this meta-analysis was to gain a better understanding of the effectiveness of social media platforms, in changing behavior for health promotion, as well as user engagement. This meta-analysis seeks to 1) examine the role of social media for health

behavior change 2) how social media is being used for engagement 3) the effectiveness of social media for health promotion. The analysis builds upon a previous systematic review covering studies from 2006-2013 (Maher, et al). This paper firstly provides an updated review of studies published between 2014-2019 and secondly applies meta-analysis to estimate social media intervention/treatment effect sizes.

METHODS

Information Sources and Search Strategy

This review was undertaken and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The final search was completed in November 2019, and included four electronic databases: Pubmed, Medline, Scopus and Africa-Wide. Each database was searched individually and the search strategy for the Medline database is represented in Table 1 as an example. Pre Covid-19 the database search was limited to journals published in English between January 2014 and November 2019. During Covid-19 another search was done in November of 2021 to consider new research in the field. This search did not yield any new results due to inaccessibility of a pay wall as well as some of them being a narrative review and some not aligned with the inclusion criteria. Reference lists of articles identified were further hand searched to source additional articles. In addition, reference lists of previous systematic reviews or literature reviews identified here were also screened to identify potential articles.

Table 1. The search strategy used for all databases

Databases	Search Strategy	Search Items
Africa Wide Medline Pubmed Scopus	1. Social media	Social Networking OR social network.mp. OR social media.mp. OR social media/ OR Facebook
	2. Health Promotion	Health campaign OR Mass media campaign
	3. Behavior Change	Diet OR nutrition OR healthy eating OR Food habits OR Vegetables OR Snack food OR Physical activity OR exercise OR Sedentary lifestyle OR sitting OR inactive or Healthy lifestyle actions
	4. User Engagement	Likes OR Shares OR Comments OR clicks OR Traffic
	5. Combined	1 AND 2

Eligibility Criteria

A three-step method was followed to identify the studies that were included in the final review. Databases were searched by two reviewers to identify potential titles and abstracts. The titles and abstracts were screened for eligibility by three reviewers independently (FL, EL, RW) using the inclusion and exclusion criteria outlined in Table 2. We did not have any restriction about the population; we took any relevant publications regardless of the age, the origin, or the gender

of the studied populations. The reference lists of all papers included, identified in the original search were checked to find additional publications that met the inclusion criteria. After all duplicates were removed, and articles assessed for eligibility, 20 studies were selected for full text extraction. (Fig.1).

Table 2. Inclusion and exclusion criteria used in the selection process

Exclusion	Inclusion criteria used to select articles incorporated in the systematic review
<ul style="list-style-type: none"> • Conference proceeding, letters, blogs, conference abstracts, non-peer reviewed • Studies not utilizing social media • Studies not using health research • Studies on mental & sexual health 	<ul style="list-style-type: none"> • Date Range: January 2014 – November 2019 • Language: English • Journal type: Peer Reviewed • Any study design for example randomized control trial, cross sectional survey, mixed methods • Social media /Facebook was used as a tool for health promotion or health campaign and user-engagement

Articles were included if they met the following criteria: Published between January 2014 and November 2019, available in full text, in English and peer reviewed. Study design was not limited to randomized controlled trials, if the intervention included social media, promoting healthy diet and/or exercise behaviors in the general population (Table 2). Interventions using social media, alone or as part of a complex intervention, were included based on Kaplan and Haenlein’s classifications (Kaplan et al., 2010). Any outcomes related to lifestyle behavior change were considered for inclusion in this review. Even though they fall under wellness, sexual and mental health studies were excluded as they were not the focus of this study. Future research will possibly include these health issues.

Outcomes

The online social media intervention had to target one of the following individual modifiable health behaviors identified by the World Health Organization as leading risk factors for global disease burden (WHO, 2016): tobacco smoking, alcohol use, physical inactivity, or unhealthy eating and obesity. For inclusion in the review, the study had to report data regarding the effectiveness of behavior change (e.g., change in physical activity behavior [min/d]). Additionally, studies were included if they reported variables closely related to behavior change. This included studies of potential mediators of behavior change (e.g., dietary awareness or physical activity self-efficacy), or “downstream” variables (i.e., variables that may have conceivably been impacted by health behavior change, e.g., quality of life or body weight). Even though sexual and mental health are part of the wheel of wellness, these articles were excluded because they were not relevant at the time of the study.

Data extraction

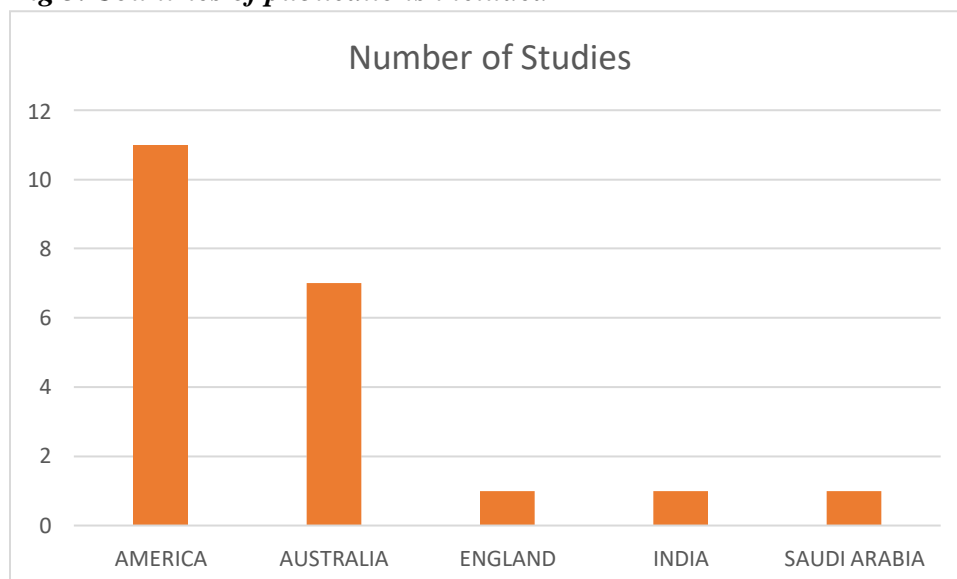
Data from articles were extracted by two reviewers using a customized, pre-set summary table in which the following items were recorded: (1) name(s) of the author(s), (2) year of publication,

(3) country where the study was conducted, (4) purposes of the studies related to the use of social media or text message reminders, (5) setting of the study (e.g., university, school, clinic, community), (6) the groups receiving social media posts and the comparison or control condition, (7) study design, (8) number of participants enrolled in the study, and 9) response rate of the studies, (10) objectives (or underlying behavioral theory) of posts and texts, (11) dose of the intervention based on social media message posts (e.g., the number of key message reminders, how often key messages were sent), and the timing (e.g., the time of day or week the message was sent; the time of a reminder before a specific intervention) of the intervention were extracted, (12) outcome measures, (13) instruments used to measure the outcomes of the intervention based on social media messages and posts (e.g., names of the instruments used), and (14) outcomes of the intervention. Outcomes were described as increased, decreased, or unchanged (for narrative synthesis) or according to standardized mean difference (for meta-analysis). The data extraction was based on the CONSORT-EHEALTH checklist (<http://citeseerx.ist.psu.edu>) where possible.

Quality Appraisal

The methodological quality of the studies was appraised with the Mixed Method Appraisal Tool (MMAT) by Pluye et al, 2018. The method was designed to review the methodological quality in systematic literature reviews that include qualitative, quantitative, and mixed methods studies. For evaluating qualitative studies, Section 1 of the MMAT was used, which contains items related to data sources, data analysis, context, and researcher’s influence. Section 2 of the MMAT was used to evaluate randomized controlled studies; it contains items related to randomization, allocation concealment, assessment of outcome data and completeness of follow-up (drop-out). Section 3 was used for non-randomized studies; it contains items related to participants’ recruitment, outcome measurements, comparability of groups, and completeness of outcome data. Section 4 was used for descriptive studies; it contains items related to relevant sampling strategy, representativeness of the sample, outcome measurements, and acceptability of the response rate. Each item was scored as “yes”, “no”, or “can’t tell” Pluye, 2018. In 15% (3/20) of the studies, the quality score was 4/4, meaning that all four criteria were met. In 90% (18/20) of the studies, the quality score was 3/4. In 95% (19/20) of the included studies, the quality score was 3/4 or 4/4, indicating the methodological quality of the included studies.

Fig 3. Countries of publications included



Data Synthesis

Data from the included studies were analyzed with Open meta-Analyst (V0.-2018) using random effect models. Studies with two groups (including control) were analyzed using standardized mean difference. Studies with a single intervention group were analyzed using a mean percentage change in engagement. Variation in effect size was assessed between studies using the I statistic, with an $I > 50\%$ interpreted as indicating the presence of heterogeneity.

RESULTS

Trial Identification

The initial searches yielded 3252 titles, of which 2721 were excluded as shown in the PRISMA diagram presented in Figure 2. A total of 531 abstracts were subsequently screened, of which 451 were excluded, for reasons presented in Figure 2. Of the remaining 80 articles, a further 60 were excluded as the focus was not on health promotion or user engagement. Twenty articles were then available for full-text review and data extraction. Summaries of the included studies are presented in Table 5. Table 5.1 represents the user engagement studies and Table 5.2 represents the behavior change studies. The 20 studies that were included in this review were then divided into categories involving health promotion (5 studies), engagement (5 studies) and behavior change (10 studies). Under behavior change, the studies were also grouped according to outcome, including physical activity (seven studies), weight change (four studies), and dietary change (three studies).

Characteristics of the Included Studies

The studies included participants of all ages and backgrounds, largely conducted in the United States 55% (11/20), followed by Australia (Figure 1). Of the included studies 80% (14/20) had a quantitative design, one (1) had a qualitative design, and five (5) used both quantitative and qualitative designs. Over two-thirds (75%, 15/20) of the studies were randomized controlled trials (RCT), and the remainder were observational, quasi-experimental, cross-sectional studies and qualitative descriptive studies. The most common participant groups described were individuals who suffered from obesity or enrolled with the goal of weight management (45%, 9/20) diabetes (40%, 8/20), cancer (25%, 5/20), or hypertension (20%, 4/20). Other patient groups are described in more detail in Appendix 2. The sample size of the studies varied from 14 participants to 450. In half of the studies (50%, 10/20), the sample size was less than or equal to 100. In 3 studies (15%, 3/20) the sample size was shown as the number of fans/groups, not participants. The response rates of the studies varied from 41-90%. Descriptive characteristics of the included studies are presented in more detail in Multimedia Appendices 1 and 2.

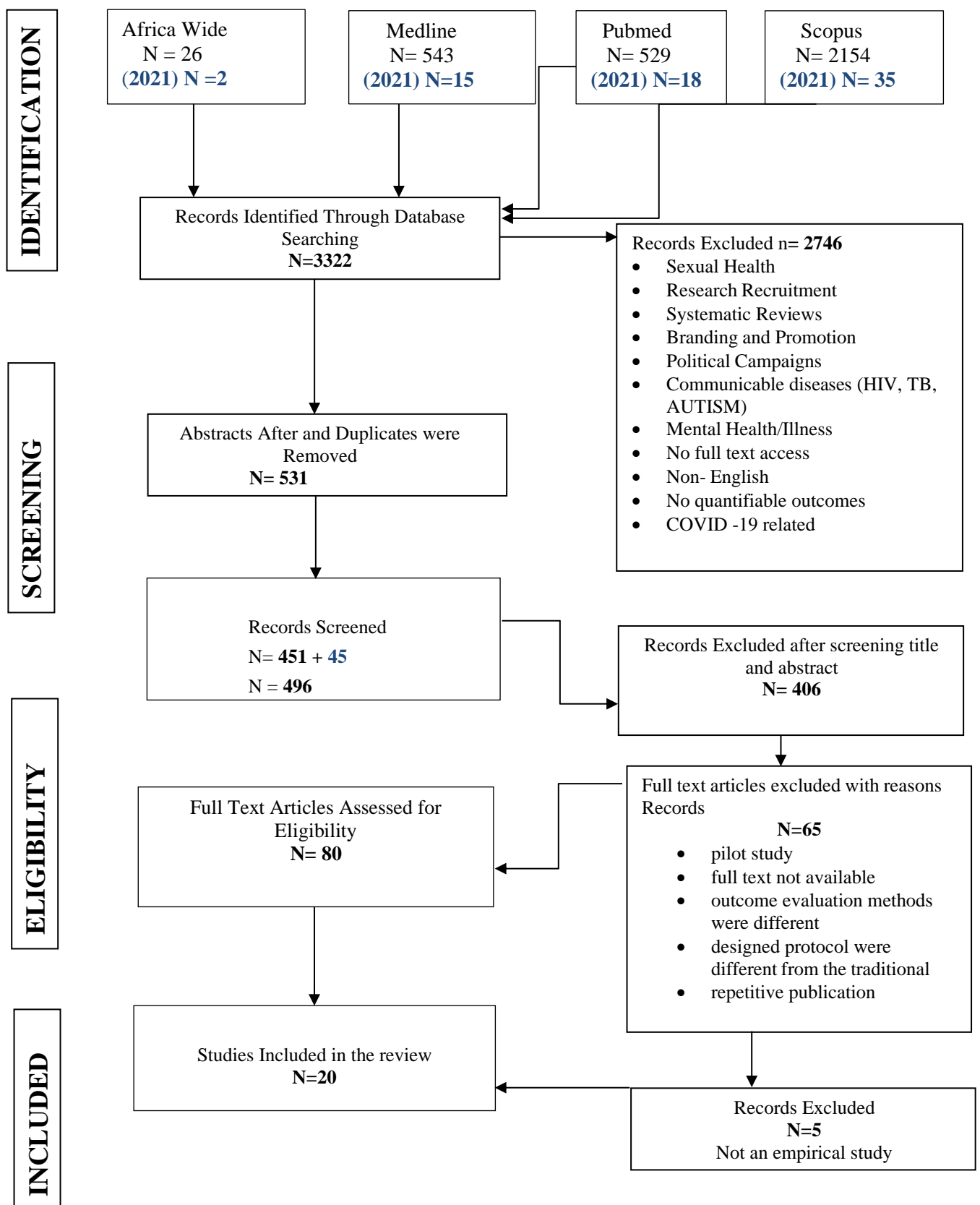


Fig.2. Summary of data collection process

Social media intervention and study characteristics (narrative synthesis)

Purpose of Social media used in health promotion

There were 6 studies that measured the effects of social media on health promotion (Andrade et al., 2018; Al Qarni et al., 2016; Joseph et al., 2015; Loh et al., 2018; Merchant et al., 2016 and Syred et al., 2014). All 6 studies fall in the high quality of evidence on the MMAT (mean 3.3; range 3-4 points). There were variations in sample sizes, populations studied, outcome measures used, dosage of key messages and length of intervention (Table 6).

The purpose of the study, description of the interventions, dose, and timing were extracted to describe the purposes of key messages used in health care. Key messages were used to remind participants to set achievable goals and to record their step count or weight loss in about 35% of the studies (7/20). A multifaceted approach was used including educational text and key messages (7/20) (studies by Andrade, Al Qarni, Edney, Hales, Krishnamohan, Syred and Valle), informational text and key messages about disease and healthy living (45%, 9/20) (studies by Berends, Joseph, Merchant, Hales, Jane, Krishnamohan, Loh, Raggat and West), supportive text and key messages for lifestyle change (studies by Al Qarni, Maher, Valle and West) or to promote diary data collection (studies by Maher, Merchant and Ryan 2014).

In the studies by Loh (2018) and (Zhang et al., 2016) reminders were sent as non-interactive neutral pictures delivered as an SMS. This means that scheduling posts at the correct time may offer the most social exchange value. In 90% (18/20) of the studies, the dose was reported as how often the text message reminder was sent, so that the most common dose was to send the key message reminders daily (60%, 12/20) (Al Qarni et al., 2016). In 35% (7/20) of the studies, the dose was reported as the number of key messages sent overall, and in 15% (3/20) of the studies, the dose was reported to depend on participants' preferences. The timing was reported as the time of the day and weekday (e.g, Monday morning, evening) or as a certain time (eg, 10 a.m., 8 p.m.) in 15% (3/20) of the included studies. In 20% (4/20) of the studies, the timing was reported to be based on participants' personal needs. However, in 70% (14/20) of the studies, the time of sending text messages was not reported (Multimedia Table 6).

Five of the six studies (Merchant et al., 2014; Syred et al., 2014; Al Qarni et al., 2016; Joseph et al., 2016 and Andrade et al., 2018) reported positive results for using social media for health promotion. Al Qarni et al. (2016) reported an increase in knowledge sharing and awareness on diabetes. An increase in physical activity and reduction in BMI was reported by Andrade et al. (2018) and Joseph et al. (2015) & Syred et al. (2014) were the only studies that reported a negative result. This was mainly due to lack of continued interaction from the moderator and self-sustaining conversation among the participants. The key messages posted did not respond to the needs of the users.

Theoretical Framework

Some studies used theoretical frameworks to inform the design of application features and intervention content. This included individual behaviour models like the transtheoretical model (Thrul et al., 2016), theory of reasoned action, self-determination theory, trans-contextual model of motivation (Berends, 2016), COM-B system (Nour et al., 2019) and theory of planned behaviour (Maher, 2014 & Merchant, 2014). One used the Attitude-Social Influence-Self-efficacy model based on the theory of planned behaviour specific to fruit and vegetable consumption (Krishnamohan, 2017). Three studies used interpersonal behaviours models such as

control, social cognitive (Zhang, 2015; Maher, 2015 and Raggat, 2019), and social network theories (Andrade, Ryan & Valle 2016). One accounted for broader influences using ecological models of health behaviour (Jane, 2018). One study described using general cognitive behavioural strategies (Joseph, 2015) or behavioural change techniques (Nour, 2019) to design interventions. Technology use theories, such as the theory of interactive technology, were also used (Ryan et al., 2017). Three studies did not report using theoretical frameworks (Al Qarni, 2016; Loh, 2016 & West, 2016)

Social Media features and devices

Social media features were categorized based on the function, purpose, or activity for which they were used and by specific platforms. The three main functions of social media in the interventions were 1) to facilitate communications and relationships among peers; 2) to support self-monitoring 3) to share content among caregivers, networks, and participants. the researcher expanded on these below.

One of the more common uses of social media was to facilitate communication, relationship building, and social support among peers. In (Andrade et al., 2018) posts often contained photos, videos, and branded advertisements that portrayed local Adelante youth, whom participants knew first-hand, thus likely increasing youth interest. These posts also included content that promoted informed messages and disseminated information related to health promotion and risk prevention. In some cases, interactions were open-ended to allow participants to organically discuss topics of interest. In studies by (Joseph et al., 2015) and (Al(Qarni, 2016) Facebook posts were used as discussion topics for participants to share their experiences and engage in dialogue on living a healthy lifestyle and managing chronic disease(diabetes).

Social media was also used to support sharing of tracking activities. (Merchant et al., 2014) included diet- and exercise-related games and challenges with an application enabling the posting of results to other participants or publicly to the broader platform membership. In addition to sharing of goal setting, diet and physical activity logs, quizzes were offered to assess nutrition knowledge. Behavioral dietary challenges were used to increase engagement for healthy eating and personal and group challenges promoted increases in physical activity. Reward systems, were popular for incentivizing intervention activities such as completing quizzes, viewing and reading content, playing games and providing comments and feedback to other users.

Health Education

The most common educational component of the social media studies included in this review was prevention and awareness of a particular chronic, non-communicable diseases, through multiple strategies and approaches. These included sharing recipes, infographics and photos of healthy foods, sharing of the latest research, as well as participant experiences (Al Qarni, 2016& Merchant, 2014). Several studies included social media features for teaching participants how to understand behaviour and situations that lead to healthy living triggers (Joseph, 2015 & Merchant, 2016), such as stress and special occasions. One study extended this to teach cognitive approaches (problem solving, action planning) to manage such issues. Along with nutrition, interventions integrated educational content on physical activity such as daily step count recommendations and explanations of energy balance. Most educational content was delivered using technology. Websites, blog posts, links, and videos were available to view (AlQarni, Andrade, Joseph, & Syred, 2014). Two studies used Facebook only to house content (AlQarni, 2016 & Andrade, 2018). In other cases, content was sent to users through text messages, facebook chat (Andrade, 2018 & Joseph, 2015), messages from healthy lifestyle coaches

(Syred, 2014), email (Merchant, 2016), Facebook, Instagram and Twitter (Loh, 2016). Other interventions relied on non-technical modes of delivery led by professionals or through printed materials (Joseph et al, 2015; Merchant et al, 2018).

Social support

Some interventions also included features to facilitate social support outside the use of social media with peers, for example, through discussions and meetings with friends on living a healthier lifestyle and keeping participants motivated through rewards and gifts (Loh, et al, 2016). Peer support was leveraged through in-person and technology-mediated methods. These included mentoring (Merchant, et al, 2014), teaching support skills (Andrade, 2018; Al Qarni, 2016; Joseph, 2016), and peer coaching with review tracking and personalized video feedback, motivational messaging, and phone calls (Loh, 2016 & Merchant, 2014). In some cases, participants were asked to seek support within existing social networks by sharing goals and results (Merchant, 2014) or having non-study “buddies” (Al Qarni, 2016 & Joseph, 2016). Syred, (2014) was the only study that did not include any social support for participants.

Quantitative and narrative data synthesis

Risk of Methodological Bias

Most studies met the CONSORT requirements to provide a strong scientific rationale and described their interventions clearly. However, none of the studies met the stringent guidelines for quality reporting of trial results, which requires provision of effect size estimates and their precision. Only one study reported that participants were blinded to the treatment condition (Edney et al., 2018). There was only one study that included not only the number of participants that dropped out, but also the reason for dropping out (Jane et al, 2015), whereas other studies mentioned how many participants dropped out, but no reasons were given. West (2018) and Al Qarni (2016) did not mention any dropouts in their study. It was also unclear if intention to treat analysis was used in most studies. There is, therefore, some risk of bias particularly regarding randomization and attrition.

Intervention and Follow-up Duration

The dose of key messages ranged from daily to once per week over a period as short as 4 weeks (Berends et al., 2018) to one lasting if 4 years (Al Qarni et al., 2016). No studies reported follow-up of outcomes and maintenance of behavior change beyond the end of the intervention itself.

Recruitment Method and Rates

Sixteen studies recruited participants to their interventions, whereas three others involved evaluations based upon existing users of commercial online social networks (Andrade et al., 2018; Valle et al., 2017 & Ryan et al., 2017) and one study recruited participants through a coin toss (West et al., 2016). Of these, six described their recruitment strategies, with all these studies reporting a variety of traditional recruitment methods, such as advertising with flyers (Edney, 2018), mainstream media (Syred, 2014), and mass emails (Joseph, 2015 & Zhanget al., 2015). Only one study (Berends et al., 2018) reported using an online social media campaign, in addition to other recruitment methods. Participation rates varied widely, ranging from 22% (Raggat et al., 2018) to 97% (Cavallo et al., 2014 & Loh et al., 2016).

Participants included adolescents and adults of varying ages with a maximum age of approximately 80 years. Individual studies focused on one of these subgroups (Table 6). One

study targeted only women (Joseph et al., 2015). Four studies recruited students from secondary schools, colleges, and universities (Andrade et al., 2018, Loh et al., 2018; Merchant et al., 2014 & Syred et al., 2014). Minorities were represented in 90% of the studies. Income levels were reported in four studies (Andrade et al., 2018, Joseph et al., 2015, Loh et al., 2018 and Merchant et al., 2014), which explicitly served low-income populations and the remainder served broader income levels (AL Qarni et al., 2016 & Syred et al., 2014). Typical inclusion criteria were normal to obese body mass index (BMI); general good health; suboptimal diet or physical activity behaviors; and access to the internet and computer or mobile phone. Typical exclusion criteria were being pregnant; taking specific medications; in a weight loss program; and having medical conditions precluding them from intervention activities.

Effectiveness of intervention: Physical Activity Behaviour

Of the 20 studies, 7 indicated physical activity behavior as a key outcome. Physical activity intervention studies (N=7) yielded a standardized mean difference (STD of 0.101, 95% CI - 0.124, 0.326) favoring the intervention (Figure 3), which was not statistically significant (P=0.379). Four of the seven studies reported significant differences in the outcome measure. The standardized mean difference was used as a summary statistic as the studies all assessed physical activity but measured it in a variety of ways. Three (Joseph, 2015; Maher, 2015 & Zhang et al., 2015) of the 7 studies included an objective measure of physical activity (pedometer & exercise classes), the remaining studies used self-reported measures (e.g., minutes of moderate vigorous physical activity). Examples of these questionnaires are Godin Leisure-Time Exercise Questionnaire, WHO Steps questionnaire, Australia Active Survey and Paffenberger Activity Questionnaire. Heterogeneity was present in the two-group analysis, which justified the use of random effects model thus the likelihood of committing a type-I error was minimized.

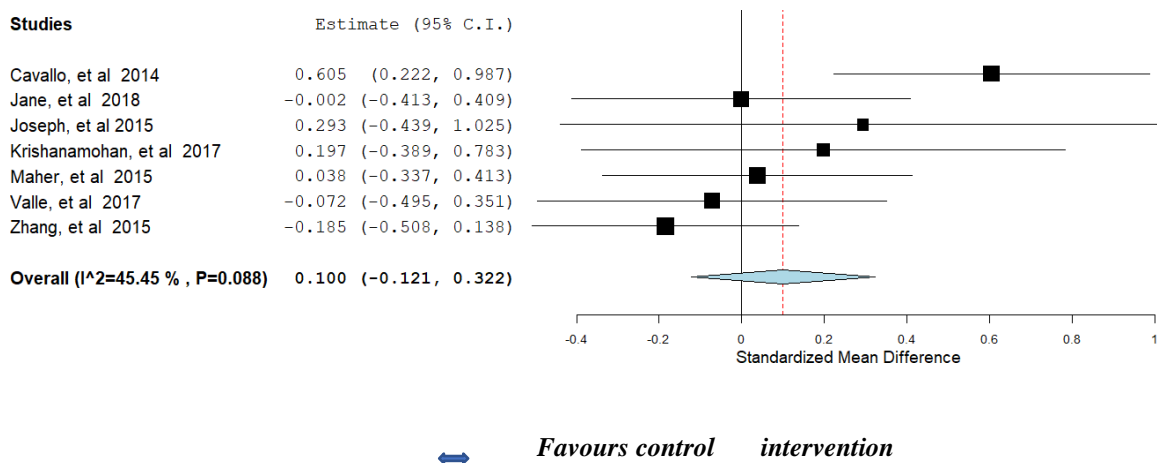


Figure 3. Forest plot showing standardized mean difference of physical activity interventions with a control group (Two -group analysis Controlled studies)

Effectiveness of intervention: Weight changes and changes in dietary intake

Outcomes commonly assessed across studies included weight, dietary changes, or vegetable intake. Changes in weight (SMD 1.293, 95% CI -4.037 to 6.623), 4 studies; Figure 4) and dietary intake (SMD 0.095, 95% CI -0.190 to 0.381, 3 studies; Figure 5) showed no significance (p = 0.634 and p =0.514) respectively. However, within group measures, there was a significant improvement in weight loss and energy intake. The pooled effect size was small to moderate.

The standardized mean difference was used as a summary statistic as the studies all assessed weight change (BMI, Waist circumference, calorie loss) and dietary intake but which was measured in a variety of ways. Heterogeneity was present in the two-group analysis, which justified the use of random effects model thus the likelihood of committing a type-1 error was minimized.

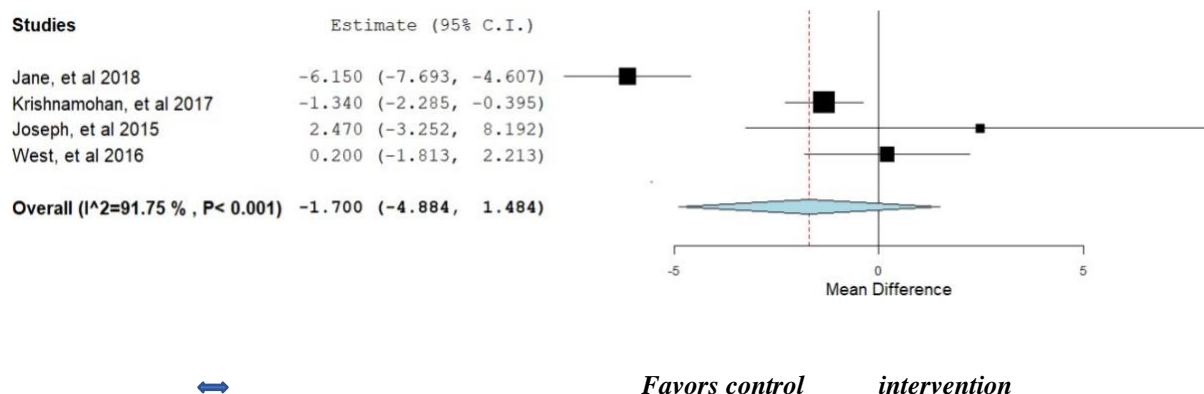


Figure 4: Forest plot showing standardized mean difference of Weight interventions with a control group

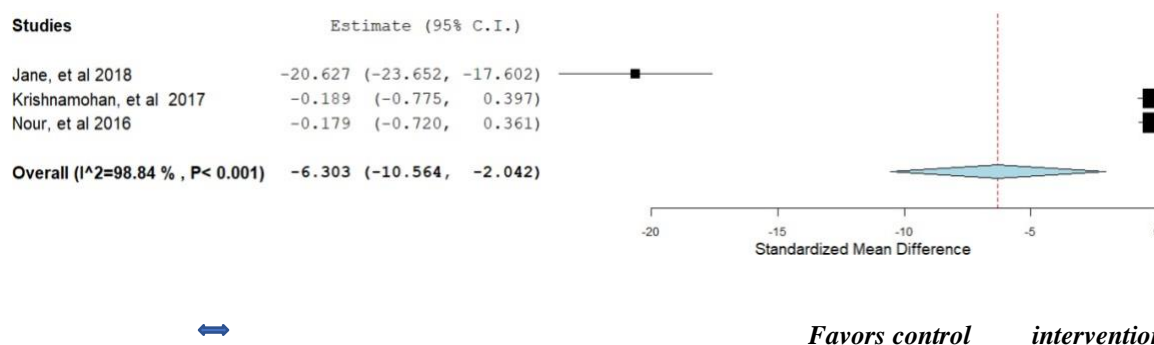


Figure 5: Forest plot showing standardized mean difference of Dietary Intake interventions with a control group

Table 3. Summary of intervention effects on behavior outcome measures.

Study	Dietary Intake	Weight Loss	Physical Activity	Weights %
Cavallo, et al			•	24.009
Jane, et al	+	+		48.299
Joseph, et al			+	20.631
Krishnamohan, et al	+			23.769
Maher, et al			+	21.569
Nour, et al	+			27.932
West, et al		+		26.062
Valle, et al			•	20.849
Zhang, et al			•	18.855

++ significant improvement; + within-group improvements but significance not reported,
 • No significant change; +/- within-group mixed results; some significant improvements, some no change

Engagement, Attrition and Fidelity

Engagement in the intervention

Even though the outcome of engagement was not statistically significant ($p = 0.441$), (SMD 0.2018, 95% CI -0.736 to 0.321), 5 studies favored the intervention. The pooled effect size was small to moderate. Although heterogeneity was also present in the single group analysis, a fixed effects model was used to avoid an overestimation bias in the effectiveness of interventions included. Thus, the likelihood of committing a type-1 error was minimized.

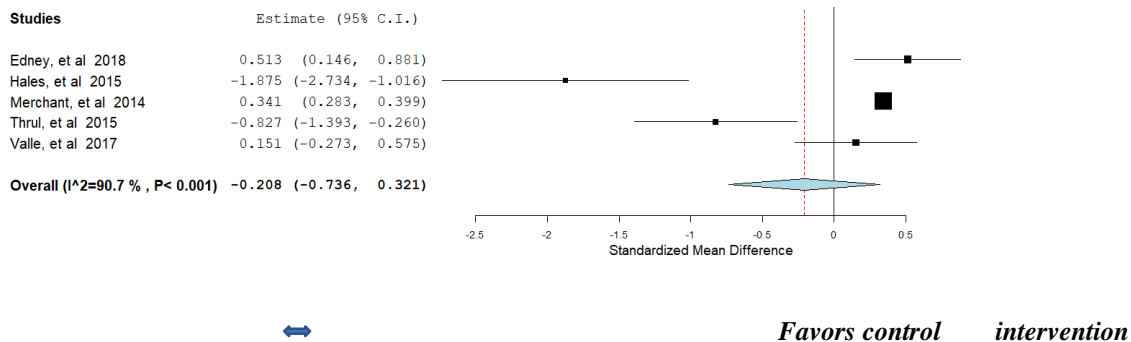


Figure 6: Forest plot showing standardized mean difference of Engagement interventions with a control group.

Attrition rates (i.e., participant dropout over the course of the study) varied by study design, with the small-scale studies reporting the lowest attrition (0%), the mid-sized RCTs reporting low attrition (27%) (Cavallo et al., 2018, Hales et al., 2015, Merchant et al., 2014 & Valle et al., 2015) and the large trials reporting higher attrition (40%) Edney et al., (2018). Attrition rates were not reported in Thrul et al., (2016). Where possible, we examined engagement with the social networking component of the intervention in each study and compared it with the intended dosage, to provide an indication of fidelity. Results in table 4 show that fidelity was generally high. Only the study by Hales (2015) resulted in relatively low usage rates of 17%. Edney (2018) with the highest intended user engagement linked increased engagement to increased adherence to the running program. All five studies reported that engagement changed over the course of the intervention and found that it gradually declined.

Table. 4 Summary of engagement and fidelity with the interventions.

Study	Intended number of uses	Actual Usage	% Intended: actual = fidelity
Edney, et al 2018	62	56	90.3
Valle, et al 2017	86	58	67.4
Hales, et al 2015	99	17	17.1
Thrul, et al 2015	512	268	52.3
Merchant, et al 2014	1816	1325	72.9

DISCUSSION

The primary aim of our review was to evaluate the available evidence of social media, as a tool to promote behavior change outcomes such as physical activity, healthy dietary intake and weight change in populations with lifestyle illnesses, as well as the impact of engagement on health awareness. This

study fills the important gap in the existing knowledge regarding the efficacy of social media interventions in wellness.

Social media is ubiquitous in individuals' lives, offering enormous potential as a tool in the public health domain (Zhou et al., 2018). On the one hand, they present a low-cost opportunity to virally spread health information, possibly improving the reach and cost-effectiveness of health interventions. On the other hand, they can promote social support and social influence, facilitating health behaviour change (Laranjo et al., 2015). While others have reviewed the use of social media for health (Yonker et al., 2015; Welch, et al., 2016 & Stefellson et al., 2020), to the best of our knowledge, this review is the first to focus on evaluating the effectiveness of social media, particularly Facebook, on improving health-related behavior using key messages for healthy lifestyle illness.

The results show that the use of social media in public health behaviour change, and health promotion is limited but promising. Of the 20 studies, seven had significant lifestyle change outcomes suggesting that social media may be valuable for delivering health interventions for individuals with chronic illnesses. The potential for using new media to achieve improved health outcomes is broader than social marketing alone. Even though the effect sizes in this review were small, some studies showed a significance ($p < 0.05$) in certain health outcomes such as dietary intake and physical activity; (Krishnamohan, et al., 2017; Maher, 2015 & Nour, 2016) and not in others (Weight loss) (Jane et al., 2018; Joseph, 2015 & West, 2018). Our findings are consistent with the systematic review done by Maher et al., (2014) in which the improvement in health behaviors using social media may work for some health indicators and not for others. In addition, positive outcomes require sustained interaction with the material and participants even after the intervention ceases. Kohl et al., 2013 suggests that interventions show improved effectiveness when they are embedded in an existing structure, such as schools or in the primary health care settings. Of the 7 studies all of them were conducted in ethnically diverse populations. All this suggests is that interventions that incorporate digital technologies and in particular social media have a high potential to reach diverse groups of individuals.

While some studies in this review did examine the efficacy of social media as a novel mechanism for behavioural interventions, many studies used it to add a social support component to a more traditional intervention. Studies included in this review (Andrade, 2018; Cavallo, 2016; Edney, 2018; Merchant 2014; Loh, 2016 & Valle, 2017) were more attuned with how people use online social networks to interact with people with whom they share an offline connection with, rather than using social media to interact with new people. Our review shows that while both approaches appear to have a positive impact on behaviors, adding social components to behavioral interventions does not always lead to high user engagement. In the systematic review by Maher et al., (2014) engagement was low considering these studies utilized extensive participant contact, prompting, and email. Studies that were over a 12-week period did not account for individual set-back or participants "falling off the wagon", or engagement retention. Consistent with other studies, Thrul et al., (2015) found that there was a clear trend for engagement to decline across the intervention period. leveraging existing social connections may help to increase low adoption and engagement barriers and help to create a positive impact of social media on individuals' health.

Social media platforms such as Facebook and Instagram report that 79.9% of its total users log in daily (Kaushal et al., 2021). The widespread use of social media can also influence public health behaviors and goals through social reinforcement. Because human beings are a highly social species, they are often influenced by their friends, as well as by friends of friends (George et al., 2013). Social media establishes virtual social environments that generate opportunities for

people to learn, discuss, and connect around a particular health topic, which can also lead to improved health literacy (Roberts, M et al 2017). Studies that comprised this review (Merchant, 2016 & Joseph 2015) included goal setting, peer support, tailored feedback, interactivity, and combinations of online and in person contact which enhanced the literacy and engagement rates when using social media interventions. Each study highlighted the need for relevant content and related knowledge incumbent on increasing the use of social media for health knowledge and promotion. To achieve this, some investigators (Al Qarni, 2016; Andrade, 2014; Joseph, 2015; Loh, 2018, & Merchant, 2014) expressed the importance of understanding the needs of the target audience. They concluded that providing them with consistent, varied, and new knowledge encouraged them to stay motivated.

Social media platforms allow users to generate and share content and alters modes of health information exchange and how individuals search for and disperse health information (Ventola et al., 2014). The most common platforms for recruitment and dissemination of information, in addition to traditional formats, were discussion boards or social media networks and to a lesser, more effective degree, social media campaigns (Raggat, et al., 2018). This method increased the potential for disseminating the interventions on a mass scale and the efficacy of randomization. In contrast, the previous review by Maher et al., 2014 only used traditional methods (flyers and media advertising) to prevent contamination between study groups.

Strengths and Limitations

Strengths of this systematic review are that it was conducted and reported according to PRISMA guidelines. It utilized a rigorous and comprehensive search strategy. Study selection, data extraction, and critical appraisal were completed in duplicate by three members of the research team independently, ensuring the accuracy of the review data.

We recognize that there are some limitations in our review. First, the literature search yielded studies that were diverse methodologically and clinically. The studies included were heterogeneous in study design, population group, sample size, description of the intervention, and outcome measures. The small number of included studies reflects the current scarcity of experiments in this emerging and rapidly evolving field and made it impossible to conduct analyses according to type of intervention/outcome/health domain. Due to the small number of studies, we synthesized the data with both a narrative method and meta-analyses. As a result of the small sample size, all RCTs were grouped together, and their diverse nature contributed to the high heterogeneity observed. It is also, important to note that the included studies varied widely in terms of risk of bias, with some studies scoring very poorly, which reduces the trust that can be placed in their findings. Furthermore, our search was completed prior to the onset of the COVID-19 pandemic and therefore, did not include studies arising from the change in circumstances and likely increased online presence and interventions during this period (Massaad and Cherfan, 2020).

Future Research

Interventions using social media for health behavior change hold promise and may be feasible for future research. However, more experimental studies need to be included to increase the meta-analytical power and measure their effectiveness more accurately. Future research should focus on chronic disease groups to assess the feasibility of social media campaigns to change behavior and upscale healthy lifestyle programs. In addition, future research should identify features that increase engagement and retain target audience by being aware of times of most engagement on these social media platforms and social media trends.

Given that interventions may be improved by drawing on theories specifically targeting group behavior's, this would be a useful focus for future research. Davis, 2015 shows that designing interventions should be underpinned by a theoretical model for behavior change. Even though behaviors change models have been incorporated in some studies, not enough has been done concerning social networks theory for behavior change. This will enable researchers to leverage their interventions with the most up-to-date evidence and transition research into *practice*. Single-component interventions, factorial design methods, and adaptive designs should be considered more often, so that the effectiveness of social networking site components can be clearly evaluated (Laranjo et al., 2015). Social networking platforms often use algorithms, and therefore key messages should be scheduled to increase engagement (Kanuri et al., 2018). Study duration should also be thoughtfully planned, so that engagement and retention are optimized, and enough time is allowed for the specific type of behavior change to occur. Finally, the accuracy of outcome measures should be optimized and, when possible, self-reporting bias should be avoided.

CONCLUSIONS

The widespread use of social media among the general population and in different targeted groups may have the potential to improve adherence to making healthier lifestyle choices, monitoring physical activity and dietary changes as well as preventing the increase in NCDs globally. As the use of social media becomes more prevalent and as health organizations start to incorporate it into health practice, the discussion of the positive and negative consequences is imperative. Social media can provide participants with social support and/or assist with improving health outcomes (including weight loss, physical activity), however studies to date have typically examined either health outcomes, or social support, but rarely the two together. This examination is timely and appropriate for health practitioners and policymakers to improve health outcomes. The trend of social media usage will continue in the foreseeable future and establishing standards of practice within the scope of social media is needed.

Appendix 1

Table.5 Summary of articles Reviewed for Social Media and Health Promotion

Author	Population size Sample size Response Rate%	Description of Intervention	Goal of Posts	Dose	Duration	Response Rate %
Andrade, et al (2018)	743 fans 12-19 yr. Latino Immigrant community	Study design Description Automated posts with health risk and prevention messaging for substance abuse, sexual risk and interpersonal violence	Program announcement, program activity sharing, health or social service promotion, internship or educational opportunity advertisements, health education or promotion, contest, youth achievement or story highlight, news story sharing, awareness raising or social issue advocating, and campaign messaging	213 posts – weekly posts	12 month campaign	80%
Al Qarni et al, (2016)	55 groups 40-80 year Diabetes Mellitus	Study design Description Facebook focus group and reviews on diabetes	Raising awareness, personal experiences, providing spiritual support, providing education	1551 posts – daily posts	4 years	None reported
Joseph et al, (2015)	29 participants (African American women) 15 (Print) 14 (FB and Text)	Study design Randomized control Trial Description receive either a Social Cognitive Theory-based, culturally relevant physical activity intervention delivered via Facebook and text messaging or to a standard print-based intervention, consisting of non-culturally tailored.	Increase physical activity participation, reduce barriers to physical activity. Reminders of health benefits of Physical Activity	Weekly posts on Mondays	8 weeks	75%

		Physical activity promotion brochures developed by the American Heart Association				
Merchant et al, (2014)	Overweight College students 202 online educations 202 social and mobile education 18-35 years	<p>Study design randomized into 1 of 2 groups.</p> <p>Description The intervention group had access to a study-specific website, blog, apps, Facebook page, text-messaging component, and a health coach. Upon entering the study, all intervention participants were asked to like the Facebook page. After liking the page, users were considered fans of the page and could see all posts in their news feed. Because the Facebook page was open, non-study participants could also become fans and view and engage with the content. A health coach (a registered dietitian) remotely delivered all intervention content to the 202 intervention participants. The health coach moderated the Facebook page, and posted to the</p>	randomized into 1 of 2 groups. Access to a study-specific website, blog, apps, Facebook page, text-messaging component, and a health coach. Upon entering the study, all intervention participants were asked to like the Facebook page. After liking the page, users were considered fans of the page and could see all posts in their news feed. Because the Facebook page was open, non-study participants could also become fans and view and engage with its content. A health coach (a registered dietitian) remotely delivered all intervention content to the 202 intervention participants. Mindful eating, action plan and find creative ways to increase daily steps	3 posts a day	21 months	80%

		<p>blog. Participants could contact the health coach up to 10 times (Lifelines) via Skype, email, phone, or text. Alternatively, the healthcoach could reach out to participants a maximum of 10 times (Lifesavers). The health coach used Lifesavers when participants gained >5pounds since study entry or had not logged into at least 1 of the study's tools in >1 month.</p>				
Syred, et al (2014)	68, 175 Fans 13-55yrs	<p>Study design Not mentioned</p> <p>Description Automated posts on Facebook to encouraged discussion about chlamydia testing, entitled "Say Yes to the Test"</p>	Attitudes towards Chlamydia and education	508 posts-daily posts	5 months	77.1%

Table 6: Summary of articles reviewed for social media and engagement

Author	Population size Sample size	Description of Intervention	Goal of Posts	Dose	Duration	Response Rate%
Nour, et al(2019)	97 participants 18-30 years old	Study design Randomized control trial Description Set goals at baseline and use app daily to record and monitor vegetable intake. Reminder texts were sent to prompt vegetable intake. For social support and educational material, a Facebook group was created. Key messages were posted daily to the group.	Meal inspiration Meal planning Educational tips on vegetable intake and nutrition	Daily posts	4 weeks	64%
Edney, et al(2018)	56 participants 118	Study design Randomized control trial of arunning program delivered via Facebook	Educational video ontechniques, motivation and inspiration, facilitate running related discussion	Daily Messages	8 weeks	80%
Loh, et al(2018)	241 Caregivers 18 – 65 years	Description Implementation of social media and text messaging program in a multi-level multi component obesity prevention program. Automated text messages and social media messages. Bidirectional communication for follow-up monthly meetings during themaintenance phase of the study, participants were provided with a private Facebook group fortheir assigned diet.	Goal orientated reminders for the week Recipes for food items Nutrition information Food budget and costs	2 posts per day	17 weeks	97%

Hales et al, (2015)	69 participants 15 low engagers 15 high engagers 79%	Study design Randomized Control Trail Description Control group attended monthly meetings and received weight loss information via weekly email lessons. After the initial 8 weeks of the study, all five diet groups were provided with monthly, face-to-face group meetings. In order to provide social support between	Education and sharing of information on nutrition, weight-loss tracking reminder	Daily posts (5 days)	8 weeks	79%
Cavallo et al,(2014)	132 participants 25 years and younger	Study design INSHAPE randomized control trial. Description Participants had access to educational materials related to physical activity as well as access to the Facebook group which provides participants with a mechanism to exchange social support for physical activity. Participants were allowed to post, comment, and share on the group. Moderator posted messages and educational materials to the group. Education only arm participants were provided access to a limited version of the INSHAPE website, which included only education materials.	Exercise support, discussion questions Motivations to exercise Barriers to exercise Endorsement of exercise	Daily posts	12 weeks	97%

Table 7: Summary articles of the effects of social media on behaviour change

Author	Population size Sample size	Description of Intervention	Goal of Posts	Dose	Duration	Response Rate %
Ryan, et al(2019)	51 participants 19-65 years N=25	<p>Study design Randomized control group.</p> <p>Description Active team intervention encourages users to meet two behavioural goals: 1) take 10 000 steps a day 2) record orlog step counts for each day.</p>	Team discussion board Motivation and reward	Weekly	8 weeks	70%
Berends, et al(2018)	49 16yrs and older Aboriginal community	<p>Description A healthy lifestyle campaign using storytelling and video messages on Facebook</p>	Reminder to choose healthier food and beverage options	Daily messages on nutrition	4 weeks	69%
Jane et al(2018)	120 overweight and obese participants N=110 21-65 years	<p>Description Condensed version of the CSIRO TWD weight management program, along with weekly checklist to the two intervention groups. Additional information will be posted on the Facebook</p>	Increase physical activity Support network Dietary education and recipes	Weekly Message	24 weeks	41%

Raggat, et al(2018)	16-25 years old 180	Description Online survey	Inspire participants to improve health and wellbeing	Daily	6 weeks	22%
Krishnamohan, et al (2017)	45 participants N=23 N=22 Medical students 18-23 years	Description Baseline survey on lifestyle factors (Physical activity and dietary habits) BMI was calculated. Intervention group joined Facebook and received health education messages on physical activity and nutrition.	Motivation and education for healthy living	3 times a week	6 weeks	64.5%
Valle, et al(2017)	86 participants – Cancer survivors N=43 18 years and older	Study Design Randomized Control study Description FINET -received pedometer and weekly key messages and behaviour strategies as well as access to the self-monitoring website. Facebook group with discussion prompts. Communication with Participants online. Questionnaires at baseline and after 12 weeks. Self-help participants did not have access to the website and had no discussion prompts	Educational lessons and guidance on physical activity, behavioural self-monitoring and social support.	Weekly Facebook messages	12 weeks	86%

Thrul et al(2016)	586 participants N=293 18-25year old	Description All participants invited to a Facebook group tailored to their stages of change and readiness to quit. Followed the TTM(Transtheoretical model)	Decisional balance Consciousness raising Reinforcement management	Daily	12 weeks	79%
West, et al(2016)	58 participants N=29 College students 18-25 years	Description Focused on weight gain patterns among college populations and long-term risk for obesity-related chronic diseases, as well as behavioural strategies to maintain weight and avoid obesity. Participants in both interventions were emailed weekly electronic newsletters targeting relevant content and enrolled in separate, private Facebook groups. These groups served as an additional channel for the delivery of intervention content, as well as promoted interaction between fellow group members, facilitated by study counsellors. The control condition did not include any healthy weight-related behaviour change elements. The interventions were matched for intervention duration and structure, as well as the number of newsletters and planned Facebook content postings.	Building social support for selecting more fruits and vegetables, lower-fat dairy products, and lower-calorie and/or more nutrient-dense snack options, as well as validating a social norm around eating a healthier diet. Reminders to check weight. Motivation to increase physical activity. Fostering positive lifestyle habits.	Weekly posts	9 weeks	90%
Maher, et al(2015)	110 participants N=105	Description Working in teams of 3 to 8 existing Facebook friends. Active Team is designed to encourage friendly rivalry within friendship groups, offer peer encouragement and support, and be quick, social, and enjoyable to use. It includes a	Daily tips for physical activity Peer encouragement and support. Reminders to set achievable goals.	Daily messages	20 weeks	87.3%

		<p>calendar to log daily step counts (steps can be logged up to 7 days in arrears) a dashboard showing step-logging progress, awards, and gifts. A team tally board to allow users to monitor their own and their teammates' progress; a team message board for team members to communicate with one another; daily tips for increasing physical activity; gamification features, such as awards for individual and team step-logging and step-count achievements; and the ability to send virtual gifts to teammates. Automated computer-tailored weekly emails are sent to participants summarizing their progress and encouraging continued participation.</p>				
Zhang et al(2015)	217 graduate students N=164	<p>Study design & description Participants were randomly assigned to 1 of 3 conditions (control conditions, media condition with promotional messages and social conditions</p>	Exercise tips and motivational messages	Weekly basis	13 weeks	75.5%

Appendix 2

Table 8: Outcomes of Meta-Analysis Studies

Author (Year)	Outcome Measure	Instruments	Outcome	Conclusions
Nour, et al (2019)	Change in Vegetable Intake Engagement	Behaviour Change Taxonomy Likes, Shares, comments	↓ ↑	Significant differences in vegetable intake over time were found. However, no change was observed in the group by time differences. The duration of app engagement (total days of use) was significantly positively associated with vegetable intake post intervention.
Andrade, et al (2018)	Reach Engagement Traffic to Page	shares Likes & comments Page Views	↑ ↑ ↑	Post features that were significantly associated with post engagement comprised the inclusion of photos Spanish or bilingual posts, and portrayal of youth of both sexes.
Berends, et al (2018)	Reach Engagement Behaviour Change (Healthy Lifestyle)	Page Views Likes, shares, comments Improve diet and Nutrition	↑ ↑ ↑	Participants found the campaign useful and beneficial. 1/3 rd of the participants were able to change their behaviour.
Edney, et al (2018)	Change in Physical Activity Engagement	Active Australia Survey Likes, shares, comments	↔ ↑	Volume of engagement was higher for moderator- initiated than participant- initiated posts. Total engagement with the Facebook group was not directly associated with change in physical activity.

Jane, et al (2018)	Weight Change Change in Behaviour (PA,Nutrition)	BMI TFEQ WHO Quality Questionnaire Bouchard 3-day PA Questionnaire	↓ ↑	While both intervention groups showed significant changes in psychological outcome measures, the Facebook Group was the only group to experience statistically significant weight loss by the end of the 24 weeks.
Loh, et al (2018)	Reach Engagement	Traffic to page Likes, shares & comments	↑ ↑	social media implementation improved from low- moderate to high reach, dose delivered, and fidelity. Text messaging increased from moderate to high in reach and dose delivered, fidelity decreased from high to moderate. Social media and text messaging were innovative tools to include in and increase reach of a multilevel community intervention.
Raggat, et al (2018)	Change in Behaviour Engagement	Exercise addiction inventory Eating attitude test Page views, Likes, Shares and comments		Participants described both positive and negative influences of engaging with fitspiration content.
Krishnamohan, et al (2017)	Change in physical activity Change in behaviour	WHO Steps Questionnaire	↑ ↔	Except for the decrease in junk food intake, use of Facebook as an effective tool to promote healthy lifestyle could not be proved with confidence.

Ryan, et al (2017)	Change in Physical Activity Engagement	Step Count Page Views	↑ ↑	Self-reported compliance with the physical activity goal. (10,000 steps per day) was high. Engagement differed on the basis of sociodemographic characteristics namely, engagement differed on the basis of education, which the strongest engagers from the middle and high education category, and engagement with gamification features differed by sex, with males the strongest engagers.
Valle, et al (2017)	Change in Physical activity Engagement	Exercise Tracker Facebook Intensity Scale	↑ ↑	Engagement within the Facebook group varied by the type of moderator-initiated post, with discussion questions about cancer experiences and PA receiving the most responses from participants. Similar to other social media-based interventions for weight control, posts that prompted participants to provide responses were more engaging. 12min increase in light Physical Activity.
Al Qarni, et al (2016)	Reach Traffic to Page	Members/ Fans to page	↑ ↑	Individuals with Diabetes are increasingly sharing their health information with other FB users. This study will help inform future research about health information sharing and designing appropriate interventions to harness the power of social media in improving public health.

				Sharing the information can also help in improving the management and control of Diabetes.
West, et al(2016)	Weight Change Engagement	BMI (Body Mass Index) Likes, Shares, comments	↔ ↑	Students weight remained stable with no significant difference between groups. Weight gain prevention intervention merits evaluation over longer period of time to determine whether engagement and behavioural improvements positively affect weight outcomes and can be maintained.
Hales, et al(2015)	Engagement Weight Change	Likes, shares, comments BMI (Body Mass Index)	↑ ↓	Poll votes were the most engaging (mean number of votes or comments/poll followed by suggestions posts, and weight-related posts. Engagement with Facebook was significantly associated with weight loss during the 4-month maintenance period
Joseph, et al(2015)	Change in Physical Activity Weight Change	ActiGraph (Step count) BMI (Body Mass Index)	↑ ↓	Decreased sedentary behaviour, increased light-and moderate-lifestyle intensity physical activity enhanced psychosocial outcomes, and high participant satisfaction.

Maher, et al(2015)	Change in Physical Activity &QL (Quality of life) Engagement	Active Australia Survey Page Views, Likes	↑ ↑	An online, social networking physical activity intervention with pedometers can produce sizable short-term physical activity changes. Participants had significantly increased their total weekly MVPA by 135 minutes relative to the control group, due primarily to increases in walking time.
Thrul, et al(2015)	Change in behaviour Engagement	TTM (Trans theoretical Model) Likes, shares, comments	↔ ↑	Participants not ready to quit in 30 days (in Precontemplation or Contemplation) engaged most when prompted to think about the pros and cons of behaviour change, while those in the Preparation stage engaged most when posts increased awareness about smoking and smoking cessation.
Zhang, et al(2015)	Change in Physical Activity Enrolment in classes		↑ ↑	Social influence from anonymous online peers was more successful than promotional messages for improving physical activity
Cavallo, et al(2014)	Change in Physical activity Engagement	Paffenbarger Activity Questionnaire Facebook Intensity Scale	↑ ↑	Changes in perceived social support and physical activity were more strongly associated with participants' individual Facebook use than use of the Facebook intervention group.

Merchant, et al(2014)	Engagement Behaviour Change(PA, Nutrition)	Likes shares, comments, poll responses Conceptual Model	↑ ↓	Participants interacted most with polls. Engagement and subsequent behaviour change are a function of delivery and content. Although being able to use a variety of types of posts (e.g., polls, photos) facilitates the delivery of diverse content, it is unclear which post(s) are most effective.
Syred, et al(2014)	Reach Engagement	Fans Page Views	↑ ↑	Health promotion site provided a space for single user posts but not a self-sustaining conversation. Possible explanations for this include little new content from the moderator, a definition of content too narrow to hold the interest of participants, and limited responsiveness to user needs.

Outcome Increased or improved ↑ Outcome
decreased ↓ No impact on the outcome ↔
N/A=Not avail

Table 9: Quality appraisal of Meta-Analysis Studies

Author (year)	Country	Purpose of Study	Setting	Type of Study	Design	Quality Appraisal (MMAT)
Nour, et al(2019)	Australia	User engagement with a 4-week smartphone program for improving vegetable intake	NSW Community	Quantitative & Qualitative	2 x 2 Factorial RCT	3/4
Andrade et al, (2018)	America	Characterize Adelante participant Facebook reach and engagement. Identify post content and features that resulted in greater user engagement.	Latino Youth Community	Quantitative	Mixed Methods	3/4
Berends, et al(2018)	Australia	Promoting a healthy lifestyle program using social media marketing Aboriginal community	Aboriginal Community	Quantitative	Collaborative	4/4
Edney, et al(2018)	Australia	Examine engagement with an 8-week physical activity intervention delivered via Facebook	Facebook Users	Quantitative	RCT	3/4
Jane, et al(2018)	Australia	Examine the weight outcomes in an online social networking groups were mediated by changes to psychological outcome measures in overweight and obese individuals, following a weight management programme delivered via Facebook	Overweight and Obese participants	Quantitative	RCT	3/4
Loh, et al(2018)	America	Examine Childhood obesity Program in Low-income community using A Social Media Intervention	African American Caregivers	Quantitative & Qualitative	RCT	3/4
Raggat, et al(2018)	Australia	How users engage with content. Understand	Facebook Users	Quantitative & Qualitative	Cross Sectional Survey	4/4

		the perceived influence on health and wellbeing Facebook users				
Krishnamohan, et al (2017)	India	To measure the efficacy of health education using social networks in promoting healthy lifestyle among medical students Pudcherry	University Medical Students	Quantitative	NRCT	3/4
Ryan, et al(2017)	Australia	Engagement, compliance, and retention across a 50-day period.	University Students	Quantitative	RCT	3/4
Valle, et al(2017)	America	Characterize Facebook engagement by young adult cancer survivors in the context of a physical activity intervention compared to a self-help comparison condition.	Cancer Survivors	Quantitative	RCT	3/4
AL Qarni,et al (2016)	Saudi Arabia	Information Sharing on Diabetes on Facebook.	Arab Diabetic Community	Quantitative & Qualitative	Mixed Method	4/4
West, et al(2016)	America	Examine a social media facilitated weight gain prevention intervention for college students.	Overweight College Students	Quantitative	Quasi-Experimental	2/4
Hales, et al(2015)	America	Examine whether different types of posts differentially affect participant engagement and if engagement with social media enhances weight loss	University (students)	Quantitative	RCT	3/4

Joseph, et al(2015)	America	Evaluate a culturally relevant intervention delivered via Facebook designed to promote Physical activity among AfricanAmerican Women	African American Church, Sororities(obesity, cardiovascular disease , diabetes prevention)	Quantitative	RCT	3/4
Maher, et al(2015)	Australia	The primary aim of this study is to examine whether using the 'Active Team' smartphone app, a purpose-built, gamified physical activity intervention that connects users to each other via Facebook, leads to a significant difference in physical activity levels relative to a basic app-based experimental condition and a waitlist control condition after three months.	Facebook Users	Quantitative	Cluster RCT	3/4
Thrul, et al(2015)	America	Identify which intervention content based on the TTM generated the highest engagement among participants in pre-action stages of change	Facebook users who are Smokers	Qualitative RCT 3/4	RCT	3/4
Zhang, et al(2015)	America	Identify which feature of social media-promotional messaging or peer networks can increase physical activity.	University Graduate Students	Quantitative	RCT	3/4
Cavallo, et al(2014)	America	Examine Facebook in a physical activity promotion trial	University (Students)	Quantitative	RCT	3/4
Merchant, et al(2014)	America	Describe participant exposure to a Facebook page designed to deliver content to overweight college students in a weight loss randomized control trial.	Southern California Universities	Quantitative & Qualitative	RCT	3/4

Syred, et al(2014)	England	Examine which elements of moderator and participant behaviour stimulated and maintained interaction with a sexual health promotion site on Facebook.	Facebook users who are sexually active	Quantitative	Observational	3/4
--------------------	---------	--	--	--------------	---------------	-----

Table 10: Numeric evidence table of studies included in two-group analysis (controlled)

Author	Physical Activity Measure	Sample size	Control Change: Pre to Post(SD)	Sample size	Intervention Change: Pre to Post(SD)
Jane, et al (2018)	WHO Quality of Life Questionnaire (KJ/day)	46	17.217 (1070)	45	15.533 (741.33)
Krishnamohan, et al (2017)	WHO steps questionnaire Min/week	23	83.9 (174.25)	22	118.3 (168.52)
Valle, et al (2017)	Gordin Leisure time Exercise Questionnaire Min/week	41	118.4 (126.3)	45	109.3 (125.0)
Joseph, et al (2015)	Actigraph (Pedometer) min/week	15	7 (194)	14	62 (169)
Maher, et al (2015)	Actigraph (pedometer) Min/week	59	22 (23)	51	23 (29)
Zhang, et al (2015)	Enrolment in exercise classes/week	75	2.2 (2.1)	73	1.8(2.2.)
Cavallo, et al (2014)	Paffenberger activity Questionnaire (Kcal/day)	55	676.67 (104.52)	55	748.24 (129.25)

Table 11: Numeric evidence of studies included in two group analysis (controlled)

Author	Engagement Measure	Sample size	Control Change: Pre to Post	Sample Size	Intervention Change: Pre to Post
Edney, et al (2018)	Interactions (shares, likescomments)	56	8.0 (6.8)	62	5.3 (3.2)
Valle, et al(2017)	Interaction (Likes, comments, shares)	41	5.83 (9.68)	45	4.43 (7.33)
Hales, et al(2015)	Interactions (Likes, comments, shares)	15	16.20 (18.85)	15	58.00 (24.20)
Thrul, et al(2015)	comments	27	25.5 (12.6)	25	33.6 (4.7)
Merchant, et al(2014)	Interactions (Likes, comments, shares)	1325	6.77 (5.37)	8967	4.94 (5.37)

Table.12: Numeric evidence table of studies in two-group (controlled) of change in weight

Author	Weight Change	Sample Size	Control Change: Pre to Post	Sample size	Intervention Change: Pre to Post
Jane, et al(2018)	Weight Loss (kg)	45	93.35 (4.3)	46	87.2 (3.1)
Krishnamohan, et al (2017)	BMI (Body mass Index)	23	25.36 (1.4)	22	26.7 (1.8)
West, et al(2016)	BMI (Body Mass index)	29	22.5 (4.2)	29	22.3 (3.6)
Joseph, et al(2015)	BMI (Body mass Index)	15	32.45 (8.27)	14	29.98 (7.45)

Table 13: Numeric evidence table of studies in two-group analysis (controlled)

Author	Dietary Change	Sample size	Control Change: Preto Post	Sample size	Intervention Change: Pre toPost
Nour, et al(2019)	Intake of vegetables (serving/week)	28	1.975 (1.375)	25	1.725 (1.375)
Jane, et al(2018)	Intake of kJ/day	46	7.601 (397.5)	45	7.449 (328.5)
Krishnamohan, etal(2017)	Intake of fruit & vegetables (servings/week)	23	5.4 (2.55)	22	4.9 (2.65)

Chapter 2

Does the “WoW! Live Well, Be Well” Social media Campaign Change Healthy Lifestyle Behavior and Increase Engagement.

INTRODUCTION

Western Cape on Wellness (WoW!) is a multi-layered, longitudinal healthy lifestyle-promoting partnership program started by the Western Cape Government Department of Health in 2014. The goal of the program is to advocate wellness, through partnership, innovation and policy, including health in communities, worksites and schools in the Western Cape Province. Physical inactivity, unhealthy eating and an unhealthy weight are considered major risk factors for several harmful health outcomes including obesity, diabetes, hypertension and other non-communicable diseases (NCDs) (WCDoH – www.westerncape.gov.za/wow). The risk profile of ordinary South Africans indicates that nearly 7 or of every 10 women and 1 in 3 men are overweight or obese; 1 in 3 women and 1 in 5 men have hypertension (Peer et al., 2014). NCD's account for 38.9% of deaths nationally and 61% in the western Cape (Sheik et al., 2016). Addressing these harmful outcomes through the implementation of novel healthy lifestyle initiatives and communication strategies is paramount to reducing NCDs and changing health behaviors.

Behavioural risk factors for NCDs are influenced by social norms, thus social media has been utilized as a tool to change the way individuals approach these lifestyle behaviors, (Yang, JS., et al 2018). Reframing NCDs as such provides individuals with a locus of action and clarity Allen, L et al., 2017). Allen and colleagues state that it is important not to absolve individuals of all responsibility for their own health and lifestyle choices and the changing social environment strongly influences the set of choices available. Virtually all diseases are influenced by social factors to some degree (Islam, SMS et al, 2014). To reduce and prevent NCD's, changing behavior is of utmost importance (Mikkelsen, B, et al 2019).

The distribution of health risk information is a topic of key importance in health communication. At the individual level, exposure to health information allows individuals to recognize and exert control over health-related events through their own actions (Jacobs et al., 2017). “Collectively, effective health information dissemination promotes health literacy enhancing health conditions and reducing the rates of hospitalizations and mortality” (Cameron et al., 2011). Over the last two decades, social networking sites (SNS) have become important online destinations. Through a network of users and with a culture of sharing, SNS have shown great potential for disseminating information (Oh & Syn et al., 2015). In 2019, there were 16.9 million Facebook users ranging from 25-65 years. Social media has revolutionized communication, creating and intensifying social bonds through posting, sharing, and exchanging information (Chow et al., 2013). The participatory, interactive nature of social media platforms allows for information to be generated and shared in a viral fashion, providing new mechanisms to foster engagement and partnership with consumers, to influence their behaviors and promote healthy lifestyles (Edosomwan et al., 2011). Social media provides a channel whereby organizations can quickly diffuse messages of interest to a wide audience. In fact, in the previous chapter, we demonstrated the potential of using social media to support behavior change for healthy lifestyles, across varying settings and population groups. And although the effect sizes were small to moderate, this is just one of several reasons to advocate for using social media for health promotion, health campaigns and behavior change.

Mass Media campaigns in the Health Sector

Mass media campaigns have been used more frequently over the last decade to change behavior in various populations (Wakefield et al., 2010). Most campaigns have focused on HIV and heart disease prevention, tobacco use, sexual education, and cancer screening. A study done in South Africa by Davie et al., (2013) targeting pregnant women proved that disseminating messages through social media contributed to improving a mothers' knowledge on maternal and child health. The great promise of mass media campaigns lies in their ability to disseminate well defined, behaviorally focused messages to large audiences repeatedly (Wakefield, et al 2010). According to Wakefield et al., (2010) mass media campaigns can produce positive changes or prevent negative changes in health-related behaviors across large populations. "Not including social media in health education can mean missed opportunities. Consumers are using social media to communicate and unless health professionals learn to use these tools, they will be left out of the dialogue" (Hansan et al., 2011, McNabet al., 2009). Online social networks, like Facebook, give the user several useful features that may enhance social support, including the ability for users to share personal information that is aggregated and displayed to other users in real time (Cavallo et al., 2012). In addition, online networks have extensive reach, and they use technology that enhance social support, an established determinant of lifestyle actions. This combination of reach and functionality makes online social networks a promising intervention platform for increasing health messaging campaigns and health promotion.

South African Context

According to Business Tech, 2021 (www.businessstech.co.za) there are currently 38 million users online in South Africa, with Facebook being by far the most widely used platform across the board with an estimated 27 million users. Using social media to galvanize communities through engagement can create the social influence required to change behavior (Latkin, C.A, et al., 2015). A study by Peck, 2014 showed that combining social media resources and in person education helped to increase public awareness and disseminate health information for hypertension amongst Facebook group members. In addition, the healthcare hashtag project analyzed the growing influence of twitter, which exceeded the threshold of 100 million tweets, equating to 100 million individual pieces of health information shared. Generating engagement is important because it not only reflects the ability of the content to capture the attention of users but also directly influences the reach of content (Kite, J et al., 2016). Previous research by Edosomwan et al., (2011) has found that users of social networking sites such as Facebook primarily share information on these platforms when they believe the information is beneficial to others. There is little to no research in South Africa evaluating user engagement. So while there may be enthusiasm for, and interest in, using social media for public health communications, there is little understanding of the connection between online engagement and behavior change.

Behavior and Lifestyle Change

According to Osch et al. (2009), the large discrepancies between people's intention to have a healthier way of eating and to be physically active and their actual health behavior indicate that motivation is not a sufficient instigator for health behavior change. This discrepancy between motivation and actual health behaviors has been subject to profound scrutiny in the past decade. In a review of health behaviors (Sheeran et al., 2002), it was demonstrated that only 53% of individuals with positive intentions to engage in health behaviors translate their intentions into actual behaviors. Research efforts to decrease this 'intention - behaviour gap' have centred on aspects of self-regulation, most importantly self-regulatory planning (Van

Osch et al., 2009). Most focus on the promotion of health protective behaviors and not the predictive value of action planning in health protective behavior. Harris et al., 2018 define “health protective behavior “as any behavior performed by a person, regardless of his or her perceived or actual health status, to protect, promote, or maintain his or her health, whether or not such behavior is objectively effective toward that end. The study by Sheeran et al., (2002) and later by Osch et al., (2009) show that action planning may be an important strategy to promote health protective behaviors and suggest that current social-cognitive models on health protective behavior should be extended by incorporating volitional cognitions that facilitate the transition from motivation to behavior.

Social media and adherence to lifestyle change

Google and the Internet have become the “go to” doctor (Korda et al., 2011). This is evident in that the most popular online activities were searching for online health information. Patients can use social media for a variety of reasons that include education, research, support, goal setting, and tracking personal progress (Modhal et al., 2011). Patients can express themselves, share their stories, learn from others, and spread health knowledge. (Roblin et al., 2011), studied the potential use of mobile social networking healthcare to aid in the support of chronic disease self-management. The author conducted a pilot study in which social media programs were used to mediate communication between adults with type 2 diabetes and to motivate them to self-monitor their blood glucose levels. Some of the diabetic patients put more care into their self-monitoring and observed improved emotional health as a result of the peer support enabled by the social network. Social media platforms like Facebook provide an ideal space to bring health issues to the forefront as well as providing healthcare workers an added avenue to promote self-management, health education, behavior change and medical support (Ventola et al., 2014).

“Interactive social media is defined as two-way communication between peers or the public” (Hilde et al., 2018). This interactive functionality of social media offers a tremendous opportunity for increasing the reach of health interventions and enhancing a person's ability to engage in healthful behaviours. A recent study on how individuals in South Africa access information, use social media and rate the credibility of the information source showed that FB was the leading social media platform used (Shava et al., 2018). Within Facebook, the information posted which can be shared, commented upon or liked by other users. The role that social media plays in influencing behavior change is unchallenged. These challenges are directly tied to the nature of social media itself, where health education specialists cannot fully control what, when, and how health information is shared. A health intervention that seeks to change behavior should try to consciously and unconsciously influence its target audience by changing not only behaviors but also attitudes and habits (Bartholomew et al. 2006), Behavior Change Communication (BCC) programs are designed to bring about behaviors that improve health status and long-term outcomes through mass media campaigns (FHI 360, 2002; Fishbein et al., 2006). The most effective behavior change communications are those aimed at changing behaviors rather than behavioral categories (Fishbein et al., 2006).

It has been argued that interpersonal communication is a link between campaign activities and its desired outcome (Jeong et al., 2018). With social media networks, these conversations are visible and measurable (to some extent) and provide valuable information on the uptake of campaign messages, thus they can be defined as an outcome for health promotion campaigns (Southwell et al., 2009). Although autonomy of sharing information and discussing different viewpoints can lead to increased reach of campaign messages and support goals,

campaign activities need to be carefully monitored to avoid undesirable outcomes for individuals(Dwivedi et al.,2021).

The exchange of health information related to NCDs and living a healthier lifestyle prompted by health campaigns via social media can provide a good source of understanding, motivation & engagement (Mendoza-Harrera et al, 2020). As well as a change in attitude for those with a vested interest in the care and well-being of those with chronic diseases of lifestyle. Interactive social media has the potential to uphold health endeavours in various ways. This is noted in the use of implementing strategies aimed at influencing individual health behaviors, informing health research, supporting health advocacy groups, and promoting health services (Brusse et al., 2014; Seltzer et al., 2015; Rhodes et al., 2016; Sinnenberg et al., 2016 & Wong et al., 2016). While the use of social media is common for supporting public health activities, very few organizations have reported consistent strategies describing how public health interventions sustained through social media have helped achieve their health equity goals (Thackery et al., 2012; Osborne et al.,2013; Chauvin et al., 2016 & Ndumber-Eyoh et al., 2016).

The Western Cape Government Department of Health (WCDoH- www.westerncape.gov.za) public policy recognizes that wellness includes physical, psychological, financial and social domains, and can mitigate in the province contributes to the escalating pressure on demands for health and social services, community safety and policing, education and human settlements. This requires a commitment to co-create these enabling environments. Despite the large number of people using Facebook to share health information, little is known about the type of informationsharing and potential health consequences on members of the WoW! program and their network. In terms of scaling health communication, building an online community is important for WoW!, as it may serve to create capability, offer opportunities for engagement and enhance motivation, including self-management of chronic conditions.

Hence the aim of this chapter was to evaluate a 12-week key message health campaign delivered via Facebook to:

1. Determine which types of Facebook posts elicited the highest engagement
2. Consider whether engagement varied based on the post generated by a group moderator or a member of the WOW! Facebook group.
3. Determine if lifestyle actions change based on a key message health campaign.
4. To analyze content and characteristics of the comments made on the WoW! group retrospectively, as well as during the campaign and identify themes that emerge concerning participation and adherence.

These measures were compared to the Facebook “traffic” in the 12 weeks preceding this targeted messaging campaign.

CHAPTER 3

METHODS

Study context and setting

This study involved a subgroup analysis of evaluating a 12-week key message campaign delivered via public Facebook group. The analyses of the database was conducted with approval from Faculty of Health Science's Human Research Ethics Committee (HREC REF 025:2019), University of Cape Town, Cape Town, South Africa. The "live well, be well" key message campaign was conducted on the WoW! WesternCape on Wellness Facebook group.

The key message campaign sought to implement five strategies across all of WoW!'s tiers (community, school and worksite) :

1. Establish an effective, sustainable communication tool for all WoW! groups
2. Build an online community for all WoW! groups that promotes engagement, education, and social support.
3. Explore the effect of a social media campaign on traffic to the page.
4. Explore the effect of social media campaign on lifestyle actions.
5. Identify themes that strengthen the para-social relationship between the participants and the healthcare facilitator to assist with adherence to the programme.

Dose Delivered

A mixed methods quantitative and qualitative content analysis was undertaken to assess key messages, which were publicly available on the WoW! Facebook group.

Dose delivered is the number of unique posts (key messages) made by the moderator to the study's Facebook page. The number of moderator posts was summed over the course of the study's campaign months, which was 3 months (June 1st, 2019, to August 31st, 2019). A key message wellness campaign was conducted, with a total of 60 lifestyle key messages. Key messages were posted on the WoW! Facebook group 5 times a week from Monday through to Friday. All posts were planned and disseminated by the moderator. Each message built upon the previous weeks message and remained consistent with the theme of the month. The themes of the month were Youth health, Women's health, Heart health. Nutrition was categorized into five main categories (breakfast, snack, lunch, dinner, hydration) and each category had a recipe and an important nutrition tip. Fitness was categorized into 3 main categories (cardiovascular, strength and flexibility) and comprised of a specific type of movement and a fitness tip. The campaign was designed for WoW! Facebook participants to make healthier lifestyle choices. Within the campaign, a moderator aimed to provide information, motivate participants, and facilitate social interaction. Participants could be involved by engaging with the posts by liking, commenting, and sharing the posts.

A total of 60 posts and associated comments were extracted and coded using a codebook based on items from the supportive accountability model and peer social support analysis. The analysis was undertaken between 1st June and 31st August 2020. The identified search material was reviewed allowing removal of any personally identifying or geographical material in order that the comments were rendered anonymous. Sorting of the comments allowed removal of duplicate material. Comments were initially read and then re-read with an identifying code being applied to each comment - this coding used phrasing from the

source comment to maintain close allegiance with original meaning. Comments were then organized according to descriptive headings and overarching themes were identified.

Data Source

The Facebook group at the time of the study had 1,087 members. Key message campaign Facebook posts ($n = 60$) were categorized into four mutually exclusive post types: Motivation, Information, Inspiration, Activation. Posts made by the group moderator were designed to fall into six distinct categories: to provide motivation for the coming week (“Motivation Monday”), to provide health related information (“Topic Tuesday”), to provide information and recipes on nutrition (“Nutrition Wednesday”), to be motivated or inspired by others living a healthy lifestyle (“Transformation Thursday), or to facilitate a fitness or physical activity question or information (“Fitness Friday”). WoW! Facebook users could also create their own posts and were encouraged to share their experience or pose a question, which fell under the broad category of shared experience.

Process Measures and Analysis Plan

The findings presented represent a way in which exposure to and engagement with Facebook can be conceptualized for the purposes of health behavior intervention research. These analyses focused on Facebook posts delivered by the moderator and posts received by Facebook participants. The measures used to define exposure and engagement are presented subsequently.

Engagement

Three icons were used to measure levels of participant engagement with each of the five post types: “likes,” generated by clicking on a thumbs-up icon for agreement or enjoyment of the content; “comments,” allowing the participant to join a conversation with others in the group; and “shares,” where participants shared the post to their networks. The total number of likes, comments, and shares per Facebook post was summed up across the campaign period to give a total engagement score. The mean number of likes, comments, and shares was then calculated for each of the five post types. In addition, traffic to the group pre and post campaign was analyzed. The moderator responded to comments as necessary to (1) facilitate conversation (2) correct misinformation regarding incorrect health advice) (3) remove identity (4) be available for advice and feedback 5) address cyberbullying – defined as removing any hate or harmful comments.

Information collection and analysis

Data Analysis

One –way ANOVA was performed to determine whether level of likes, shares and comments differed between posts. One-way ANOVA was performed to determine whether level of engagement differed between post types, with Tukey–Kramer test used to determine post hoc differences. An independent-samples t-test was conducted to determine whether total engagement differed between moderator-initiated posts and Facebook user-initiated posts. All analyses were undertaken using SPSS (Version 23) and Prism V9.0, with an alpha of $p < .05$ used to determine statistical significance. Facebook Analytics was used to gauge number of active members to the WoW! Facebook group before and during the campaign.

Thematic Analysis

A thematic guide was used that focused on seven main themes and three main areas which are reported in this paper. These are 1) what is healthy living and how do we adhere to it, 2) how do we create healthy lifestyle awareness, 3) views on members experience and knowledge sharing. The first step in the analysis aimed at understanding the range and variation of attitudes and perceptions regarding the concepts of health and healthy living. Later when focusing more on health messaging in practice the analysis was deepened to include also the more latent meaning of the data. The emerging themes were developed by introducing Weber's concept of "ideal types" (Lindbekk et al., 1992). Originally these are theoretical constructs that metaphorically capture essential features of an investigated phenomenon, not necessarily found empirically.

The search strategy, following elimination of duplicate material, produced a total of 112 individual comments. Descriptive coding and summary themes are represented in Table 17, together with counts of comments within each theme. The theme social cohesion and connectedness contained the greatest amount of material. Five main themes were structured into the content analysis: 1) Enjoyment of the intervention - Having creative elements that focus on self-improvement and inspiration are associated with increased interaction with campaign messages. 2) Benefits of the intervention – Psychosocial and health benefits 3) Obstacles affecting adherence – Confidence in adhering to a plan 4) Experience and knowledge sharing 5) Social cohesion and connectedness – developing a social network through shared experiences 6) Developing professional communication 7) Organizational support.

The coding was used to independently extract and analyze core information from Facebook postings to determine major content themes. Comments were imported into NVivo12 for Windows (QSR International) and analyzed thematically, following the six steps outlined from Braun and Clarke (2006): Data familiarization, generating initial codes, searching for themes; reviewing themes; defining and naming themes; producing the report. The coding scheme was used to extract comments and divide the posts into categories in which each post could have more than one code. Each category related specific theme as outlined above. Each post was analyzed and reviewed in an iterative process in isolation to the previous posts to ensure the consistent application of codes and themes.

As the data were collected as secondary analysis of a database, individual ethical approval was not obtained, other than posting on the FB page that information would be used for subsequent analysis to improve the relevance and quality of FB messaging to the group. However, individual responses and quotes are not provided in this content analysis, as this would render the responder identifiable, as the FB page is open to the public.

RESULTS

Per post Analysis

There was a total of 60 moderator- initiated posts during the 12-week campaign. Taken together likes were the most common form of interaction (mean = 7.6, SD 9.8) and least commonly in the form of comments (mean = 0.81, SD 2.3). ANOVA revealed that total engagement varied between types of posts (Table 1), ($F(4, 60) = [4.53], p=0.03$).

Table.1 Mean number of likes, shares, comments & engagement during the campaign

<u>Post Type</u>	<u>N</u>	<u>Me an like s per post</u>	<u>Std Dev</u>	<u>Mea n Shar e per post</u>	<u>Std dev</u>	<u>Mea n Com ment per post</u>	<u>Std dev</u>	<u>Mean Enga geme nt per post</u>	<u>Std dev</u>	<u>P value</u>
<u>Motivation Monday</u>	<u>12</u>	6.83	SD(3.6)	1.154	(SD2.2)	<u>0.538</u>	<u>SD(1.46)</u>	7.31	SD (3.9)	P< 0.001
<u>Topic Tuesday</u>	<u>12</u>	7.00	(SD7.9)	2.58	(SD4.64)	<u>0.41</u>	<u>SD(1.44)</u>	<u>10.00</u>	<u>(SD12.09)</u>	*P<0.012
<u>Nutrition Wednesday</u>	<u>12</u>	6.66	(SD3.2)	1.08	(SD1.08)	<u>0.80</u>	<u>(SD0.28)</u>	<u>8.41</u>	<u>(SD3.47)</u>	* P<0.000
<u>Transformation Thursday</u>	<u>12</u>	12.16	(SD20.04)	4.538	(SD3.4)	<u>2.5</u>	<u>(SD 4.73)</u>	<u>15.5</u>	<u>(SD24.74)</u>	*P<0.003
<u>Fitness Friday</u>	<u>12</u>	5.66	(SD1.37)	0.58	(SD0.90)	<u>0.50</u>	<u>(SD0.52)</u>	<u>6.75</u>	<u>(SD1.76)</u>	P<0.001

Values reported as means +_ sd. * Denotes significant differences between mean likes, shares and comments and post type during the campaign.

Table 2a: ANOVA: Engagement of key messages during health campaign.

Key messages	N	Mean	StDev	95% CI
Motivation	12	7.31	3.9	(5.72, 10.10)
Topic Tuesday	12	10.00	12.09	(2.31, 17.68)
Nutrition Wednesday	12	8.41	3.47	(6.20, 10.62)
Transformation Thursday	12	15.5	24.74	(-.22, 31.22)
Fitness Friday	12	6.75	1.76	(5.62, 7.87)

Total engagement varied between post types $F(4, 60) = [4.53]$, $p=0.03$). Using Tukeys HSD the below table demonstrates the key message that elicits the highest form of engagement. This is noted by the large difference in the mean and being grouped as an alternative letter.

Table 2b: Grouping Information Using the Tukey Method and 95% Confidence.

Key messages	N	Mean	Grouping
Transformation Thursday	12	15.5	A
Topic Tuesday	12	10.00	B
Nutrition Wednesday	12	8.41	B
Motivation Monday	12	7.31	B
Fitness Friday	12	6.75	B

*Means that do not share a letter are significantly different

Tukey’s HSD test for multiple comparisons found that Transformation Thursday key messages prompted higher levels of engagement (Likes, shares & comments) relative to the other posts (Table 2b).

An independent sample T-test determined that the volume of engagement was higher for moderator-initiated posts than Facebook WoW! member (Table 3, mean 8.04, SD 6.41 compared to mean 3.77, SD 5.01, $P < 0.001$).

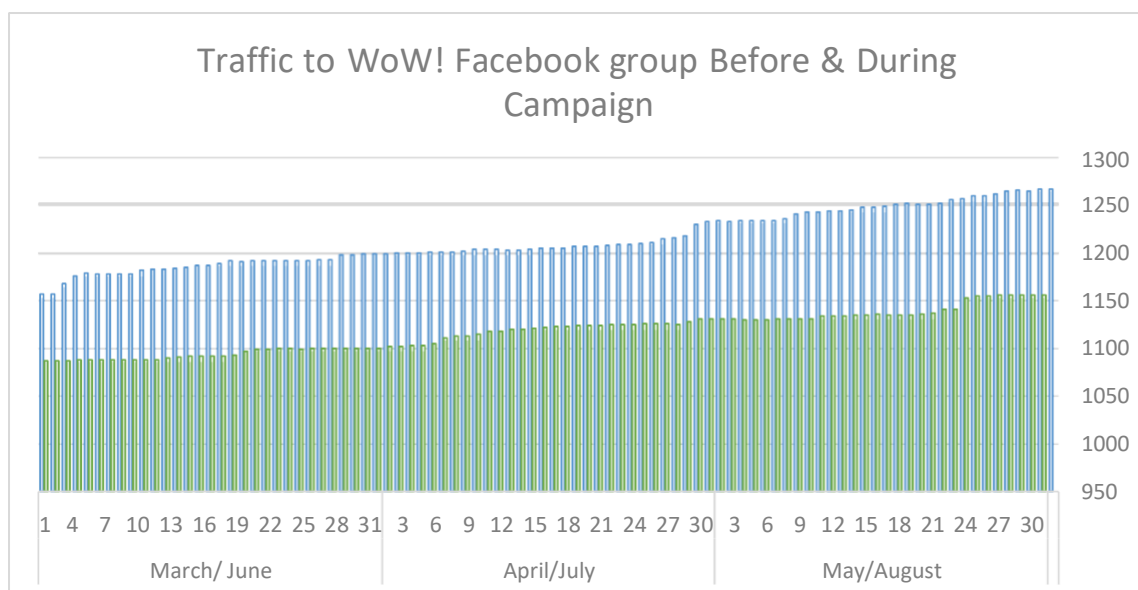
Table.3 Sample T-Test for moderator-initiated and Facebook user initiated during the campaign.

Sample	N	Mean	StDev	SE Mean
Moderator post	60	8.04	6.41	0.94
Facebook User post	47	3.77	5.01	0.73

$t = 3.60$ $df = 92$, $p < 0.001$. This T-test demonstrates the differences in engagement between moderator initiated posts and participant.

Figure.1 shows that traffic to the WoW! Facebook group consistently increased as the campaign continued over time. This demonstrates that key messages resonated with members of the group and were seen by individuals who were not a part of the WoW! Facebook group.

Figure.1 Traffic to Facebook group Before & During Key Message Campaign.



Characteristics of the Facebook posts

Out of total 105 posts both retrospective and those that were initiated during the campaign, the 91 that received comments were coded and assessed. Content analysis and characteristics of Facebook posts are presented in Table 16. First there were no safety concerns throughout moderating. There were fewer than 5 instances that moderators intervened to correct misinformation. There were no instances of cyberbullying or crisis situations. The moderator

most often commented to facilitate conversation or offer feedback and advice. Of the 91 posts, there were 1.9% (2/105) where only the moderator responded; 23.8% (25/105) where only one or more participants responded; and 35.2% (37/105) where both the user and moderator responded. Of the 37 posts for 62.1% (23/37) of the conversations continued after the moderator responded. During the retrospective analysis 45 posts from WoW! members met the eligibility criteria and were included for further analysis. Table 16 highlights the characteristics of the posts. Most of the posts (n= 31, 68.8%) were from Bonteheuwel, followed by (n=7, 15.5%) from Paarl and Macassar.

Table 16: Characteristics of FB posts pre and post Health Campaign

Characteristics (N=105)	Characteristics of Facebook posts			
	Pre Campaign Frequency	Pre Campaign Percentage	During Campaign Frequency	During Campaign Percentage
Gender				
Female	24	53.3%	36	55.3%
Male	5	11.1%	18	27.7%
Age Group (Years)				
<20	-	-	-	-
20-40	12	20%	19	29.2%
40-65	19	31.6%	37	56.9%
Geographic Origin				
Athlone	5	8.3%	-	-
Auckland, New Zealand	-	-	4	12.5%
Bishop Lavis	2	3.3%	7	11.6%
Bonteheuwel	3	6.6%	11	18.3%
Belville	3	11.1%	9	15%
Cape Town, Metro	10	22.2%	35	58.3%
Caledon	-	-	3	5%
Gugulethu	5	11.1%	20	33.3%
George	7	-	24	40%
Johannesburg	2	4.4%	9	28.1%
Khayelitsha	2	4.4%	13	21.6%
Macassar	3	6.6%	11	18.3%
Malmesbury	2	4.4%	7	11.6%
Mossel Bay	-	-	4	6.6%
Paarl	3	11.1%	29	48.3%
Port Elizabeth	1	2.2%	7	11.6%
Pretoria	1	2.2%	3	5%
Stellenbosch	2	4.4%	8	13.3%
Wellington	-	-	8	13.3%
Worcester	1	2.2%	10	16.6%

Most of the posts, 28 (62.2%), were from women and a large portion were posted by members between the ages of 45-65 (n=37, 68.5%). Even though men posted the least on the Facebook group, they on average (n=8) commented and responded to messages more frequently and without prompts from the moderator. A total of 49 comments were made during the campaign

compared to 63 pre campaign. The geographic region was included to note where the most active participants are based for future health campaigns. As the campaign progressed the sharing of health information by WoW! members related to healthy living gradually increased over time. Looking at the geographical areas, most of the comments and posts came from participants in the Metro (58.3%) and rural districts Paarl (48.3%) and George (40%). A study by (Opegard, B et al., 2016) suggests that a proximal or virtual tie to a place adds connection and thus value to the information.

Thematic Content Analysis

The total coverage of the 7 main themes that were identified constituted 53.3% (112/210) of all comments in the pre and during campaign analyses. The remaining 98 comments were too vague to be classified into a single topic with meaningful coverage. The most prevalent theme was social cohesion and connectedness at 29% (33/112) followed by experience and knowledge sharing at 17.8% (20/112). Health benefits and enjoyment held equal value 10.7% (12/112). The least common theme was developing professional communication and organizational support at 4.5% (5/112).

Table 17 Pre and during Campaign Identified Themes and analysis of comments

	Description	Pre-Campaign	Campaign
Enjoyment	<i>Joy Fun Vitality</i>	4	1 4 3
Experience and Knowledge Sharing	<i>Information gathering Anecdotal or personal experience Learning a skill Advising</i>	3 3 2 3	4 5
Organisational support	<i>Policy changes Management approval Sharing resources</i>	1 2 2	
Health benefits	<i>Increased physical activity Better eating habits Improved Mental health Consistency</i>	1 1	5 5
Social cohesion and connectedness	<i>Accountability Group Encouragement and support Drawing inspiration from peers Building a network Compassion</i>	3 10 2 2 1	6 5 4

Obstacle to adherence	<i>Weather Data</i> <i>Time constraints</i> <i>Family & Work obligations</i>	3 4	3 2
Developing Professional Communication	<i>Team work Respect</i> <i>Willingness to question</i>	2 1	2
Total comment count		63	49

CHAPTER 4

DISCUSSION

This study sought to determine whether a lifestyle key message campaign increases engagement and traffic to a public wellness platform. As well as determine the type of posts that have the most impact on users for future recommendations and development of educational material for effective communication and behavior change. The study found that a purposive key-message campaign increased engagement and traffic to the WoW! social media platform. Differences between the likes, shares and comments for each post was evident. Overall likes were the most common form of engagement. This suggests that ease of use is a key determinant of how users choose to interact with Facebook delivered health campaigns, given that one-click offers a show of support with minimal effort (Lee et al., 2016). The finding that Transformation Thursday key messages elicit higher rates of engagement than other post type. Transformation Thursday posts are characterized by personal storytelling, conveying the health journey and challenges of wellness champions. This is consistent with previous literature examining diabetes awareness. In the studies by (Dai Pu., et al 2021 & Gabarron et al., 2020) posts that were the most engaging to their diabetic patients were the ones that featured personal stories and those that gave patients a sense of empowerment. This suggests future campaigns using Facebook should aim to enhance engagement by designing content with a personal, emotional element and ones that show the possibility of lifestyle change despite the environmental, financial and social barriers to change.

In a social media context sharing is an important tool to increase and retain the target audience to the campaign and increase reach. In this study sharing as a means of engagement was low and inconsistent (m=1.1, SD 2.41). Sharing of health information in past research has shown that strong personal disassociation from the core message often prevents individuals from engaging in preventive actions (Tewksbury, Moy, & Weis, 2004; Wei et al., 2008). These results support the importance of creating shareable content to reach audiences beyond the WoW! Facebook Group. A study by (Chau et al., 2018) states that adding social

components to behavioral interventions does not always lead to high user engagement. This is consistent with findings of (Heimlich et al., 2011) that suggest that individuals are more likely to use Facebook to maintain their current friend group, rather than to develop new relationships. Using existing relationships may help to improve adoption and engagement barriers and help create a positive impact on health via through social media.

Engagement was higher for moderator-initiated posts compared with participant-initiated posts). In the context moderators are seen as the information source and therefore more knowledgeable. Users may be less likely to post, if they deem themselves less Users are more likely to respond to moderators requesting feedback. Eastin, et al 2002 and Jung, et al 2016 state that the perception of the moderator being seen as a more credible source, will result in better engagement. Other findings that emerged from the study was that having specific key health promotion messages increased opportunity for healthy lifestyle actions via the WoW! Facebook community. Polls were conducted to analyse Physical activity and nutrition changes but not enough data was collected. Observationally, however the key message campaign engagement increased the amount of physical activity the participants were doing over the 3 months and beyond. Providing individuals with a goal that is identifiable can result in changed behaviour. The creation of policies that support opportunities to change provides additional motivation for change, whereas policy enforcement can discourage unhealthy or unsafe behaviours (Wallack et al.,1996) . Public health and media advocacy campaigns that shape the treatment of a public health issues also represent a promising complementary strategy to change behaviour. Active users and traffic increased from 1087 before the campaign to 1256 during the campaign. Dissemination of these key messages had a wide reach but none that was significant. Using strategies to engage health campaign dissemination (e.g. other healthaccounts and influences in the space) could therefore be a promising strategy in promoting digital word of mouth and campaign reach. The number of participants who visibly engaged with the WoW! Page was low but higher than those in other studies. Cavallo et al, 2012 found that just 45% of participants interacted with the study's Facebook page once or more over thecourse of a 12-week intervention, and Napolitano et al 2013 found that less than 25% of participants engaged with the study's Facebook page during an 8-week intervention. As health education specialists, we need to be wary of designing social media interventions or campaigns that are most suited to population segments that are comfortably well off, and text-, tech- and eHealth-literate.

The themes identified in this study of a healthy lifestyle key message campaign via Facebook over a period of 6 months, pre-COVID 19 provide several insights about the user's experience with social media in changing healthy lifestyle actions. The most prevalent topic was social cohesion and connectedness as well as knowledge sharing and experience. These findings demonstrate that Facebook users communicate shared values, challenges and experiences while trying to change their lifestyle behavior. In other words, such posts may notify others about lifestyle message campaigns and align patients, change agents and active users into a community around health promotion and lifestyle. Similarly, a recent study by (Winstone, et al., 2021) found that online mental health interventions stimulated feelings of social connectedness via enhancing feelings of belonging and group membership. In addition, using social media to share experiences- messaging, viewing online content together with friends and families appeared to foster feelings of connectedness.

Health benefits with regards to increased physical activity, healthy eating and improved mental health were identified as topics of discussion. Two fundamental strategies were used to achieve this: behavior to be followed; and time for a routine to produce effects, leading to consolidated

behavior change and visible alterations. This means that there are psychological-cognitive components (such as habits, motivation, and self-control) present 10% of the time. Similarly, a research study by Easton, et al., (2018) found participants following “*fitspiration*” accounts and used them to gain practical tips and ideas about healthy lifestyles. In addition, these lifestyle accounts boosted their motivation to be more active, adopt a healthier way of eating and a positive mindset. These interpersonal communications suggest that commonly individuals’ bond around health-related messages and that there may be a social influence in which one person motivates another to change behavior.

One of the main themes highlighted was obstacles to adherence. Adherence to management of chronic health conditions in medicine and health is described as the degree to which an individual’s health and lifestyle behaviors are consistent with health recommendations (Kardas, et al., 2013) Adherence in this study was influenced by 1) weather 2) family & social obligations 3) Time constraints and 4) expensive data charges. We found that these obstacles prevented users from completing their goals set out for the week, which resulted in a barrier to their lifestyle changes. Behavior change can only occur when both the individual and their social environment support that change (Cox, 2000). Being digital-media-proficient means being able to meet priority populations where they are to bring about change within the physical, social, and online environments in which they live, work, and play (Stefellson et al.,2020). Although time availability is a personal resource, lack of time is typically attributed to external factors (Cobb-Clark, 2014). Family and work commitments are often prioritised over one’s health, leading to reductions in healthy lifestyle actions. This is supported by (White et al., 2005), who demonstrated that becoming a parent is associated with reductions in physical activity for mothers. In terms of the geographical analysis being able to engage in lifestyle changes may be a hindrance in achieving that participants goals. The study on proximity and digital platforms by(Oppegard et al, 2016) suggests that place curated social media campaigns can be a grounding and a generative force; grounding in the sense that while digital worlds are unlimited and pragmatically unmanageable, the lone physical world we share is not only finite and fixed in space, but also a community’s primary connective tissue. Therefore, we can assume that if communities do not feel tethered to the message and the space adherence to programmes and campaigns become a stretch.

In this study it was noted that periodic prompting by moderators was an important tool to encourage participation. During the campaign even though the traffic to the Facebook group steadily increased the comments were far less. It is important to note that perhaps the themes chosen during the campaign did not provide an emotional connection for users. A study by (Jaakonmaaki et al.,2017) observed that messages that include persuasive content (e.g., emotional, and philanthropic) increases engagement, while informative content (e.g., product prices, availability, or features) reduces engagement when used separately but increases engagement when combined with some persuasive content. Observationally, the themes that had the most comments, coincided with the posts that had the most likes and shares. The role of the moderator in social media campaigns is necessary to ensure the consistency of engagement, the safety of users and quality of campaign content. Moderation improves quality and accuracy of information shared by users (Sooklall et al., 2018) and helps direct users to specific site content to address their unique needs (Gleeson et al., 2017). User engagement is essential for the success of social media interventions (Kraut et al., 2011), which can be influenced by content, moderators, and users themselves. A study examining user engagement between different types of Facebook posts (e.g., pictures, polls, multimedia, and questions) found that posts requiring a simple response, particularly polls, generated the greatest engagement (Edney, 2018). Observationally, in this study moderator-initiated posts that offered simple questions and

moderator follow-up comments did incite a response from users, suggesting that users felt comfortable engaging with content sourced directly from the moderator.

The role of the moderator involves a delicate balance. Too much can be perceived as surveillance and becomes detrimental to the success of the intervention (Windler et al., 2019). Further research could consider the validity of moderators sending direct messages to users in response to comments as an option to responding publicly. Does this bring about meaningful conversation among users. Feedback about moderator techniques such as this can have far-reaching effects for effectively increasing user engagement in potentially valuable social media interventions. To effectively engage diverse audiences, there are several steps that can be followed to adopt a more strategic approach to social media use in health promotion: 1) understand how the priority population uses social media, 2) identify evidence-based social media strategies, 3) select appropriate communication times and channels, and 4) determine which types of social media apps will engage your audience most often in a meaningful way (Bensley et al., 2019).

Study Limitations

The terms of engagement involved simple terms (i.e., “no of shares”, “comments” and “likes”). Each indicator of engagement provides a different level of enjoyment, ease of effort and approval rating. Our campaign period took place during the winter months (June to August) and we cannot comment whether our findings are applicable throughout the year. It should be noted that the users of the Facebook group do not represent the larger population in terms of health needs and health literacy. Engagement with this social media campaign does not reflect real-life outcomes in terms of behavior change. This study provides a rich resource of perceptions of health messages in health-promotion campaigns on social media. The aim of the study was to understand the social dynamics of the campaign, not generalizability. Quantitative data is provided to supplement qualitative results, aiding in more detailed interpretation. There were very few comments that could be used for analysis and thematic value. We recognize that our findings did not represent the views of users who did not engage with the content. The role of moderators in this case was underutilized, more especially to encourage responses and connection to the messages conveyed when engagement paused. Skilled social media moderators are important for the maximization of engagement during health campaigns, responding to users in a timely manner and advising on current public health concerns. Moderators can provide invaluable social support that health promoters and healthcare workers cannot, such as how to effectively communicate with individuals with chronic illnesses.

Although the application of social media in public health and health promotion has yielded some success in terms of generating support structures and networks for effective health behaviour change, there are challenges and complications associated with social media use that also need to be addressed (e.g., managing misinformation, ensuring compliance with user privacy protections). While it is relatively straightforward to view social media use as a universal communication channel, especially for those who already use social media, the risk of using social media lies in reducing health information access among those who are not technologically “connected”. Social media is not likely to be an effective option for population subgroups include the elderly; the physically and cognitively disabled; and those with low text, technical, and eHealth literacy.

Strength & Practical Application

This research offers several insights that may be useful for researchers developing social media-based health promotion campaigns and interventions in the future. The use of Facebook as a promising platform for health promotion. Tools such as social media analytics and data mining software can assist health education specialists in assessing the reach and dose of communication messages. With a large user base, it is possible to reach and engage with individuals not within the Western Cape. Analyzing user engagement with social media posts is a way for health promoters, community liaison officers to understand the voice of the patient and to understand what individuals are interested in at a specific moment. Analytics also help to extract useful patterns of user activity to measure the engagement, experience, and moderator responsiveness within online communities (Seering, J et al 2019). This type of social media data enables decision makers to learn from mistakes, make health promotion program modifications, monitor progress towards program goals, and justify the success of achieving desired health-related outcomes (Bensley et al, 2019). Online campaigns seem to work best when there is a clear and achievable call to action. Developing campaigns that are shareable and that create change may mean taking calculated risks with campaign content that is suitable on a literacy level, for individuals in the community, as well as those with NCDs (Wang, A et al 2013). This study advocates for using social media as a health promotion tool because it is efficient, allows for easier access to information for all populations and maintains the relationship between practitioner and patient. This study affirms the need to administer tailor made health messages via social media for chronic diseases as well as overall health & wellness to wider populations in a more efficient manner without the need for paper trails or “door to door” selling as a health promotion tool. This enables health workers to develop further themed content for social media for health interventions. Using health messaging via these platforms provides the health practitioner with immediate feedback on the patients goals, challenges, actions that need to be changed. Working with healthcare professionals, health promoters and community-based volunteers, such as WoW! Wellness Champions, as content moderators creates a symbiotic relationship that holds potential and promise for the effective integration of social media health promotion campaigns within the health sector.

CONCLUSION

This chapter examines the effect of a 3-month key message campaign on traffic to the WoW! database, engagement, and type of posts most valued by Facebook users. The use of social media for communications in health promotion offers exciting new prospects for broader reach. Tailoring health education messages to fit the target audience is essential in improving knowledge sharing and engagement. The qualitative themes unpacked during this study offer rich and valuable information on how to further improve the WoW! communication strategy. The 5 main themes discovered during the campaign and two sub themes pre-campaign highlighted the positive effects that a social media driven health campaign can have on participants. First, social media can play a significant role in improving *health literacy*. Second, Social support is important for the maintaining good health and is just as important when individuals undergo health-related lifestyle changes, including weight loss, dietary intake, and physical activity. Social media content for health literacy should be created through a well thought out process with the support of moderators to facilitate the conversation and drive engagement. There are several roadblocks that affect an individual's adherence to health recommendations. Addressing modifiable such as social support, knowledge sharing, user motivation, emotional status and healthcare systems may provide better opportunities to affect behavior change and long-term

adherence to health behaviors. The trend of using social media is here to stay and establishing policies and standard practice within the scope is needed.



References

1. Abdulkadri A. Addressing the adverse impacts of non-communicable diseases on the sustainable development of Caribbean countries”, *Studies and Perspectives series-ECLAC Subregional Headquarters for the Caribbean*, No. 100 (LC/TS.2021/4-LC/CAR/TS.2021/2), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2021.
2. Ajzen I. *Theory of planned behaviour* :Organizational Behaviour and Human Decision Processes.1991 50(2) 179-211.
3. Al Qarni, Z.A, Yunus.F, & Househ, M.F. *Health information sharing on Facebook: An exploratory study on diabetes mellitus*, *Journal of Infection and Public Health*. Volume 9, Issue 6,2016, Pages 708-712.
4. Allen L, Williams J, Townsend N, Mikkelsen B, Roberts N, Foster C, Kremlin, W. *Socioeconomic status and non-communicable disease behavioural risk factors in low-income and lower-middle-income countries: a systematic review*. *The Lancet Global Health*, 2019, 5 (3).
5. Andrade EL, Evans WD, Barrett N, Edberg MC, Cleary SD. *Strategies to Increase Latino Immigrant Youth Engagement in Health Promotion Using Social Media: Mixed-Methods Study*. *JMIR Public Health Surveill* 2018;4(4):e71.URL: <https://publichealth.jmir.org/2018/4/e71>. DOI: 10.2196/publichealth.9332
6. Arlinghaus KR, Johnston CA. Advocating for Behavior Change With Education. *Am J Lifestyle Med*.2017;12(2):113-116. Published 2017 Dec 9. doi:10.1177/1559827617745479
7. Atkinson JW. *Motivational determinants of risk-taking behaviour*. *Psychological Review*. 1957,64, 359-372
8. Bandura, A (1991). Self-regulation of motivation through anticipatory and self-reactive mechanisms. In R.A. Diestbier (ED). *Nebraska Symposium of Motivation and Perspective*.
9. Bartholomew LK, Parcel GS, Kok G, Gottlieb NH, Schaalma HC, Markham CC, Tyrrell SC,Shegog RC, Fernández MC, Mullen PD, Gonzales AC. Planning health promotion programs:an intervention mapping approach. Jossey-Bass; 2006.
10. Bensley, R.J.; Thackeray, R.; Stellefson, M. Using social media. In *Community and Public Health Education Methods: A Practical Guide*; Bensley, R.J., Brookins-Fisher, J., Eds.; Jones& Bartlett Learning: Burlington, MA, USA, 2019; pp. 149–167. [[Google Scholar](#)]
11. Berends, L & Halliday, R . *Capacity building and social marketing promotes healthy lifestyle behaviour in an Australian Aboriginal community*. *Australian Journal of Rural Health*. 2018 Vol26.10.1111/ajr.12421.
12. Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, Bronner (2018) Engagement with Social Media and Social Media Advertising: The Differentiating Role of Platform Type,*Journal of Advertising*, 47:1, 38-54, DOI: 10.1080/00913367.2017.1405754
13. Brett Oppgaard & Michael K. Rabby (2016) Proximity, *Digital Journalism*, 4:5, 621-638, DOI: [10.1080/21670811.2015.1063075](https://doi.org/10.1080/21670811.2015.1063075)
14. Brusse C, Gardner K, McAullay D, Dowden M. Social media and mobile apps for health promotion in Australian indigenous populations: scoping review. *Journal of Medical Internet Research*2014;16(12):e280. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
15. Carney R, Bradshaw T, Yung, AR. Physical health promotion for young people at ultra-high risk for psychosis: An application of the COM-B model and behaviour-change wheel. *International journal of mental health nursing*.2016, 25(6), 536–545. <https://doi.org/10.1111/inm.12243>.
16. Cavallo DN, Tate DF, Ries AV, Brown JD, DeVellis RF, Ammerman AS. A social media-based physical activity intervention: a randomized controlled trial. *Am J Prev Med*2012 Nov;43(5):527-532. [doi: 10.1016/j.amepre.2012.07.019] [Medline: 23079176].
17. Cavallo DN, Tate DF, Ward DS, DeVellis RF, Thayer LM, Ammerman AS. *Social support for physical activity-role of Facebook with and without structured intervention*. *Transl Behav Med*.2014;4(4):346-354. doi:10.1007/s13142-014-02699.

18. Chauvin J, Perera Y, Clarke M. Digital technologies for population health and health equity gains: the perspective of public health associations. *Journal of Public Health Policy* 2016;37(2):232-48. [PubMed] [Google Scholar]
19. Chinyamurindi, S.H & Somdyala, W A. *An investigation into the usage of mobile phones among technical and vocational educational and training students in South Africa: original research*. South African Journal of Information Management, 18, 1-8 (2016).
20. S. C., & Schurer, S. (2014). "Healthy habits: The connection between diet, exercise, and locus of control." *Journal of Economic Behavior & Organization*, 98, 1-28.
21. Chow CK, Teo KK, Rangarajan S, et al. Prevalence, Awareness, Treatment, and Control of Hypertension in Rural and Urban Communities in High-, Middle-, and Low-Income Countries. *JAMA*. 2013;310(9):959–968. doi:10.1001/jama.2013.184182.
22. Corbin, J. & Jones, Jacky & Barry, Margaret. (2016). What makes intersectoral partnerships for health promotion work? A review of the international literature. *Health Promotion International*. 33. daw061.10.1093/heapro/daw061.
23. Couper MP, Alexander GL, Zhang N, Little RJ, Maddy N, Nowak MA, et al. *Engagement and retention: measuring breadth and depth of participant use of an online intervention*. *J Med Internet Res* 2010;12(4):e52 [FREE Full text] [doi: 10.2196/jmir.1430] [Medline: 21087922].
24. Cox, C. L. (2000). "Response to Patient-Centered Care: Understanding Its Interpretation and Implementation in Health Care." *Scholarly Inquiry for Nursing Practice*, 14(2), 183.
25. Cugelman B, Thelwall M, Dawes P. *Online interventions for social marketing health behavior change campaigns: a meta-analysis of psychological architectures and adherence factors*. *J Med Internet Res* 2011;13(1):e17 [FREE Full text][doi: 10.2196/jmir.1367] [Medline: 21320854]
26. Danaher BG, Seeley JR. *Methodological issues in research on web-based behavioural interventions*. *Ann Behav Med* 2009 Aug;38(1):28-39. [doi: 10.1007/s12160-009-9129-0] [Medline: 19806416]
27. Davie L (2013) MAMA puts Power in Moms Hands. Eastin MS. Credibility assessments of online health information: the effects of source expertise and knowledge of content. *J Comput Mediat Commun*. 2001;6(4):0–0
28. Dwivedi YK, Ismagilova E, Hughes DL, Carlson J, Filieri R, Jacobson J, Jain V, Karjaluoto H, Kefi H, Krishen AS, Kumar V. Setting the future of digital and social media marketing research: Perspectives and research propositions. *International Journal of Information Management*. 2021 Aug 1;59:102168.
29. Edney S, Looyestyn J, Ryan J, Kernot J, Maher C. *Posts, pics, or polls? Which post type generates the greatest engagement in a Facebook physical activity intervention?* *Transl Behav Med*. 2018 Nov 21;8(6):953-957. doi: 10.1093/tbm/iby006. PMID: 29660093.
30. Edney S, Looyestyn J, Ryan J, Kernot J, Maher C. *Posts, pics, or polls? Which post type generates the greatest engagement in a Facebook physical activity intervention?* *Transl Behav Med*. 2018 Nov 21;8(6):953–7. doi: 10.1093/tbm/iby006. [PubMed] [CrossRef] [Google Scholar]
31. Edney S, Vandelandotte C, Olds T, De Bourdeaudhuij I, Ryan J, Maher, C. "Active Team" a social and gamified app based physical activity intervention: randomised controlled trial study protocol. *BMC Public Health*. 2017;17(859):11.
32. Edosomwan, Simeon, Prakasan SK, Kouame D, Watson J, Seymour T (2011). The history of social media and its impact on business. *Journal of Applied Management and Entrepreneurship*. 16. 79-91.
33. Eysenbach G. Medicine 2.0: Social Networking, Collaboration, Participation, Apomediation, and Openness. *J Med Internet Res* 2008;10(3):e22.
34. Fishbein, Martin & Cappella, Joseph. (2006). *The Role of Theory in Developing Effective Health Communications*. *Journal of Communication*. 56. S1 - S17. 10.1111/j.1460-2466.2006.00280.x.
35. Freeman B, Potente S, Rock V, McIver J. Social media campaigns that make a difference: what can public health learn from the corporate sector and other social change marketers? *Public Health Res Pract*. 2015;25(2):e2521517
36. Freeman FHI 360. (2002). *Behaviour change communication (Bcc) For Hiv/Aids a strategic framework*. Retrieved on 12th September 2020 from www.fhi360.org

37. Freeman, Becky & Potente, Sofia & Rock, Vanessa & McIver, Jacqueline. (2015). Social media campaigns that make a difference: What can public health learn from the corporate sector and other social change marketers?. *Public Health Research & Practice*. 25. 10.17061/phrp2521517.
38. George DR, Rovniak LS, Kraschnewski JL. Dangers and opportunities for social media in medicine. *Clin Obstet Gynecol* 2013;56(3):453–462.
39. Gleeson J, Lederman R, Koval P, Wadley G, Bendall S, Cotton S, Herrman H, Crisp K, Alvarez-Jimenez M. Moderated online social therapy: a model for reducing stress in carers of young people diagnosed with mental health disorders. *Front Psychol*. 2017;8:485.doi: 10.3389/fpsyg.2017.00485. doi: 10.3389/fpsyg.2017.00485. [PMC free article] [PubMed] [CrossRef] [CrossRef] [Google Scholar]
40. Hair E, Pitzer L, Bennett M, Halenar, M., Rath J, Cantrell J, Vallone D. Harnessing youth and young adult culture: Improving the reach and engagement of the truth® campaign. *Journal of Health Communication*. 2017 22(7), 568–575. <https://doi.org/10.1080/10810730.2017.1325420>
41. Hales SB, Davidson C, Turner-McGrievy GM. *Varying social media post types differentially impacts engagement in a behavioral weight loss intervention*. *Transl Behav Med*. 2014 Dec;4(4):355–62. doi:10.1007/s13142-014-0274-z. PMID: 25584084; PMCID: PMC4286554.
42. Hilde A. M. Voorveld, Guda van Noort, Daniël G. Muntinga & Fred
43. Househ M. Sharing sensitive personal health information through Facebook: the unintended consequences. *Stud Health Technol Inform* 2011; 169: 616–620.
44. Islam, SMS., Tabassum R, Liu Y, Chen S, Redfern J, Kim SY, Ball K, Maddison R, Chow CK. *The role of social media in preventing and managing non-communicable diseases in low-and-middle income countries: Hope or hype?* (2019) *Health Policy and Technology*, 8 (1), pp. 96-101.
45. Jaakonmäki, Roope, Müller, Oliver, Brocke, Jan Vom. (2017). The Impact of Content, Context, and Creator on User Engagement in Social Media Marketing. 10.24251/HICSS.2017.136
46. Jacobs W, Amuta, AO, Chan Jeon K, Claudia A (Reviewing Editor) (2017) Health information seeking in the digital age: An analysis of health information seeking behavior among US adults, *Cogent Social Sciences*, 3:1, DOI:10.1080/23311886.2017.1302785
47. Jane M, Foster J, Hagger M, Ho S, Kane R, Pal S. *Psychological effects of belonging to a Facebook weight management group in overweight and obese adults: Results of a randomised controlled trial*. *Health Soc Care Community*. 2018 May 18. doi: 10.1111/hsc.12584. Epub ahead of print. PMID: 29774616.
48. Joseph RP, Keller C, Adams MA, Ainsworth BE. *Print versus a culturally-relevant Facebook and text message delivered intervention to promote physical activity in African American women: a randomized pilot trial*. *BMC Womens Health*. 2015;15:30. Published 2015 Mar 27. doi:10.1186/s12905-015-0186-1.
49. Jung EH, Walsh-Childers K, Kim HS. Factors influencing the perceived credibility of diet-nutrition information web sites. *Comput Human Behav*. 2016;58:37–47.
50. Kanuri, Vamsi & Chen, Yixing & Sridhar, Shrihari. (2018). Scheduling Content on Social Media: Theory, Evidence, and Application. *Journal of Marketing*. 86. 89-108. 10.1177/0022242918805411.
51. Kardas P, Lewek P, Matyjaszczyk M. Determinants of patient adherence: a review of systematic reviews. *Front Pharmacol* 2013;4:91 [FREE Full text] [CrossRef] [Medline]
52. Kaushal N. Facebook to roll-out country wise metrics of monthly active users & daily active users! PageTraffic Buzz. 2021. URL: <http://www.pagetrafficbuzz.com/facebook-rollout-country-wise-metrics-monthly-active-users-daily-active-users/17486/> [accessed 2021-06-23 [WebCite Cache ID 6JOnZtJ4D]
53. Kelly MP, Barker M. *Why is changing health-related behaviour so difficult?* *Journal of public health*. 2016 vol 136: Pg109-116.
54. Khorda H, Itani Z. *Harnessing social media for health promotion and behaviour change*. *health Promot Pract* 2011:1-9.

55. Kite J, Foley BC, Grunseit AC, Freeman B. Please Like Me: Facebook and Public Health Communication. *PLoS One*. 2016;11(9):e0162765. Published 2016 Sep 15. doi:10.1371/journal.pone.0162765
56. Kohl LF, Crutzen R, de Vries NK. *Online Prevention Aimed at Lifestyle Behaviors: A Systematic Review of Reviews*. *J Med Internet Res* 2013;15(7): e146
57. Kostygina G, Tran H, Binns S. Boosting Health Campaign Reach and Engagement Through Use of Social Media Influencers and Memes. *Social Media + Society*. April 2020. doi:10.1177/2056305120912475
58. Krishnamohan S, Stalin P, Singh Z, Sridhar M. *Efficacy of Health Education using Facebook to Promote Healthy Lifestyle among Medical Students in Puducherry, India: A Non-Randomized Controlled Trial*. *J Clin Diagn Res*. 2017 Jul;11(7):LC07-LC10. doi: 10.7860/JCDR/2017/27385.10259. Epub 2017 Jul 1. PMID: 28892935; PMCID: PMC5583781.
59. Laranjo L, Arguel A, Neves AL, Gallagher AM, Kaplan R, Mortimer N, et al. The influence of social networking sites on health behavior change: a systematic review and meta-analysis. *J Am Med Inform Assoc* 2015 Jan;22(1):243-256 [FREE Full text] [doi: 10.1136/amiajnl-2014-002841] [Medline: 25005606]
60. Latkin CA, Knowlton AR. *Social Network Assessments and Interventions for Health Behavior Change: A Critical Review*. *Journal of Behavioural medicine*. 2015 vol 41(3): 90-97.
61. Latkin CA, Knowlton AR. Social Network Assessments and Interventions for Health Behaviour Change: A Critical Review. *Behav Med*. 2015;41(3):90-97. doi:10.1080/08964289.2015.1034645
62. Lee SY, Hansen SS, Lee JK. What makes us click “like” on Facebook? Examining psychological, technological, and motivational factors on virtual endorsement. *Comput Commun*. 2016;73:B332–B341.
63. Lelutiu-Weinberger C, Pachankis JE, Gamarel KE, Surace A, Golub SA, Parsons JT. **Feasibility, acceptability, and preliminary efficacy of a live-chat social media intervention to reduce HIV risk among young men who have sex with men**. *AIDS and Behavior*. 2015;19(7), 1214–1227. <https://doi.org/10.1007/s10461-014-0911-z>
64. Lindbekk T. “The Weberian Ideal-Type: Development and Continuities.” *Acta Sociologica* 35, no. 4 (1992): 285–97. <http://www.jstor.org/stable/4194790>.
65. Loh IH, Schwendler T, Trude ACB, et al. Implementation of Text-Messaging and Social Media Strategies in a Multilevel Childhood Obesity Prevention Intervention: Process Evaluation
66. Maher CA, Lewis LK, Ferrar K, Marshall S, De Bourdeaudhuij I, Vandelandotte C. *Are Health Behavior Change Interventions That Use Online Social Networks Effective? A Systematic Review*. *J Med Internet Res* 2014;16(2): e40
67. Maher CA, Lewis LK, Ferrar K, Marshall S, De Bourdeaudhuij I, Vandelandotte C. *Are Health Behavior Change Interventions That Use Online Social Networks Effective? A Systematic Review*. *J Med Internet Res* 2014;16(2): e40
68. Massaad E, Cherfan P. Social Media Data Analytics on Telehealth During the COVID-19 Pandemic. *Cureus*. 2020 Apr 26;12(4):e7838. doi: 10.7759/cureus.7838. PMID: 32467813; PMCID: PMC7250522.
69. McDonagh, LK, Saunders, JM, Cassell, J. Application of the COM-B model to barriers and facilitators to chlamydia testing in general practice for young people and primary care practitioners: a systematic review. *Implementation Sci* **13**, 130 (2018). <https://doi.org/10.1186/s13012-018-0821->
70. Menon M, George B. Social media use for patient empowerment in the gulf cooperation council region. *Clinical eHealth*. 2018.
71. Mendoza-Herrera K, Valero- Morales I, Ocampo-Granados ME, Reyes-Morales H, Arce- Amaré F, Barquera S. An Overview of Social Media Use in the Field of Public Health Nutrition: Benefits, Scope, Limitations, and a Latin American Experience. *Prev Chronic Dis* 2020;17:200047. DOI: <https://doi.org/10.5888/pcd17.200047>
72. Merchant G, Weibel N, Patrick K, Fowler JH, Norman GJ, Gupta A, Servetas C, Calfas K, Raste K, Pina L, Donohue M, Griswold WG, Marshall S. *Click “like” to change your behavior: a mixed methods study of college students' exposure to and engagement with*

- Facebook content designed for weight loss.* J Med Internet Res. 2014 Jun 24;16(6):e158. doi: 10.2196/jmir.3267. PMID: 24964294; PMCID: PMC4090380.
73. Merchant G, Weibel N, Patrick K, Fowler JH, Norman GJ, Gupta A, Servetas C, Calfas K, Raste K, Pina L, Donohue M, Griswold WG, Marshall S. *Click "like" to change your behavior: a mixed methods study of college students' exposure to and engagement with Facebook content designed for weight loss.* J Med Internet Res. 2014 Jun 24;16(6):e158. doi: 10.2196/jmir.3267. PMID: 24964294; PMCID: PMC4090380.
 74. Mikkelsen B, Williams J, Rakovac I, et al. Life course approach to prevention and control of non-communicable diseases. *BMJ*. 2019;364:l257. Published 2019 Jan 28. doi:10.1136/bmj.l257
 75. Modhal M, Tompsett L, Moorhead T. *Doctors, patients and social media*; September 2011.
 76. Napolitano MA, Hayes S, Bennett GG, Ives AK, Foster GD. Using Facebook and text messaging to deliver a weight loss program to college students. *Obesity (SilverSpring)* 2013 Jan;21(1):25-31. [doi: 10.1002/oby.20232] [Medline: 23505165]
 77. Ndumbé-Eyoh S, Mazzucco A. Social media, knowledge translation, and action on the social determinants of health and health equity: a survey of public health practices. *Journal of Public Health Policy* 2016;37(2):249-59. [PubMed] [Google Scholar]
 78. Neiger, BL, Thackeray, R, Van Wagenen, SA Use of social media in health promotion: purposes, keyperformance indicators, and evaluation metrics. *Health Promot Pract* 2012; 13(2): 159–164.
 79. Nour M, Chen J, Allman-Farinelli M. *Young Adults' Engagement With a Self-Monitoring App for Vegetable Intake and the Impact of Social Media and Gamification: Feasibility Study.* JMIR Form Res. 2019 May 10;3(2):e13324. doi: 10.2196/13324. PMID: 31094322; PMCID: PMC6533870.
 80. *Open* 2014;4:e003926. doi: 10.1136/bmjopen-2013-003926. Health promotion glossary. Geneva, WHO 1998. http://www.who.int/hpr/NPH/docs/hp_glossary_en.pdf Accessed 31st August 2020
 81. Osch, Liesbeth & Beenackers, Marielle & Reubsæet, Astrid & Lechner, Lilian & Candel, Math & de Vries, Hein. (2009). Action planning as predictor of health protective and health risk behavior: An investigation of fruit and snack consumption. *The international journal of behavioral nutrition and physical activity*. 6. 69. 10.1186/1479-5868-6-69.
 82. Pagoto S, Waring ME, Xu R. A Call for a Public Health Agenda for Social Media Research. *J Med Internet Res* 2019 Dec 19;21(12):e16661 [FREE Full text] [doi: 10.2196/16661] [Medline: 31855185]
 83. Panger, G. (2017). Emotion in Social Media. Ritterband LM, Thorndike FP, Cox DJ, Kovatchev BP, Gonder-Frederick LA. *A behaviour change model for internet interventions.* *Ann Behav Med* 2009 Aug;38(1):18-27 [FREE Full text] [doi: 10.1007/s12160-009-9133-4] [Medline:19802647]
 84. Raggatt, M., Wright, C.J.C., Carrotte, E. et al. *"I aspire to look and feel healthy like the posts convey": engagement with fitness inspiration on social media and perceptions of its influence on health and wellbeing.* *BMC Public Health* **18**, 1002 (2018). <https://doi.org/10.1186/s12889-018-5930-7>.
 85. Rhodes SD, McCoy TP, Tanner AE, Stowers J, Bachmann LH, Nguyen AL, et al. Using social media to increase HIV testing among gay and bisexual men, other MSM, and transgender persons: outcomes from a randomized community trial. *Clinical Infectious Diseases* 2016;62(11):1450-3. [PMC free article] [PubMed] [Google Scholar]
 86. Rice, E.S., Haynes, E., Royce, P. et al. Social media and digital technology use among Indigenous young people in Australia: a literature review. *Int J Equity Health* **15**, 81 (2016). <https://doi.org/10.1186/s12939-016-0366-0>
 87. Rier DA. Internet social support groups as moral agents: the ethical dynamics of HIV+ status
 88. Roblin DW. The potential of cellular technology to mediate social networks for support of chronic disease self-management. *J Health Commun* 2011; 16(Suppl. 1): 59–76.
 89. Ryan J, Edney S, Maher C. *Engagement, compliance and retention with a gamified online social networking physical activity intervention.* *Transl Behav Med*. 2017 Dec;7(4):702-708. doi: 10.1007/s13142-017-0499-8. PMID: 28523603; PMCID: PMC5684077.

90. Seltzer EK, Jean NS, Kramer-Golinkoff E, Asch DA, Merchant RM. The content of social media's shared images about Ebola: a retrospective study. *Public Health* 2015;129(9):1273-7. [PubMed] [Google Scholar]
91. Seering, J.; Wang, T.; Yoon, J.; Kaufman, G. Moderator engagement and community development in the age of algorithms. *New Media Soc.* **2019**, *21*, 1417–1443. [CrossRef]
92. Sheeran, P (2002) Intention—Behavior Relations: A Conceptual and Empirical Review, *European Review of Social Psychology*, 12:1, 1-36, DOI: [10.1080/14792772143000003](https://doi.org/10.1080/14792772143000003)
93. Sheik, Sadiyya, Juliet Evans, Erna Morden, and David Coetzee. "Non-Communicable Diseases in the Western Cape." (https://www.westerncape.gov.za/assets/departments/health/burden_of_disease_update_ncds.pdf, accessed 6 Feb 2022).
94. Sherwood, N E, and R W Jeffery. (2000) "The Behavioral Determinants of Exercise: Implications for Physical Activity Interventions." *Annual Review of Nutrition* 20: 21–44. doi:10.1146/annurev.nutr.20.1.21.
95. Sooklall C. *DigiTool - McGill University*. 2018. [2018-08-14]. Mobile Application Community of Support for Parents of Children with Disabilities http://digitool.library.mcgill.ca/webclient/StreamGate?folder_id=0&dvs=1565770509018~168.
96. South Africa: digital population 2020| Statista. <http://www.statista.com>. <https://www.statista.com/statistics/490424/number-of-worldwide-facebook-users/>[cited 09/08/20]
97. Southwell, Brian & Yzer, Marco. (2009). *When (and Why) Interpersonal Talk Matters for Campaigns*. *Communication Theory*. 19. 1 - 8. 10.1111/j.1468-2885.2008.01329.x.
98. Stellefson, M., Paige, S. R., Chaney, B. H., & Chaney, J. D. (2020). Evolving Role of Social Media in Health Promotion: Updated Responsibilities for Health Education Specialists. *International journal of environmental research and public health*, 17(4), 1153. <https://doi.org/10.3390/ijerph1704115>
99. Syred J, Naidoo C, Woodhall SC, Baraitser P. Would you tell everyone this? Facebook conversations as health promotion interventions. *J Med Internet Res*. 2014 Apr 11;16(4):e108. doi: 10.2196/jmir.3231. PMID: 24727742; PMCID: PMC4042608.
100. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbooks in psychology®*. APA handbook of research methods in psychology, Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological (p. 57–71). American Psychological Association. <https://doi.org/10.1037/13620-004>
101. Taylor, J & Gibson, L.K (2017) *Digitisation, digital interaction and social media: embedded barriers to democratic heritage*. *International Journal of Heritage Studies*, 23:5, 408-420, DOI: 10.1080/13527258.2016.1171245
102. Thackeray R, Neiger BL, Smith AK, Wagenen SB. Adoption and use of social media among public health departments. *BMC Public Health* 2012;12(1):242. [PMC freearicle][PubMed] [Google Scholar]
103. The biggest and most popular socialmedia platforms in South Africa including Tiktok. www.businesstech.co.za. Last accessed 12/02/2022
104. Thorn P, Hill NT, Lamblin M, the Z, Battersby-Coulter R, Rice S, Bendall S, Gibson K.L., Finlay, S. M., Blandon, R., de Souza, L., West, A., Cooksey, A., Sciglitano, J., Goodrich, S., & Robinson, J. (2020). Developing a Suicide Prevention Social Media Campaign With Young People (The #Chatsafe Project): Co-Design Approach. *JMIR mental health*, 7(5), e17520. <https://doi.org/10.2196/17520>
105. Thrul J, Klein AB, Ramo DE. *Smoking Cessation Intervention on Facebook: Which Content Generates the Best Engagement?* *J Med Internet Res*. 2015 Nov 11;17(11):e244. doi: 10.2196/jmir.4575. PMID: 26561529; PMCID: PMC4704894.
106. Valle CG, Tate DF. *Engagement of young adult cancer survivors within a Facebook-based physical activity intervention*. *Transl Behav Med*. 2017 Dec;7(4):667-679. doi: 10.1007/s13142-017-0483-3. PMID: 28374211; PMCID: PMC5684071.
107. Ventola CL. Social media and health care professionals: benefits, risks, and best practices. *P T*. 2014 Jul;39(7):491-520. PMID: 25083128; PMCID: PMC4103576.

108. Wakefield, Melanie & Loken, Barbara & Hornik, Robert. (2010). Use of Mass Media Campaigns to Change Health Behaviour. *Lancet*. 376. 1261-71. 10.1016/S0140-6736(10)60809-4.
109. Aira T, Wang W, Riedel M, Witte SS. Reducing risk behaviors linked to noncommunicable diseases in Mongolia: a randomized controlled trial. *Am J Public Health*. 2013 Sep;103(9):1666-74. doi: 10.2105/AJPH.2012.301175. Epub 2013 Jul 18. PMID: 23865647; PMCID: PMC3780670.
110. Wallack L, Dorfman L. Media advocacy: A strategy for advancing policy and promoting health. *Health Educ Q*. 1996;23:293–317.
111. Wellman, B. (1988). Structural analysis: From method and metaphor to theory and substance. In B. Wellman & S. D. Berkowitz (Eds.), *Social structures: A network approach* (pp. 19–61). Cambridge University Press.
112. West DS, Monroe CM, Turner-McGrievy GM, Sundstrom B, Larsen C, Magradey K, Wilcox S, Brandt HM. *A Technology-Mediated Behavioral Weight Gain Prevention Intervention for College Students: Controlled, Quasi-Experimental Study*. *J Med Internet Res* 2016;18(6):e133
113. White, J. L., Ransdell L. B., Vener, J., & Flohr, J. A. (2005) "Factors Related to Physical Activity Adherence in Women: Review and Suggestions for Future Research." *Women Health* 41 (May 2015): 123–48. doi:10.1300/J013v41n04.
114. Windler C, Clair M, Long C, Boyle L, Radovic A. Role of Moderators on Engagement of Adolescents With Depression or Anxiety in a Social Media Intervention: Content Analysis of Web-Based Interactions. *JMIR Ment Health*. 2019 Sep 26;6(9):e13467. doi: 10.2196/13467. PMID: 31573923; PMCID: PMC6787534.
115. Winstone L, Mars B & Haworth, C & Kidger, J. (2021). Social media use and social connectedness among adolescents in the United Kingdom: a qualitative exploration of displacement and stimulation. *BMC Public Health*. 21. 10.1186/s12889-021-11802-9.
116. Woerendl M, Papagiannidis S, Bourlakis M, Li F. *Internet-induced marketing techniques: Critical factors in viral marketing campaigns*. *Int J Bus Sci Appl Mgmt* 2008;3(1):33-45.
117. Wong CA, Ostapovich G, Kramer-Golinkoff E, Griffis H, Asch DA, Merchant RM. How US children's hospitals use social media: a mixed methods study. *Healthcare* 2016;4(1):15-21. [PubMed] [Google Scholar]
118. Yang, J.S., Mamudu, H.M. & John, R. Incorporating a structural approach to reducing the burden of non-communicable diseases. *Global Health* 14, 66 (2018). <https://doi.org/10.1186/s12992-018-0380-7>.
119. Young SD, Cumberland WG, Nianogo R, Menacho LA, Galea JT, Coates T. The HOPE social media intervention for global HIV prevention in Peru: a cluster randomised controlled trial. *Lancet HIV* 2015;2(1):e27-32. [PUBMED: 26236767] [PMC freearticle] [PubMed] [Google Scholar]
120. Zhang J, Brackbill D, Yang S, Centola D. *Efficacy and causal mechanism of an online social media intervention to increase physical activity: Results of a randomized controlled trial*. *Prev Med Rep*. 2015 Aug 13;2:651-7. doi: 10.1016/j.pmedr.2015.08.005. PMID: 26844132; PMCID: PMC4721409.
121. Zhao Y, Zhang J. Consumer health information seeking in social media: a literature review. *Health Information & Libraries Journal*. 2017 Dec;34(4):268-83.