Literature screening report

New communicative ways in prevention: A focus on social media and youth

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The aim of this literature review is to inform FOPH and various users of public agencies, commissions, or advisory boards in support of FOPH and its prime partners on recent findings from the literature.

Prepared for

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1. Abstract English

OVERVIEW: Social media offer an expanded and unique approach to designing and implementing health promotion and prevention communication. There is great optimism about their utility to enhance communication about health but they are also credited with negative outcomes, including the spread of mis-and dis-information. So, how can public health authorities and health promotion organizations and professionals use social media to promote health among young people?

PURPOSE: The purpose of the literature review is to summarize the most recent evidence on using social media to prevent or stop smoking, improve nutrition and physical activity, and is focused on nine questions. The purpose of the report to inform governments, public health officials, health professionals, health organizations, and those involved in smoking prevention, tobacco policy, and health promotion and prevention about strategic planning decisions in their use of social media for prevention.

METHODS: A variety of strategies were used, including searching bibliographic databases focused on health and medicine, Google and Google Scholar, specific journals and review articles, bibliographies of recent publications, and "related articles" provided in journals. Included literature was published between 2018 and 2023, either peer reviewed, grey literature, or reports, and included outcome measure directly related to primary topic (anti-smoking, physical activity, nutrition).

FINDINGS: 152 articles and reports were included for data extraction (39 anti-smoking, 55 nutrition, 58 physical activity). Facebook was the most used platform in all topic areas (S=30, N=19, P=27). Instagram was the second most used (S=1, N=15, P=13) followed by twitter (S=4, N=4, P=6) and YouTube (S=1, N=1, P=6). Social media effects vary according to the stage of behaviour change, liking of messages (i.e., those that resonate), credibility of sources, and level of user engagement. There are indications that image and video-based message formats are preferred compared to text only. The duration of campaigns/ intervention varied, but ~12 weeks was common for all topics. Users highly prefer social media experiences that were designed around connections or ties with other people, rather than largely unidirectional informational or educational content. Students and young adults were most often the target of campaigns/interventions, but the evidence does not suggest that any particular target group is best reached. The best target population(s) depends on organizational goals, resources, expertise, and the underlying health related behaviors of population segments. There is very little evidence about the resources associated with developing and implementing social media initiatives.

CONCLUSIONS: It is difficult to reach definitive conclusions about the effects of individual social media components as they are frequently bundled together and studies vary widely in methods and quality. It is evident that effective messages and interventions start with formative research conducted with the target audiences in order to test relevance, appeal, messenger, and efficacy. Creating a sense of community, connectedness, and ties among participants is important. Given the evidence published in the reviewed literature, combined with expertise and experiences of the report's author, it is clear that social media is an important channel to promote health of young people. But using social media comes with challenges, including the investment of limited resources, the way in which young people use social media, and dealing with misinformation. Using social media as an amplifier

of effective health communication pushing audiences to other digital and offline health promoting messages and activities versus being a primary or sole channel may have more benefits in short term and long-term health promotion strategies.

1. Zusammenfassung Deutsch

ÜBERBLICK: Soziale Medien bieten einen erweiterten und einzigartigen Ansatz für die Gestaltung und Umsetzung von Kommunikation zur Gesundheitsförderung und Prävention. Ihr Nutzen für die Gesundheitskommunikation wird sehr optimistisch eingeschätzt, aber auch negative Folgen werden ihnen nachgesagt, darunter die Verbreitung von Falsch- und Desinformationen. Wie können also Gesundheitsbehörden, Organisationen und Fachkräfte der Gesundheitsförderung soziale Medien nutzen, um die Gesundheit junger Menschen zu fördern?
ZWECK: Die Literaturübersicht fasst die neuesten Erkenntnisse über den Einsatz sozialer Medien zur Verhinderung oder Beendigung des Rauchens sowie zur Verbesserung von Ernährung und körperlicher Bewegung zusammen und konzentriert sich auf neun Fragen. Der Bericht soll Regierungen, Gesundheitsbehörden, Gesundheitsexperten, Gesundheitsorganisationen und alle, die in den Bereichen Raucherprävention, Tabakpolitik, Gesundheitsförderung und Prävention tätig sind, über strategische Planungsentscheidungen bei der Nutzung sozialer Medien zur Prävention informieren.
METHODEN: Es wurden verschiedene Strategien angewandt, darunter die Suche in bibliografischen Datenbanken mit Schwerpunkt Gesundheit und Medizin, Google und Google Scholar, bestimmte Zeitschriften und Übersichtsartikel, Bibliografien aktueller Veröffentlichungen und "verwandte Artikel" in Zeitschriften. Eingeschlossene Literatur wurde zwischen 2018 und 2023 veröffentlicht, entweder in Form von Peer-Reviews, grauer Literatur oder Berichten, und beinhaltete Ergebnismessungen, die direkt mit dem Hauptthema zusammenhängen (Raucherentwöhnung, körperliche Aktivität, Ernährung).
ERGEBNISSE: 152 Artikel und Berichte wurden für die Datenextraktion berücksichtigt (39 Anti-Raucher, 55 Ernährung, 58 körperliche Aktivität). Facebook war in allen Themenbereichen die meistgenutzte Plattform (S=30, N=19, P=27). Instagram wurde am zweithäufigsten genutzt (S=1, N=15, P=13), gefolgt von Twitter (S=4, N=4, P=6) und YouTube (S=1, N=1, P=6). Die Auswirkungen der sozialen Medien variieren je nach Stadium der Verhaltensänderung, der Beliebtheit der Nachrichten (d.h. derjenigen, die auf Resonanz stossen), der Glaubwürdigkeit der Quellen und dem Grad des Engagements der Nutzerinnen und Nutzer. Es gibt Hinweise darauf, dass Bild- und Videobotschaften im Vergleich zu reinen Textbotschaften bevorzugt werden. Die Dauer der Kampagnen/Interventionen variierte, aber ~12 Wochen waren für alle Themen üblich. Die Nutzerinnen und Nutzer bevorzugen Social-Media-Erfahrungen, bei denen es um Verbindungen oder Beziehungen zu anderen Menschen geht, und nicht um weitgehend einseitige Informations- oder Bildungsinhalte. Schülerinnen und Schüler und junge Erwachsene waren am häufigsten das Ziel von Kampagnen/Interventionen, aber die Erkenntnisse deuten nicht darauf hin, dass eine bestimmte Zielgruppe am besten erreicht wird. Welche Zielgruppe(n) am besten geeignet sind, hängt von den Zielen der Organisation, den Ressourcen, dem Fachwissen und den zugrunde liegenden gesundheitsbezogenen Verhaltensweisen der Bevölkerungsgruppen ab. Es gibt nur

sehr wenige Erkenntnisse über die Ressourcen, die mit der Entwicklung und Umsetzung von Social-Media-Initiativen verbunden sind.

SCHLUSSFOLGERUNGEN: Es ist schwierig, endgültige Schlussfolgerungen über die Auswirkungen einzelner Social-Media-Komponenten zu ziehen, da sie häufig gebündelt werden und die Studien in Bezug auf Methoden und Qualität stark variieren. Es liegt auf der Hand, dass wirksame Botschaften und Interventionen mit einer formativen Forschung beginnen, die mit den Zielgruppen durchgeführt wird, um Relevanz, Attraktivität, Überbringer und Wirksamkeit zu testen. Es ist wichtig, ein Gefühl der Gemeinschaft, der Verbundenheit und der Verbundenheit unter den Teilnehmerinnen und Teilnehmer zu schaffen. Angesichts der in der gesichteten Literatur veröffentlichten Erkenntnisse und der Expertise und Erfahrungen der Autorin dieses Berichts ist klar, dass soziale Medien ein wichtiger Kanal zur Förderung der Gesundheit junger Menschen sind. Die Nutzung sozialer Medien ist jedoch mit Herausforderungen verbunden, z.B. dem Einsatz begrenzter Ressourcen, der Art und Weise, wie junge Menschen soziale Medien nutzen, und dem Umgang mit Fehlinformationen. Der Einsatz sozialer Medien als Verstärker einer effektiven Gesundheitskommunikation, die das Publikum zu anderen digitalen und Offline-Gesundheitsbotschaften und -aktivitäten führt, statt als primärer oder einziger Kanal zu fungieren, kann für kurz- und langfristige Gesundheitsförderungsstrategien von grösserem Nutzen sein.

1. Résumé français

APERÇU: Les médias sociaux offrent une approche élargie et unique pour concevoir et mettre en œuvre la communication sur la promotion de la santé et la prévention. Il y a un grand optimisme quant à leur utilité pour améliorer la communication sur la santé, mais on leur attribue également des résultats négatifs, notamment la propagation de fausses informations et de désinformation. Ainsi, comment les autorités de santé publique, les organisations et professionnels de la promotion de la santé peuvent-ils utiliser les médias sociaux pour promouvoir la santé des jeunes?

BUT : Le but de l'analyse de la littérature est de résumer les preuves les plus récentes sur l'utilisation des médias sociaux pour prévenir ou arrêter les gens de fumer, améliorer leur nutrition et leur activité physique. L'analyse se concentre sur neuf questions. Le but du rapport est d'informer les gouvernements, les responsables de la santé publique, les professionnels de la santé, les organisations de santé et les personnes impliquées dans la prévention du tabagisme, la politique antitabac, la promotion de la santé et la prévention sur les décisions de planification stratégique dans leur utilisation des médias sociaux à des fins de prévention.

MÉTHODES: Diverses stratégies ont été utilisées, notamment la recherche de bases de données bibliographiques axées sur la santé et la médecine, Google et Google Scholar, des revues spécifiques et des articles de synthèse, des bibliographies de publications récentes et des «articles connexes» fournis dans des revues. La littérature incluse a été publiée entre 2018 et 2023, soit par des pairs, de la littérature grise ou des rapports, et comprenait une mesure de résultat directement liée au sujet principal (anti-tabac, activité physique, nutrition).

RÉSULTATS : 152 articles et rapports ont été inclus pour l'extraction des données (39 anti-tabac, 55 nutrition, 58 activité physique). Facebook était la plateforme la plus utilisée dans tous les domaines (S=30, N=19, P=27). Instagram était le deuxième plus utilisé (S=1, N=15, P=13) suivi de Twitter (S=4, N=4, P=6) et YouTube (S=1, N=1, P=6). Les effets des médias sociaux varient selon le stade du changement de comportement, l'appréciation (« Like ») des messages (c'est-à-dire ceux qui résonnent), la crédibilité des sources et le niveau d'engagement des utilisateurs. Il y a des indications que les formats de message basés sur l'image et la vidéo sont préférés par rapport au texte uniquement. La durée des campagnes/interventions variait, mais ~12 semaines était courant pour tous les sujets. Les utilisateurs préfèrent largement les expériences de médias sociaux conçues autour de connexions ou de liens avec d'autres personnes, plutôt que d'un contenu informatif ou éducatif largement unidirectionnel. Les étudiants et les jeunes adultes étaient le plus souvent le groupe cible des campagnes/interventions, mais l'évidence ne suggèrent pas qu'un groupe cible particulier est atteint le mieux. Les meilleures populations cibles dépendent des objectifs organisationnels, des ressources, de l'expertise et des comportements sous-jacents liés à la santé des segments de population. Il existe très peu de données sur les ressources associées à l'élaboration et à la mise en œuvre d'initiatives de médias sociaux.

CONCLUSIONS: C'est difficile de tirer des conclusions définitives sur les effets des composants individuels des médias sociaux car ils sont souvent rassemblés et les études varient considérablement en termes de méthodes et de qualité. C'est évident que des messages et des interventions efficaces commencent par une recherche formative menée auprès des publics cibles afin de tester la pertinence, l'attrait, le messager et l'efficacité. C'est important de créer un sentiment de communauté, de connexité et de liens entre les participants. Compte tenu l'évidences

publiées dans la littérature examinée, combinées avec l'expertise et expériences de l'auteur du rapport, c'est clair que les médias sociaux sont un canal important pour promouvoir la santé des jeunes. Mais l'utilisation des médias sociaux s'accompagne de défis, notamment l'investissement de ressources limitées, la manière dont les jeunes utilisent les médias sociaux et la gestion de la désinformation. L'utilisation des médias sociaux comme amplificateur d'une communication efficace sur la santé poussant le public vers d'autres messages et activités de promotion de la santé digitale et hors ligne plutôt que d'être un canal principal ou unique, peut avoir plus d'avantages dans les stratégies de promotion de la santé à court et à long terme.

2. About the mandate

Purpose:

The purpose of the literature review is to identify, examine, explore, and summarize the research literature on the use of social media for smoking prevention especially for young people. In particular, it will outline what young people like, and whether any interventions have been proven effective.

The literature review will provide an overview of effective smoking prevention messages using social media. It is anticipated that the findings of this review based on the most recent developments using social media to prevent smoking will be useful for governments, public health officials, health professionals, health organizations, and involved in smoking prevention and tobacco policy. Depending on the availability of material and time, studies on the subject of diet / nutrition or physical activity / exercise could be integrated.

Overarching question the review aims to answer:

What is the current state of literature that examines social media used for health promotion/prevention; mainly focused on smoking prevention and cessation?

In terms of prevention messages communicated to young people, the specific questions include:

1) Which social media channels are used (Twitter, Instagram, Tiktok…)?
2) What formats are used (e.g. influencer posts, clips, lifestyle scenarios, memes, podcasts, challenges (like: 'the best non-alcoholic drinks')?
3) What message content (framing / themes / message design / framing / stigmatization / emotion / testimonials / graphic images…) is used?
4) For what duration?
5) What are the concrete impacts and effects (e.g. change in consumer behavior, change in lifestyle, intention to smoke/quit, attitudes related to smoking/policy)?
6) Have best practices been developed? How is it ensured that information conveyed is correct? How are social media activities monitored and updated?
7) Is there an optimal channel, format, or duration?
8) Which target groups are best reached?
9) Is there room for prevention campaigns in social media? (e.g. retweets, references to campaigns)?

Note: The scope was extended to Nutrition and Physical activity literature, as requested by FOPH

3. Summary responses to specific questions

These summary responses are based on the reviewed literature. The responses do not take into consideration the quality of studies. They simply summarize the responses to each of the questions. The report provides further description and insights into the evidence, including discussions about the implementation of social media for prevention campaigns.

1) Which social media channels are used (Twitter, Instagram, TikTok…)?

I. Anti-Smoking

The most frequently used social media platform for smoking was Facebook. Other social media channels were used far less.

II. Diet / Nutrition

Social media platform use was evenly distributed between Facebook and Instagram in the Diet / Nutrition literature.

III. Physical Activity

In physical activity related studies, Facebook was the most frequently used social media channel followed by Instagram.

2) What formats are used (e.g. influencer posts, clips, lifestyle scenarios, memes, podcasts, challenges (like: 'the best non-alcoholic drinks')?

Virtually all campaigns/interventions used text / links and/or image format as a foundation component across all three topic areas. The most frequently used formats in the reviewed literature include:

I. Anti-Smoking

- Moderator/facilitator/live counselling format was used in anti-smoking campaigns/interventions and had a prominent role in leading activities primarily on Facebook.
- Video format was frequently used, but the design characteristics and content were not described in a detailed manner.
- Personal stories were incorporated in messages in a small number of campaigns/interventions.
- Polls were part of several related studies, but it was unclear how they were used.

II. Diet / Nutrition

- Videos were formed a part of message in many diet / nutrition communication and emphasized recipe and cooking demonstrations.
- Moderator/facilitator/live counselling format was used to provide content and prompt users.
- Influencers were the subject of several cross-sectional studies in which respondents revealed factors that led to utilization and engagement.
- Challenges and competitions and polls were used in some cases as a guide for planning and communication revisions.

III. Physical Activity

- Moderator/facilitator/live counselling format were used.
- Video format was used.
- Influencers as a social media format, especially on Instagram, have been the subject of a number of studies, but not generally as components in campaigns/interventions, that examined influencer content and effects.
- Challenges and competitions were provided that typically related to accomplishing defined physical activity goals such as number of steps. Polls used in a few studies.

3) What message content (framing / themes / message design / stigmatization / emotion / testimonials / graphic images…) is used?

I. Anti-Smoking

- The transtheoretical model and stages of change, coupled with tailoring were used to inform the development of social media content.
- The most widely used message design was informational or educational content.
- Content based on smoking cessation approaches were established according to U.S. Clinical Practice Guidelines for smoking cessation.
- Supportive, encouraging or motivational message content was used in most messages. Social media users were prompted to engage with the particular platform and other users. Insulting or provocative content was rarely used as an approach.
- Culturally tailored content for use with unique groups such as Indigenous populations was implemented in a few campaigns/interventions.

II. Diet / Nutrition

- There was not extensive use of theoretical frameworks in the nutrition intervention evidence. The social cognitive theory was identified as the foundation for content more than other approaches, but theoretical congruence was not well described.
- Other approaches used in the research literature included the health belief model, the information motivation behavior, model actor–partner interdependence model and the behavior change wheel.
- In some messages nutrition information was based on the 2020 Dietary Guidelines for Americans, but there was no evidence of other national guidelines that were used.
- Informational or educational message content was extensively used especially to share recipes, food preparation, and understand diet/nutrition.
- Supportive, encouraging, or motivational message content was evident through content. Frequently, message content encouraged social media users to engage with the particular platform and other users. There were no examples of insulting or provocative content.

III. Physical Activity

- Social cognitive theory was the most frequently used theoretical approach.
- Informational or educational content was extensively used.
- Supportive, encouraging or motivational message content was frequently incorporated in content. In many instances, content encouraged social media users to engage with the particular platform and other users. There were no examples of insulting or provocative content.

4) For what duration?

I. Anti-Smoking

The most widely used duration for intervention studies was 12 weeks, followed by 24 weeks, and 10 days.

II. Diet / Nutrition

There was no pattern to campaign/intervention duration for nutrition interventions. The most common were 6 weeks (n=3), 2, 12 and 16 (n=2 each). The remaining intervention studies ranged between 3 weeks and 2-3 years.

III. Physical Activity

The most widely used duration for physical activity intervention studies was 12 weeks. The remaining intervention studies ranged between 1 day and 2-3 years.

5) What are the concrete impacts and effects (e.g. change in consumer behavior, change in lifestyle, intention to smoke/quit, attitudes related to smoking/policy)?

I. Anti-Smoking

- Verified smoking abstinence was measured by 7-day smoking abstinence, biochemically verified with remote salivary cotinine. Self-reported smoking abstinence was used by: continued abstinence ("Did you start smoking again since the beginning of the program?"); seven-day point prevalence

abstinence; 24-hour point prevalence abstinence (no smoking in the past day); reduction in cigarettes per week from baseline, making a quit attempt, and stage of change".

- Smoking intentions were measured using the Fägerstrom Test for Nicotine Dependence
- Attitudes about electronic cigarettes.
- User engagement, user evaluations/intervention acceptability included different measures such as number of visitors, registered users, and followers, number views, and interactions including "likes", "comments", "shares"; likes, and user satisfaction measured with a social media usability scale; negative feedback, and fan-total reach ratio and user posted comments: comments, 'likes' and number of views of videos
- Financial/cost outcomes were measured as cost per user initiation

II. Diet / Nutrition

- Eating and food consumption behaviors were measured by different instruments including the Healthy Eating Index score (2010) based on 24-hour food recall; Food Behavior Checklist and the perceptions of meal planning and cooking questionnaire; frequency of food consumption and desired food portion size; eating behaviors with the Dutch Eating Behaviour Questionnaire and attitudes with the Eating Attitudes Test (EAT-26); change in calcium intake; self-reported gestational weight gain, and diet quality measured using the National Cancer Institute's Healthy Eating Index-2015 (HEI-2015); the National Cancer Institute's Automated Self-Administered 24 hour (ASA24) food recall; Food literacy was measured with a food literacy questionnaire based on the Expanded Food and Nutrition Education Program. Fruit and vegetable consumption was based on questions used in the National Nutrition and Physical Activity Survey. Nutrition social support with the Friend Social Support and Eating Habits Scale.
- Anthropogenic measures such height, weight and waist size were used in several studies.
- User engagement, user evaluations/intervention acceptability were measured with: Facebook data for replies, reactions, poll votes and impressions by; interest (measured by contacting the program), intervention acceptability, adherence, and retention; number of 'likes' for Facebook posts, goal setting, and engagement questions; questions about ease of use, usefulness of program, likelihood of recommendation to others and overall enjoyment.

III. Physical Activity

- Intervention behavior outcomes included physical activity levels including walking, steps, movement, sedentary time, and physical activity intentions. Self-reported physical activity was measured with the International Physical Activity Questionnaire (IPAQ) or the short form International Physical Activity Questionnaire -short form Additionally, the Active Australia Survey was used by (and a physical activity vital signs questionnaire was used. Self-reported physical activity was collected with purpose designed survey questions in several studies.
- Fitness devices/pedometers/accelerometers were used to objectively measure physical activity (number of steps/time) and sedentary levels. In few instances anthropogenic measures such height, weight and waist size were collected.
- User engagement, user evaluations/intervention acceptability of physical activity social media interventions were measured with various indicators such as: number of likes, comments, poll votes, and photo uploads with various types of posts such as moderator, or user initiated posts reading posted content; total comments and posts; user visits; the chatbot usability questionnaire; recommendations to others and/or willingness to participate again, intervention enrollment; attrition rates; attendance at activities and challenge/ quiz completion rates and attending meetings during an intervention.
- Financial costs of a social media intervention were reported small number of cases.

6) Have best practices been developed? How is it ensured that information conveyed is correct? How are social media activities monitored and updated?

There was ambiguous evidence related to the presence or use of best practices in the development of social media communication content. It would seem that social media monitoring relies on research or individual examples. Generally, across social media platforms the quality of information, excluding formal campaigns/interventions was not high.

I. *Anti-Smoking*

Many anti-smoking campaigns/interventions indicated that communication material was developed in accordance with formal guidelines. Assessment of information quality in YouTube videos generally found low quality.

II. *Diet / Nutrition*

Content quality was assessed and generally contained low quality content.

III. *Physical Activity*

Limited use of formal guidelines, although data quality was enhanced through the use of verified data with instruments such as pedometers. Self-report data was enhanced when the IPAQ survey was used to collect physical activity information.

7) Is there an optimal channel, format or duration?

A key quality required for maximizing social media potential is related to the development of social connections among campaign/intervention target group members through comments etc. and with the program itself, usually in response to moderator/facilitator action prompts.

I. *Anti-Smoking*
- Channel: Facebook
- Format: Moderator/facilitator/live counselling format and video.
- Duration: 12 weeks

II. *Diet / Nutrition*
- Channel: Facebook, Instagram
- Format: Moderator/facilitator/live counselling format video
- Duration: No established pattern

III. *Physical Activity*
- Channel: Facebook
- Format: Moderator/facilitator/live counselling format, influencer.
- Duration: 12 weeks, but extensive variation

8) Which target groups are best reached?

There is great potential to reach any target group that is using social media or who is influenced by someone else who does. The reality is that social media are predominantly used by young people, however other populations use it, perhaps not as intensely as young people, (e.g., new parents, people with specific health needs with motivation to search for information/support). In some ways, social media is particularly well suited to reach traditionally "hard to reach" populations, as social media allow for push messaging (through own network or media algorithm) verses reaching only those who seek health information. The most frequently targeted groups in the reviewed literature include:

I. *Anti-Smoking*

Young adult smokers were the most frequent target populations in anti-smoking studies. The next largest target group was race/ethnic/linguistic minority groups.

II. *Diet / Nutrition*

Young adults and teens were the target group in the largest number of Diet / Nutrition focused social media studies. People with specific health needs were also targeted.

III. *Physical Activity*

Students, young adults, and females were the most frequent target populations in physical activity social media studies. People with specific health needs were also frequently targeted.

9) Is there room for prevention campaigns in social media? (e.g. retweets, references to campaigns)?

Yes, the creative potential of social media to be used effectively in health promotion and prevention actions is possible and important. It is mainly tempered by the practical reality of the various development and administrative responsibilities required for effective social media campaigns/interventions.

4. Social Media and Health Communication

Social media refers to a variety of Internet-based applications that allow the creation, modification, sharing and interaction of user-produced online content. It offers an expanded and unique approach to designing and implementing health communication that "can help promote mutual support and foster encouragement around a shared learning experience, while providing insight into individual perceptions around smoking-cessation methods" (Lee et al. 2022). There is a great deal of optimism and anticipation about the utility of social media to enhance health communication because of increased reach, efficiency, and flexibility. About 95% of teens used social media, although only 3.5% reported using it to seek health-related information (Plaisime et al. 2020).

More generally, the Web is a dynamic environment and reflects innovation and changes in technological capabilities. For example, artificial intelligence (AI), such as ChatGPT, has been the focus of widespread attention as the potential of this technology are explored and demonstrated. Notably, the "godfather of A.I.", Geoffrey Hinton, recently quit Google and has been widely quoted as regretting the technology he built, such as ChatGPT, warning of the dangers of misinformation spread by the technology "A.I. would flood the internet with false photos, videos, and texts. These would be of a standard, he added, where the average person would 'not be able to know what is true anymore" (Metz, 2023).

Health communication, especially related to behavior change, is challenging for a number of reasons. For behaviors such as smoking or diet, there are multiple health, social, cultural, and environmental determinants that go beyond willpower, motivation, or individual choice. The underlying theoretical approaches are complex and require a range of personal information about individuals whose behavior is being influenced. Moreover, health communication interventions operate in a multifaceted policy and economic environment that consists of multiple and sometimes competing interests. It is worth noting that the harms associated with cigarette/tobacco smoking have been established since the early 1960s and despite numerous policies, and communication interventions throughout the world since that time, smoking persists: people, notably teens, continue to initiate smoking behaviors, including vaping, and endure a variety of harms.

Increasingly, health communication focusing on behavior change has been focused on the health and economic consequences of increased overweight/obesity, sedentarism, and poor diet. There are large economic interest interests (tobacco/cigarette industry, agricultural and food businesses) that engage in large scale marketing and promotion of products that are the cause of substantial health problems.

5. Methodology:

Search strategy

A variety of strategies were used, including searching of specific bibliographic databases focused on health and medicine, google and google scholar, and a purposeful search of specific journals and review articles, bibliographies of most recent publications and "related articles" provided in journals. The review focused on papers published between 2018 – 2023.

PUB MED and EBSCO Searches:

1. (social media[Title/Abstract]) AND (nutrition[Title/Abstract])
2. ((social media[Title/Abstract]) AND (nutrition[Title/Abstract])) AND (trial[Title/Abstract])
3. ((social media[Title/Abstract]) AND (nutrition[Title/Abstract])) AND (campaign[Title/Abstract]) AND ((y_5[Filter]) AND (English[Filter]))
4. ((Facebook[Title/Abstract]) AND (nutrition[Title/Abstract])) AND (intervention[Title/Abstract]) AND ((y_5[Filter]) AND (English[Filter]))

for each topic (nutrition/physical activity/smoking), substitute social media with Instagram/Twitter/Facebook/Youtube/Snapchat/Linkedin/Flickr/Linkedin/Secondlife

Google and Google Scholar Search:

2018 - 2023. First 10 pages of results (20 results per page)

Anti-smoking

1. anti-smoking/smoking cessation social media examples
2. social media tobacco use prevention
3. anti smoking/smoking cessation and social media interventions
4. Facebook/YouTube/Twitter/Instagram smoking cessation/anti-smoking campaign
5. anti-smoking social media message design
6. social media audience engagement anti smoking/smoking cessation
7. social media smoking cessation interventions systematic review
8. social media "smoking cessation" best practices
9. social media smoking cessation Switzerland
10. smoking cessation influencers

Diet / Nutrition

1. nutrition and social media examples
2. social media nutrition campaign/promotion
3. Facebook/YouTube/Twitter/Instagram nutrition campaign
4. nutrition social media design
5. social media audience engagement and nutrition
6. social media nutrition best practices
7. nutrition and "social media" interventions

8. social media nutrition Switzerland
9. nutrition influencers

Physical Activity

1. physical activity and social media examples
2. social media campaigns physical activity promotion
3. Facebook/YouTube/Twitter/Instagram physical activity campaign/promotion
4. Physical activity promotion social media design
5. social media audience engagement and physical activity
6. social media physical activity interventions systematic review
7. social media physical activity best practices
8. "physical activity" and "social media" interventions
9. social media physical activity Switzerland
10. physical activity influencers

Journal of Medical Internet Research (JMIR) Search:

Smoking cessation/nutrition/physical activity campaign and Facebook/Youtube/Twitter/Instagram

Social Media Search

Search Facebook/Twitter/YouTube/Instagram

1. smoking cessation campaign/promotion
2. nutrition campaign/promotion
3. physical activity campaign/promotion

Title and Abstract Selection Guidelines

Include:

- peer reviewed articles, grey literature, and reports
- years 2018 to 2023
- outcome measure directly related to primary topic (smoking, physical activity, nutrition)

Exclude:

- protocol articles
- commentaries, editorials or “potential of” articles
- exclusively text-based applications
- smartphone applications
- social media used for other problems such as mental health, drug use
- food product marketing or promotion or manipulation of legislation/regulations
- education programs or massive open online courses (MOOC)
- knowledge, attitudes, beliefs about general social media or preferences about social media (during Title/Abstract selection process, did not rigidly apply)

- recruitment/promotion for studies based on social media
- social marketing campaigns unless social media was a component
- solely delivery of a program/campaign on social media about other topic such as mental health, drug use, cardiovascular disease etc.
- content analysis of social media content absent a campaign/intervention
- effects of misinformation, product marketing related to topic areas
- WeChat
- articles/studies based in dissimilar national settings such as China, Korea, Japan, Turkey, Saudi Arabia, Singapore, etc.

Articles were included according to the following procedures:

Information about the general characteristics of the articles were analyzed and summarized. Further analysis and synthesis of the literature answer the questions that guide this literature review. Information collected and coded include:

> article title; author name; source of publication; publication year; objectives/study purpose; sample characteristics; country/geographic location; type of study (research, non-research); research methods; type of social media channel; message format; message content/design; duration of activity/project; outcome behaviors; and recommendations/implications for practice. Social media outcome measures message engagement (e.g., click-through rate [CTR] of the social media messages).

Data from included articles were extracted during a full text review of each topic. During the full text review, articles that did meet the inclusion criteria were excluded. The final selection for data extraction included 152 papers (anti-smoking = 39, diet / nutrition = 55, and physical activity = 58). The data include 1) population; 2) data source; 3) outcome behavior; 4) social media channel; 5) communication format; 6) theory; 7) message content; and 8) study location. Data extracted from individual articles were recorded in tables for each topic area. Articles were entered in Zotero bibliographic reference manager and are provided as a .ris file.

5. Findings:

Social Media Evidence

The utility of social media health communication is related to the type and purpose of an intervention. More generally, mass media campaigns require different approaches than narrowly designed health behavior change interventions. Beyond the typical problems associated with health communication in terms of development and achieving impact, social media presents additional challenges resulting from the potential participation of multiple actors from multiple sources with a variety of intentions some of which are not benign. All one needs is a social media account in order to view, engage, or distribute content.

Social media expands the boundaries of communication participation by offering relatively low-cost access, to potentially large numbers of geographically dispersed users. Individuals, businesses, organizations, groups, governments, and social actors regularly use social media as a matter of normal day to day activities. This creates a forum for interaction among content providers, users (passive and engaged), and technological options offered by social media platforms. The apparent simplicity of social media communication is confounded by the diversity of message components and functionality available to content providers and users as well as the capacity to enhance/expand the distributional size of messages that results from user actions such as 'retweeting' or 'liking' and the subsequent impact on algorithmic-based message promotion by social media platforms.

There are few social media-based campaigns in the three topic areas. There are challenges to evaluating social media communication effects on health behaviors that become particularly acute in the case of isolating particular social media components. Across the three topic areas there was extensive compositional variety with studies that examined intervention outcomes, experiments, content analyses qualitative evaluations/assessments of various social media channels, social media messages and usability.

1. SOCIAL MEDIA CHANNELS USED

"Which social media channels are used (Twitter, Instagram, TikTok…)?"

Social media channels included in each article were identified including Facebook, Instagram, Twitter, YouTube, and several others. Facebook was the most used platform in all topic areas (Smoke=30, Nut=19, PA=27). Instagram

was the second most used, (Smoke=1, Nut=14, PA=12 followed by Twitter (Smoke=4, Nut=4, PA=6) and YouTube (Smoke=1, Nut=1, PA=5). Some articles included a combination of social media platforms.

Table 1: Number of studies by social media channel and topic area

Social Media Channel	Anti-Smoking	Diet / Nutrition	Physical Activity
Instagram	1	14	12
Facebook	30	19	27
Snapchat	0	1	1
Telegram	0	0	1
TikTok	0	2	1
Twitter	4	4	6
YouTube	1	1	5
Reddit	1	0	0
SecondLife	0	1	1
V/Blogs	0	2	1
Multiple channels/not defined	2	12	9
Other	0	1	0

Cell entries = number of articles. Some articles focused on more than one channel

1.1. Anti-smoking Social Media Channel

The most frequently used social media platform for smoking cessation was Facebook and other social media channels were used in far less. Facebook was the social media channel used in Desrichard et al. (2022); Emery et al. (2018); Heavey et al. (2022); Hefler et al. (2019); Humair et al. (2018); Lee et al. (2022); Meacham et al. (2021); Ramo et al. (2018); Ramo et al. (2019); Thrul et al. (2020); Vogel et al. (2019); Vogel et al, 2020); Chalela et al. (2022); La Torre (2020); Ramo et al. (2019). Twitter was used in one study Phillips et al. (2023). Youtube was examined by Sahin and Kaya (2023). The Tobacco Status Project (TSP) social media design and content material Ramo et al. (2018); Ramo et al. (2019) was also used by Lee et al. (2022); McKelvey & Ramo (2018); Maier et al. (2020); Meacham et al. (2021)(b); Meacham et al. (2021); Thrul et al. (2020); Vogel et al. (2019); and Vogel et al. (2020).

1.2. Diet / Nutrition Social Media Channel

Social media platform use was evenly distributed between Facebook and Instagram in the Diet / Nutrition literature. Facebook was the social media channel in Adedokun et al. (2020); Cavallo et al. (2021); Coccia et al. (2020); Dorić et al. (2022); Grantham et al. (2022); Gray et al. (2022); Kattan et al. (2022); Kite et al. (2019); Ling et al. (2018); Ng et al. (2022); Nosek et al. (2019); Pope et al. 2019; Rouf, Nour, and Allman-Farinelli (2020); Saez et al. (2018); Sharps et al. (2019); and Wilcox et al. 2022. Twitter was used in Coccia et al. (2020) and Grantham et al. (2022). YouTube was the focus in Sütcüoğlu et al. (2023) and Kim (2022) and WhatsApp by Tahmasebi et al. (2021). Facebook distrust among African American participants and there were no effects on participation in a Facebook-based weight management component (Okpara et al. 2022).

1.3. Physical Activity Social Media Channel

In physical activity related studies Facebook was the most frequently used social media channel followed by Instagram. Facebook was used by Biederman et al. (2021); Bonar et al. (2023); Cavallo et al. (2021); Drehlich et al. (2020); Edney et al. (2018); Hammersley et al. (2020); Johnson et al. (2022); Kernot et al. (2019); Kite et al. (2019); Ling et al. (2018); Mandic et al. (2020); McKeon et al. (2021); Pope et al. 2018; Pope et al. (2019); Prout et al. (2018); Rayward et al. (2019); Saez et al. (2018); Todorovic et al. (2019). Instagram was the focus in Berg et al. (2020); Curtis et al. (2020); and Rayward et al. (2019). YouTube was used by Kim (2022); Tang et al. (2022); McDonough et al. (2022); Nigg et al. (2021); Van Woudenberg et al. (2020). Twitter was the social media channel in Oppezzo et al. (2021) and Telegram was used by Larbi et al. (2021).

Table 2: Campaign/Intervention studies and social media platform

Social Media Channel	Anti-Smoking	Diet / Nutrition	Physical Activity
Facebook	Chalela et al. 2022; Desrichard et al. 2022; Emery et al. 2018; Heavey et al. 2022; Hefler et al 2019; Humair et al. 2018; La Torre 2020; Lee et al. 2022; Maier et al. 2020; Meacham et al. 2021; Meacham et al. 2021(b); Patten et al. 2023; Ramo et al. 2019; Ramo et al. 2018; Thrul et al. 2020; Vogel et al. 2019; Vogel et al. 2020	Adedokun et al. 2020; Cavallo et al. 2021; Coccia et al. 2020; Dorić et al. 2022; Grantham et al. 2022; Gray et al. 2022; Kattan et al.* 2022; Kite et al. 2019; Ling et al. 2018; Ng et al. 2022; Nosek et al. 2019*; Pope et al. 2019; Rouf, Nour, and Allman-Farinelli 2020; Saez et al. 2018; Sharps et al. 2019; Wilcox et al. 2022	Biederman et al. 2021; Bonar et al. 2023; Cavallo et al. 2021; Drehlich et al. 2020; Edney et al. 2018; Hammersley et al. 2020; Johnson et al. 2022; Kernot et al. 2019; Kite et al. 2019; Ling et al. 2018; Mandic et al. 2020; McKeon et al. 2021; Pope et al. 2018; Pope et al. 2019; Prout et al. 2018; Rayward et al. 2019; Saez et al. 2018; Todorovic et al. 2019
Instagram		Grantham et al. 2022; Martinino et al. 2021; Sharps et al. 2019	Berg et al. 2020; Curtis et al. 2020; Rayward et al. 2019
Twitter	Phillips et al. 2023	Coccia et al. 2020; Grantham et al. 2022	Oppezzo et al. 2021
YouTube			Kim 2022; McDonough et al. 2022; Nigg et al. 2021; Van Woudenberg et al. 2020
SecondLife		Nosek et al. 2019	Nosek et al. 2019
Reddit			
Buzzfeed			
Telegram			Larbi et al. 2021
WhatsApp		Tahmasebi et al. 2021	

2. FORMATS USED

"What formats are used (e.g. influencer posts, clips, lifestyle scenarios, memes, podcasts, challenges (like: 'the best non-alcoholic drinks')?"

The research evidence contains a variety of communication formats including: 1) video, 2) text, 3) images, 4) hashtag, 5) influencer, 6) personal stories, 7) moderator/facilitator or live counselling. The type of communication format used in the research was diverse although not surprisingly text/links was the most widely used format in the three topic areas, followed by video, and then images. Influencer content was used nearly as much as images for

nutrition and physical activity, whereas there were no influencer format examples in the anti-smoking literature. For the most part, the literature supplied limited information, generally the length in time, about the specific content and characteristics of videos used in the research.

2.1. Anti-smoking Format

Text/links were used by Desrichard et al. (2022); Humair et al. (2018); Lee et al.(2022); McKeon et al. (2021); Meacham et al. (2021); Meacham et al. (2021)(b); Thrul et al. (2020;) Vogel et al. (2019); Vogel et al. (2020); and Watti et al. (2022). Image format was used in messages implemented by Lee et al (2022); Thrul et al. (2020); Vogel et al. (2019); and Vogel et al. (2020). Moderator/facilitator/live counselling format was used in anti-smoking campaigns/interventions by Desrichard et al. (2022), and trained smoking-cessation counselors were utilized by Heavey et al (2022); Humair et al. (2018); Lee et al. (2022); McKelvey & Ramo (2018), Meacham et al. (2021), and Meacham et al. (2021)(b); Ramo et al. (2018); Ramo et al. (2019); Thrul et al. (2020) Vogel et al. (2019); and Vogel et al. (2020).

Video format was incorporated by La Torre (2020); Lee et al. (2022); Merculieff et al. (2021); Thrul et al. (2020); Vogel et al. (2019) and Vogel et al. (2020). Personal stories were developed for by intervention by Hefler (2018) and Merculieff et al. (2021). Polls were used by Ramo et al. (2018;) Ramo et al. (2019;) Lee et al. (2022); McKelvey & Ramo (2018); Maier et al. (2020); Meacham et al. (2021)(b); Meacham et al. (2021); Thrul et al. (2020); Vogel et al. (2019); Vogel et al. (2020) but it was not specified how they were used.

Table 3: Anti-Smoking Social Media Format and Study

Format	Study
Moderator / facilitator / live counselling	Desrichard et al. 2022; Heavey et al 2022; Humair et al. 2018; Lee et al. 2022; McKelvey & Ramo 2018, Meacham et al. 2021, Meacham et al. 2021(b); Ramo et al. 2018; Ramo et al. 2019; Thrul et al. 2020; Vogel et al. 2019; Vogel et al. 2020
Video	La Torre 2020; Lee et al. 2022; Merculieff et al. 2021; Thrul et al. 2020; Vogel et al. 2019 and Vogel et al. 2020
Text/links	Desrichard et al. 2022; Humair et al. 2018; Lee et al. 2022; McKeon et al. 2021; Meacham et al. 2021; Meacham et al. 2021(b); Thrul et al. 2020; Vogel et al. 2019; Vogel et al. 2020; Watti et al. 2022.
Images	Lee et al 2022; Thrul et al. 2020; Vogel et al. 2019; Vogel et al. 2020
Challenges	
Personal stories	Hefler 2018; Merculieff et al. 2021; Patten et al. 2023

Polls	Lee et al. 2022; McKelvey & Ramo 2018; Maier et al. 2020; Meacham et al. 2021; Meacham et al. 2021(b); Ramo et al. 2018; Ramo et al. 2019; Thrul et al. 2020; Vogel et al. 2019; Vogel et al. 2020

2.2. Diet / Nutrition Format

Nutrition and diet related videos were available that touched on a variety of topics including information about the Mediterranean diet (Ng et al. 2022), cooking videos (Gray et al. 2022), nutrition videos (Chan & Allman-Farinelli 2022), live streaming of nutrition classes (Adedokun et al. 2020), exercise demonstrations (Pope et al. 2019), influencers educational content (Cavallo et al. 2021; and Pancer et al. 2022).

Moderator/facilitator/live counselling format was used by Cavallo et al. (2021); Grantham et al. (2022); Kattan et al. (2022); Ng et al. (2022); and (Wilcox et al. 2022). Text/links were used by Cavallo et al. (2021); Chan & Allman-Farinelli (2022); Grantham et al. (2022); Ng et al. (2022); Kattan et al. (2022); Roccapriore & Pollock (2022); Tahmasebi et al. (2021); and Wilcox et al. (2022). Images were incorporated in messages by Ng et al. (2022); Cavallo et al. (2021); Chan & Allman-Farinelli (2022), and effects of images and text on Instagram user behaviour (Roccapriore & Pollock, 2022). Challenges and competitions were implemented by Cavallo et al. (2021); Pope et al. (2019) and Tahmasebi et al. (2021). Polls were used by Kattan et al. (2022); Pancer et al. (2022) and podcasts were offered by Wilcox et al. (2022); personal stories by Grantham et al. (2022).

Table 4: Diet / Nutrition Social Media Format and Study

Format	Study
Moderator / facilitator / live counselling	Cavallo et al. 2021; Grantham et al. 2022; Kattan et al. 2022; Ng et al. 2022; Pancer et al. 2022; Wilcox et al. 2022
Video	Adedokun et al. 2020; Cavallo et al. 2021; Chan & Allman-Farinelli 2022; Gray et al. 2022; Ng et al. 2022; Pope et al. 2019; Pancer et al. 2022; Roccapriore & Pollock, 2022
Text/links	Cavallo et al. 2021; Chan & Allman-Farinelli 2022; Grantham et al. 2022; Kattan et al. 2022; Ng et al. 2022; Roccapriore & Pollock 2022; Tahmasebi et al. 2021; Wilcox et al. 2022
Images	Cavallo et al, 2021; Chan & Allman-Farinelli 2022; Ng et al. 2022; Roccapriore & Pollock, 2022
Challenges	Cavallo et al. 2021; Pope et al. 2019; Tahmasebi et al. 2021
Personal stories	Grantham et al. 2022
Polls	Kattan et al. 2022; Pancer et al. 2022

2.3. Physical Activity Format

Moderator/facilitator/live counselling format was used by Bonar et al. (2023); Drehlich et al. (2020); Edney et al. (2018) and Prout et al. (2018) and included exercise physiologists McKeon et al. (2021); nutrition experts Ng et al. (2022); Master's-level nutrition students (Cavallo 2021); trained dieticians (Hammersly et al. 2020), and peer moderators (Saez et al. 2018). Video format was used by Biederman et al. (2021); Cavallo (2021); Curtis et al. (2020); Edney et al. (2018); Ng et al. (2022); Nigg et al. (2021); McDonough et al. (2022); McKeon et al. (2021); Pope et al. (2019); Prout et al. (2018); and Van Woudenberg et al. (2020).

Text/links were included in Berg et al. (2020); Bonar et al. (2023); Cavallo (2021); Drehlich et al. (2020); Edney et al. (2018); Hammersly et al. (2020); McDonough et al. (2022); McKeon et al. (2021); Ng et al. (2022); Pope et al. (2019); Prout et al. (2018); Robertson et al. (2022); Rayward et al. (2019); and Saez et al. (2018) and Todorovic et al. (2019). Images were used by Berg et al. (2020); Cavallo (2021); Edney et al. (2018); Ng et al. (2022); and Todorovic et al. (2019). Challenges were provided in Drehlich et al. (2020); Saez et al. (2018); Rayward et al. (2019); Pope et al. (2019); McKeon et al. (2021) and different types of challenges were developed by focus group participants (Robertson et al. 2022). Influencers as a social media format, especially on Instagram, have been the subject of a number of studies, (but not generally as components in campaigns/interventions), that examined influencer content and effects in Duplaga (2020); Durau et al. (2022); Schlittchen (2020); Bowles et al. (2021); Tricás-Vidal et al. (2022) and Roccapriore & Pollock 2022. Polls were used by Edney et al. (2018).

Table 5: Physical Activity Social Media Format and Study

Format	Study
Moderator / facilitator / live counselling	Bonar et al. 2023; Drehlich et al. 2020; Edney et al. 2018; Prout et al. 2018; McKeon et al. 2021; Ng. et al. 2022; Cavallo 2021; Hammersly et al. 2020; Saez et al. 2018
Video	Biederman et al. 2021; Cavallo 2021; Curtis et al. 2020; Edney et al. 2018; Ng et al. 2022; Nigg et al. 2021; McDonough et al. 2022; McKeon et al. 2021; Pope et al. 2019; Prout et al. 2018; Tang and Haines 2022; Van Woudenberg et al. 2020
Text/links	Berg et al. 2020; Bonar et al. 2023; Cavallo 2021; Drehlich et al. 2020; Edney et al. 2018; Hammersly et al. 2020; McDonough et al. 2022; McKeon et al. 2021; Ng et al. 2022; Pope et al. 2019; Prout et al. 2018; Robertson et al. 2022; Rayward et al. 2019; and Saez et al. 2018; Todorovic et al. 2019.
Images	Berg et al. 2020; Cavallo 2021; Edney et al. 2018; Ng. et al. 2022; Todorovic et al. 2019

Challenges	Drehlich et al. 2020; Saez et al. 2018; Rayward et al. 2019; Pope et al. 2019; McKeon et al. 2021; Robertson et al. 2022
Influencers	Bowles et al. 2021; Duplaga 2020, Durau et al. 2022; Schlittchen 2020; Tricás-Vidal et al. 2022; Roccapriore & Pollock 2022
Polls	Edney et al. 2018

3. MESSAGE CONTENT USED

"What message content (framing / themes / message design / framing / stigmatization / emotion / testimonials / graphic images…) is used?"

The development, design and of evidence-based message content is complex based on by multiple theoretical foundations and undergo revisions resulting from formative research and feasibility studies. In a number of cases, there was minimal description of specific communication message content in the literature which makes it difficult to replicate specific messages or the theory-based composition of messages.

Communication message content was examined in order to identify the theoretical approaches used and whether content was 1) designed to provide support, encouragement or motivation; 2) information/education; 3) consisted of personal stories; 4) based on guidelines/standards; 5) humorous. Information/education message content was most prevalent followed by supportive/encouraging content in the three topic areas.

In many intervention studies multiple theoretical approaches were described as guiding an intervention, communication material and practices. The transtheoretical model of behavior change/stages of change, social cognitive model, and motivational interviewing were widely used. Some research tested the application of theoretical constructs to observed patterns in social media data using for example the Twitter API. Apart from the Italian Facebook smoking prevention campaign there was no evidence of stigmatization or provocative/graphic message content.

3.1. Anti-smoking Message Content

The transtheoretical model and stages of change theories were used to inform content development by Lee et al. (2022); Meacham et al. (2021); Ramo et al. 2018; Ramo et al. (2019), and Thrul et al. (2020).

The most widely used message design was informational or educational content and was provided by Desrichard et al. (2022); Heavey et al. (2022); Humair et al. (2018); Philips et al. (2023); Rame et al. (2018) and Ramo et al. (2019).

Content based on smoking cessation approaches established according to U.S. Clinical Practice Guidelines for smoking cessation was used by Meacham et al. (2021); Thrul et al. (2020); Lee et al. (2022); Vogel et al. (2019); Vogel et al. (2020); Ramo et al. (2019) and Ramo et al. (2018).

Supportive, encouraging or motivational message content was used by Desrichard et al. (2021); Chalela et al. (2022); Humair et al. (2018); Lee et al. (2022); Meacham et al. (2021); Phillips et al. (2023); Pocs et al. (2022); Ramo et al. (2019); Ramo et al. (2018); Thrul et al. (2020); and Watti et al (2022). Insulting or provocative content was rarely used except in the Italian Ministry of Health video campaign that was described as conveying a "dismissive manner and could be viewed as offensive" (La Torre 2020).

Based on formative research, the Tobacco Status Project (Ramos et al., 2018 and 2015) established Facebook groups that used communication messages designed to be consistent with US Clinical Practice Guidelines for Treating Tobacco Use and Dependence. The Facebook posts were tailored to participant stage of change (1) Precontemplation; not ready to quit; 2) contemplation - thinking about quitting; 3) Preparation - getting ready to quit). "The precontemplation group received messages incorporating the 5Rs (relevance, risks, rewards, roadblocks, repetition) core Motivational Interviewing techniques of expressing empathy, rolling with resistance, supporting self-efficacy, and developing discrepancy; and Transtheoretical Model strategies of increasing the pros of quitting, raising consciousness about quitting smoking, and environmental opportunities to quit smoking (e.g., clean indoor air laws)." One sample Facebook post was provided in the published material:

> "*Having a phrase or mantra that's motivating and centering that you can repeat to yourself when things get tough can be a HUGE help to deal with cravings. Think of your own mantra or phrase and post it here."*

"Thinking About Quitting" group posts emphasized decreasing the negatives of smoking, and environmental re-evaluation (identifying negative effects of smoking on others and positive effects of change). "Getting ready to quit" posts focused on self-liberation (e.g., making a commitment to quit), stimulus control (e.g., removing smoking paraphernalia from the home), and counter conditioning (e.g., engaging in alternative behaviors)." (p 3. from (Ramo et al., 2015) note: this was the initial article published from the program and was excluded in the literature screening and data extraction due to publication date of 2015) (Ramo et al., 2018).

Table 6: Anti-Smoking Social Media Content and Study

Content	Study
Transtheoretical model and stages of change	Lee et al. 2022; Meacham et al. 2021; Ramo et al. 2018; Ramo et al. 2019, Thrul et al. 2020
Informational or Educational Design	Desrichard et al. 2022; Heavey et al. 2022; Humair et al. 2018; Philips et al. 2023; Rame et al. 2018; Ramo et al. 2019
Clinical Practice Guidelines	Meacham et al. 2021; Thrul et al. 2020; Lee et al. 2022; Vogel et al. 2019; Vogel et al. 2020; Ramo et al. 2019; Ramo et al. 2018
Culturally tailored content	Merculieff et al. 2021; Patten et al. 2023; Hefler 2018
Supportive, encouraging or motivational	Desrichard et al. 2021; Chalela et al. 2022; Humair et al. 2018; Lee et al. 2022; Meacham et al. 2021; Phillips et al. 2023; Pocs et al. 2022; Ramo et al. 2019; Ramo et al. 2018; Thrul et al. 2020; Watti et al 2022

3.2. Nutrition Message Content

There was not extensive use of theoretical frameworks in the nutrition intervention evidence. The social cognitive theory was identified as the foundation for content by Wilcox et al. (2022); Doric, Ilić and Rumbak (2022); Pope et al. (2019) and Gray et al. (2022). Other approaches that were used included the health belief model (Coccia et al. 2020); the Information Motivation Behavior model (Kattan et al. 2022); Actor–Partner Interdependence Model (Ling et al. 2018); and the Behavior Change Wheel (Rouf, Nour, and Allman-Farinelli 2020). Nutrition information was based on the 2020 Dietary Guidelines for Americans (Kattan et al. 2022). Informational or educational message content was provided by Adedokun et al. (2020); Cavallo et al. (2021); Coccia et al., (2020); Kattan et al. (2022); Kite et al. 2019; Martinino et al. (2021); Ng et al. (2022); Nosek et al. (2019); Pope et al. (2019); Saez et al. (2018); Tahmasebi et al. (2021); and Wilcox et al. (2022). Supportive, encouraging, or motivational message content was developed by Cavallo et al. (2021); Kattan et al. (2022); Ling et al. (2018); Ng et al. (2022); Pope et al. (2019); and Tahmasebi et al. (2021). Personal stories were collected and distributed by Grantham et al. (2022).

Table 7: Diet / Nutrition Social Media Content and Study

Content	Study
Social Cognitive	Wilcox et al. 2022; Doric, Ilić and Rumbak 2022; Pope et al, 2019; Gray et al. 2022
Other theories	Coccia et al., 2020; Kattan et al. 2022; Ling et al. 2018; Rouf et al. 2020
Informational or Educational Design	Adedokun et al. 2020; Cavallo et al. 2021; Coccia et al., 2020); Kattan et al. 2022; Kite et al. 2019; Martinino et al. 2021; Ng et al. 2022; Nosek et al. 2019; Pope et al. 2019; Saez et al. 2018; Tahmasebi et al. 2021; and Wilcox et al. 2022

Clinical Practice Guidelines	Kattan et al. 2022
Supportive, encouraging or motivational	Cavallo et al. 2021; Kattan et al. 2022; Ling et al. 2018; Ng et al ai. 2022; Pope et al. 2019); Tahmasebi et al. 2021

3.3. Physical Activity Message Content

Social cognitive theory was the most frequently used theoretical approach in the physical activity research and was implemented by Hammersly et al. (2020); Pope et al. (2019); Doric, Ilić and Rumbak (2022); Nigg et al. (2021); and Oppezzo et al. (2021). Other theoretical approaches that were used included: *Self-Determination Theory* (Robertson et al. 2022; Berg et al. 2020; Johnson et al. 2022); *Persuasion Theory* (Kim 2022); *Transtheoretical Model* (Oppezzo et al. 2021); *Theory of Planned Behavior* (Kernot et al. 2019); *Social Determination Theory* (McDonough et al. 2022); and the *Actor–Partner Interdependence Model* (Ling et al. 2018).

Informational or educational content was provided by Biederman et al. (2021); Berg et al. (2020); Bonar et al. (2023); Cavallo et al. (2021); Curtis et al. (2020); Drehlich et al. (2020); Kite et al. (2019); Ling et al. (2018); McDonough et al. (2022); McKeon et al. (2021); Nigg et al. (2021); Nosek et al. (2019); Pope et al. (2019); Prout et al. (2018); Saez et al. (2018); Haines (2022); Todorovic et al. (2019); and Van Woudenberg et al. (2020). Marketing/promotional material for a 10,000 steps campaign was examined by Rayward et al. (2019). Survey results indicated that parents preferred information, family activities, goal setting, and tips Scott-Andrews et al. (2022).

Supportive, encouraging or motivational message content was used by Bonar et al. (2023); Curtis et al. (2020); Divine et al. (2019); Edney et al. (2018); Hammersly et al. (2020); Johnson et al. (2022); Kernot et al. (2019); Larbi et al. (2021); Mandic et al. (2020); McKeon et al. (2021); Nigg et al. (2021); Pócs et al. (2022); and Prout et al. (2018); and Robertson et al. (2022). The use of encouraging or motivational content is supported by secondary data analysis studies by Gabarron et al. (2021); Park (2022); and Liu et al. (2019). The utility of confidence building content was observed by Robertson et al. (2022).

The effects of social media content were mediated by the impact of perceived similarities with other users Burke & Rains (2019); feeling connected to other users Divine et al. (2019); and trustworthiness, expertise, and attractiveness of influencers Durau et al. (2022); engaging in social interaction coupled with information quality and visual content Kim (2022).

Table 8: Physical Activity Social Media Content and Study

Content	Study
Social Cognitive Theories	Hammersly et al. 2020; Pope et al. 2019; Doric, Ilić and Rumbak 2022; Nigg et al. 2021; Oppezzo et al. 2021
Other theories	Robertson et al. 2022; Berg et al. 2020; Johnson et al. 2022; Kim 2022; Oppezzo et al. 2021; Kernot et al. 2019; McDonough et al. 2022; Ling et al. 2018
Informational or Educational Design	Biederman et al. 2021; Berg et al. 2020); Bonar et al. 2023; Cavallo et al. 2021; Curtis et al. 2020; Drehlich et al. 2020; Kite et al. 2019; Ling et al. 2018; McDonough et al. 2022; McKeon et al. 2021; Nigg et al. 2021; Nosek et al. 2019; Pope et al. 2019; Prout et al. 2018; Saez et al. 2018; Todorovic et al. 2019; Van Woudenberg et al. 2020
Clinical Practice Guidelines	
Supportive, encouraging or motivational	Bonar et al. 2023; Curtis et al. 2020; Divine et al. 2019; Edney et al. 2018; Hammersly et al. 2020; Johnson et al. 2022; Kernot et al. 2019; Larbi et al. 2021; Mandic et al. 2020; McKeon et al. 2021; Nigg et al. 2021; Pócs et al. 2022; and Prout et al. 2018; Robertson et al. 2022

4. DURATION

"for what duration?"

4.1. Anti Smoking Duration

The most widely used duration for intervention studies was 12 weeks (Emery et al. 2018; Heavy et al. 2022; Lee et al. 2022; Maier et al. 2020; Meaghan et al. 2021; Meacham et al. 2021(b); Patten et al. 2023; Philips et al. 2023; Ramo et al. 2018; Ramo et al. 2019; Thrul et al. 2020; and Vogel et al. 2020).

Table 9: Anti-Smoking Intervention Studies and Duration

Intervention Duration	Study
10 days	Chalela et al. 2022
4 weeks	Vogel et al. 2019
12 weeks	Emery et al. 2018; Heavy et al. 2022; Lee et al. 2022; Maier et al. 2020; Meaghan et al. 2021; Meacham et al. 2021(b); Patten et al. 2023; Philips et al. 2023; Ramo et al. 2018; Ramo et al. 2019; Thrul et al. 2020; Vogel et al. 2020
24 weeks	Desrichard et al. 2022; Hefler et al. 2019; Humair et al. 2018
Unclear	La Torre 2020

4.2. Diet / Nutrition Duration

The most used duration for nutrition interventions was 12 weeks (Cavollo et al. 2021; Durau et al. 2022; Pope et al. 2019), followed by 6 weeks (Coccia et al. 2020; Gray et al. 2022; Rouf et al. 2020). The remaining intervention studies ranged between 2 weeks and 2-3 years.

Table 10. Diet / Nutrition Intervention Studies and Duration

Intervention Duration	Study
2 weeks	Doric, Ilić and Rumbak 2022; Sharps et al. 2019
3 weeks	Martinino et al. 2021
4 weeks	Ng et ai. 2022
6 weeks	Coccia et al. 2020; Gray et al. 2022; Rouf et al. 2020
8 weeks	Tahmasebi et al. 2021
10 weeks	Ling et al. 2018
12 weeks	Cavollo et al. 2021; Durau et al. 2022; Pope et al. 2019
16 weeks	Nosek et al. 2019; Grantham et al. 2022
20 weeks	Kattan et al. 2022
32 weeks	Wilcox et al. 2022
Unclear ~2-3 years	Kite et al. 2018; Kite et al. 2019
Academic year	Saez et al. 2018
Unclear	Adedokun et al. 2020

4.3. Physical Activity Duration

The most widely used duration for physical activity intervention studies was 12 weeks (Cavollo et al. 2021; Curtis et al. 2020; Durau et al. 2022; Johnson et al. 2022; McDonough et al. 2022; Pope et al. 2019; Prout et al. 2018). The remaining intervention studies ranged between 1 day and 2-3 years.

Table 11. Physical Activity Intervention Studies and Duration

Intervention Duration	Study
1 days	Larbi et al. 2021

Intervention Duration	Study
1 week	Van Woudenberg et al. 2020
2 weeks	Nigg et al. 2021
4 weeks	Berg et al. 2020; Biederman et al. 2021; Todorovic et al. 2019
5 weeks	Biederman et al. 2021
6 weeks	Rayward et al. 2019
~7 weeks / 50 days	Kernot et al. 2019
8 weeks	Bonar et al. 2023; Edney et al. 2018
10 weeks	Ling et al. 2018; McKeon et al. 2021; Pope et al. 2018
11 weeks	Hammersly et al. 2020
12 weeks	Cavollo et al. 2021; Curtis et al. 2020; Drehlich et al. 2020; Johnson et al. 2022; McDonough et al. 2022; Pope 2019; Prout et al. 2018
13 weeks	Oppezzo et al. 2021
16 weeks	Nosek et al. 2019
24 weeks	Mandic et al. 2021
Unclear ~2-3 years	Kite et al. 2018; Kite et al. 2019
Academic year	Saez et al. 2018

5. OUTCOMES

"What are the concrete impacts and effects (e.g. change in consumer behavior, change in lifestyle, intention to smoke/quit, attitudes related to smoking/policy)?"

The primary outcomes specified in social media campaigns/interventions were described according to: 1) concrete behavior change measures and whether they were self-reported by users; validated biochemically or with an instrument such as a pedometer; or measured by health professionals; 2) intentions to engage in behavior change; 3) knowledge attitudes and beliefs about health behaviors, activities, social media use, social media preferences or policy related issues; 4) consumer behaviors such as reading food nutrition labels; 5) user engagement/user evaluations/ user acceptance was generally measured with social media platform data such as views, likes and

shares and user evaluation surveys; 6) financial/cost outcomes of a campaign/intervention; and 7) whether social media development best practices were used or if quality assessments of information were performed.

Across the three topic areas, behavior change outcomes were the most frequently studied, followed by user engagement, user evaluations/intervention acceptability. No campaigns or interventions examined policy outcomes. Many studies used outcomes that were collected from self-reported data.

5.1. Anti-Smoking Outcomes

For feasibility reasons, many studies rely on self-report individual-level data. This issue directly impacts claims of outcome behavior effects because self-reported data are characterized by limitations. The "Society for Research on Nicotine and Tobacco workgroup recommends collecting and reporting both biochemically verified and self-report data Internet-based samples on abstinence measures" (Meacham et al 2021 b).

Varieties of self-reported smoking abstinence were used including: continued abstinence ("Did you start smoking again since the beginning of the program?"); (DesRichard et al. 2022); continuous smoking abstinence, smoking reduction and cessation with occasional smoking (Humair et al. 2018); seven-day point prevalence abstinence (Heavy et al. 2022); the Fägerstrom Test for Nicotine Dependence (Lee et al. 2022; Philips et al. 2023; Meacham et al 2021(b)); 24-hour point prevalence abstinence (no smoking in the past day) (Chalela et al. 2022); and self-reported 7-day point prevalence abstinence, reduction in cigarettes per week from baseline, making a quit attempt, and stage of change" measured with the Smoking History Questionnaire (Vogel et al. 2020).

Smoking intentions were measured using the Fägerstrom Test for Nicotine Dependence (Lee et al. (2022); Vogel et al. (2020)). Attitudes about electronic cigarettes were examined by Wright et al. (2021) and Lee et al. (2022).

Verified smoking abstinence was measured by 7-day smoking abstinence, biochemically verified with remote salivary cotinine by Ramo et al. (2018); Meacham et al. 2021; Thrul et al. (2020); Meacham et al 2021(b); Patten et al. (2023); and Vogel et al. (2020).

User engagement and user evaluations/intervention acceptability included different measures such as number of visitors, registered users, and followers, number views, and interactions including "likes", "comments", "shares" (La Torre 2020). User engagement was measured by: the number of posts and number of comments (Humair et al. 2018); the number of comments from users, ease, comprehensibility, helpfulness, and likability of

the intervention (Meacham et al. 2021(b); likes, and user satisfaction measured with a social media usability scale (Patten et al. 2023); negative feedback, and fan-total reach ratio and user posted comments (Pocs et al. 2022); comments, 'likes' and number of views of videos (Heavey et al. 2022). User evaluations of social media intervention content were measured by Hefler (2018); Merculieff et al. (2021); Ramo et al. (2018); Ramo et al. (2019); Hefler (2018); and Lazard (2021). Assessment of information quality in YouTube anti-smoking videos was conducted by Sahin and Kaya (2023).

Financial/cost outcomes were measured as cost per user initiation in a Facebook campaign (Emery 2018).

5.2. Diet / Nutrition Outcomes

A variety of approaches were used to measure diet and nutrition intervention outcomes including: the Healthy Eating Index score (2010) based on 24-hour food recall (Adedokun et al. 2020); validated Food Behavior Checklist and the Perceptions of Meal Planning and Cooking questionnaire (Gray et al. 2022); frequency of food consumption and desired food portion size (Sharps et al. 2019); eating behaviors with the Dutch Eating Behaviour Questionnaire and attitudes with the Eating Attitudes Test (EAT-26) (Tang et al. 2022); change in calcium intake measured from self-reported consumption of milk and other calcium-rich foods (Rouf, Nour, and Allman-Farinelli 2020); self-reported gestational weight gain, and diet quality measured using the National Cancer Institute's Healthy Eating Index-2015 (HEI-2015) (Wilcox et al. 2022); the National Cancer Institute's Automated Self-Administered 24 hour (ASA24) food recall (Pope et al. 2019); and self-reported fat intake, nutrition knowledge and BMI change (Coccia et al. 2020).

Food literacy was measured with a food literacy questionnaire based on the Expanded Food and Nutrition Education Program. Fruit and vegetable consumption was based on questions used in the National Nutrition and Physical Activity Survey (Ng et al. 2022).

Nutrition knowledge and frequency of beverage and snack food consumption was measured with a purpose specific survey items (Doric, Ilić and Rumbak 2022). Intentions to consume healthy, calorie-light meals (Pancer and Noseworthy 2022); and change in diet and physical activity levels gathered from focus group interviews (Saez et al. 2018).

Anthropogenic measures such height, weight and waist size were collected in Cavallo et al. (2021).

Nutrition knowledge and attitudes related to Diet / Nutrition were measured by a validated questionnaire and social support with the Friend Social Support and Eating Habits Scale Cavallo et al. (2021); Ng et ai. (2022); Doric, Ilić and Rumbak (2022); Gray et al. (2022); Coccia et al. (2020); Saez et al. (2018); and perceptions of food health; and likelihood of consumption by Nelson and Fleming (2020) and Tang et al. (2022).

User engagement and user evaluations/intervention acceptability were measured with: Facebook data for replies, reactions, poll votes and impressions by Kattan et al. (2022); interest (measured by contacting the program), intervention acceptability, adherence, and retention Pope et al. (2019); followers, impressions, engagements, likes and comments Grantham et al. (2022); number of likes for posts, goal setting, and engagement questions Gray et al. (2022); questions about ease of use, usefulness of program, likelihood of recommendation to others and overall enjoyment Rouf, Nour, and Allman-Farinelli (2020); Cavallo et al. (2021) and Nosek et al. (2019); and enrolment in a follow-up Facebook component (Tahmasebi et al. 2021).

Content quality was assessed by Sütcüoğlu et al. (2023); Raber et al. (2022); Meyerding & Marpert (2023); Hoare et al. (2022); Turnwald et al. (2022); Sabbagh et al. (2020) and Kabata et al. (2022).

5.3. Physical Activity Outcomes

Intervention behavior outcomes included physical activity levels walking, sedentary, and intentions. Self-reported physical activity was measured with the International Physical Activity Questionnaire (IPAQ) in Nigg et al. (2021); Tricás-Vidal (2022); Mandic et al. (2021) or the short form International Physical Activity Questionnaire-short form (Curtis et al. 2020; Tang et al. 2022). Additionally, the Active Australia Survey was used by Edney et al. (2018) and a physical activity vital signs questionnaire was used by McKeon et al. (2021). Self-reported physical activity was collected with purpose designed survey questions in Nosek et al. (2019); Bonar et al. (2023) and Bowles et al. (2021).

Fitness devices/pedometers/accelerometers were used to objectively measure physical activity (number of steps/time) and sedentary levels by Ling et al. (2018); Cavallo (2021); Biederman et al. (2021); Drehlich et al. (2020); Edney et al. (2018); Oppezzo et al. (2021); Kernot et al. (2019); Hammersly et al. (2020); Johnson et al. (2022); McDonough et al. (2022); McKeon et al. (2021); Pope et al. (2018); Pope et al. (2019) and Van Woudenberg et al. (2020).

Anthropogenic measures such height, weight and waist size to compute BMI were collected by Cavallo (2021); Ling et al. (2018); Nosek et al. (2019); and Prout et al. (2018).

User engagement and user evaluations/intervention acceptability of physical activity social media interventions were measured with various indicators such as: number of likes, comments, poll votes, and photo uploads with various types of posts such as moderator, or user initiated posts (Edney et al. 2018; Kite et al. 2019; and Rayward et al. 2019); reading posted content (Berg et al. 2020); total comments and posts (Hammersly et al. 2020); the number of likes and comments (Prout et al. 2018); user visits (Kernot et al. 2019); the Chatbot Usability Questionnaire—"Do you think MYA telegram chatbot, could help you in increasing your physical activity/change your activity behavior? (Larbi et al. 2021); recommendations to others and/or willingness to participate again, intervention enrollment; attrition rates, attendance at activities and challenge/quiz completion rates (Ling et al. 2018) useful in promoting motivation (Drehlich et al. 2020); attending meetings during an intervention (Nosek et al. 2019); and vlog exposure was measured by how many times, and seconds a participant watched the vlogs (Van Woudenberg et al. 2020).

Content analysis of user engagement including likes, comments, and engagement ratios and assessments of Diet / Nutrition content quality were conducted by Kabata et al. (2022); Pilgrim & Bohnet-Joschko (2019) and Marocolo et al. (2021).

Financial costs of a social media intervention were reported by Rayward et al. (2019) and Bonar et al. (2023).

6. BEST PRACTICES

"Have best practices been developed? How is it ensured that information conveyed is correct? How are social media activities monitored and updated?"

Concerns about the quality and accuracy of online health communication has been a consistent and persistent theme since the advent of the Web. Social media does not possess the mechanisms to monitor or assess the quality, content, and information reliability of content (Sahin and Kaya 2023). The examined literature did not contain evidence related to the development or implementation of guidelines or standards related to social media health communication. None of the intervention articles in the three topic areas supplied information about content

review or updating of material or messages. Klemm (2022) “Guidance for nutrition and dietetics practitioners in using social media” provides an example of this type of information.

There have been efforts to provide users with guidance on identifying credible health websites (e.g., HON Code (Health on the Net) available to websites that meet quality criteria) since the early 2000s. But these approaches have not been adopted for social media, perhaps given the complexity in the screening of dynamic user generated content. Instead awarding quality certificates to certain channels and content creators. Social media channels themselves have committed to removing mis and dis-information for several years now, but the results are disappointing and inadequate. Not only is content not removed, often due to the lack of robust and accurate algorithms, but the mental health effects on people who screen such content is concerning and recently Twitter removed staffing levels for this service.

In February 2023, YouTube announced an effort to develop a certificate for organizations that post on YouTube, aiming to inform users that the organizations are credible and meet specific quality standards (Weiß 2023). The “YouTube standard for health” certificate is designed to help consumers identify quality content, but it is yet to be seen how well this works, both for consumers and for organizations applying for the certificate and is limited to video content.

The relative open and unregulated nature of social media highlights the serious risk of incorrect information or misinformation. The production of social media content by AI is just one of many areas that will influenced by the disruptive effects of technological developments for which public policy is not well advanced.

There is not an extensive amount of guidance concerning best practices for social media campaign/intervention development and implementation. However, some of the included research focused on examining social media information in terms of message validity, accuracy, credibility, and conformity with relevant standards such as nutrition guidelines.

6.1. Anti-Smoking Best Practices

An evaluation of YouTube anti-smoking related videos determined that 78% were useful and 22% misleading. Moreover, misleading videos obtained more views and comments compared to useful videos. Independent

YouTube users and media sources produced more misleading videos (Sahin & Kaya 2023). Lee et al. (2022) examined user comments as part of ongoing quality improvement efforts for a clinical smoking-cessation service.

6.2. Diet / Nutrition Best Practices

There was no specific evidence of best practices being used. Nutrition and diet videos posted on YouTube were evaluated according to the DISCERN quality criteria and only 21% were evaluated as good or excellent (Sütcüoğlu et al. 2023). Just over half of TikTok content providers, related to the Mediterranean diet, provided health credentials in their account information and the material was more detailed and higher quality than other content providers (Raber et al. 2022). 27 videos (7.4%) did not feature any food or beverage cues. Cakes (9.4%) and fast foods (8.9%) were most frequent, while healthier food such as fruits (6.5%) and vegetables (5.8%) were less frequent. Overall, less healthy cues were observed in nearly half (49.4%) the videos compared to healthy cues in 34.5% (Coates et al. 2019).

Some social media influencer posts contain features that impact users in subtle ways (Lynn et al. 2020). For example, 70% of influencer videos aimed at teens contained food or beverages and the most frequent product categories were chocolate, candy, and soft drinks, and 66% received the lowest Nutri-Score ratings (Meyerding & Marpert 2023). Almost half of examined Instagram posts containing nutrition hashtags depicted unhealthy food or beverages and the majority of images included young, healthy-weight female adults (Hoare et al. 2022). Celebrity social media accounts with healthy Nutrient Profile Index scores were associated with fewer likes and comments compared to the remaining 90% of accounts that had lower ratings and would not comply with youth advertising policy in the UK (Turnwald et al. 2022). Only two influencer-hosted weight management blogs were qualified to provide nutrition and diet advice, the rest of the sample had limitations, and most were not credible (Sabbagh et al. 2020).

Approximately, 70% of a sample of Instagram posts assessed according to quality of nutrition information, popularity and engagement measures were rated as no quality or very low quality and nearly 6% were rated moderate quality and only one post was rated good quality (Kabata et al. 2022). There was more user engagement with videos that contained less-healthy calorie-dense food compared to healthier, calorie-light food videos (Pancer and Noseworthy 2022). Nearly 3/4 of food images were nutrient-dense and 29% were energy-dense (Jebeile et al.

2021). A content analysis of Twitter posts over 16 months revealed that a majority of actors were non-health professionals and bot use was widespread. Main topics were diet, nutrition, exercise, weight, disease, and quality of life (Lynn et al. 2020). Using TikTok hashtags to identify diet / nutrition content, Minadeo et al. (2022) found the most prevalent themes included glorification of weight loss, positioning of food to achieve health and thinness, and the lack of expert voices providing nutrition information. Girls with Snapchat and Tumblr accounts and boys with Snapchat, Facebook and Instagram were significantly more likely to have eating disorder behaviors and over-evaluation of shape and weight (Wilksch et al. 2020).

6.3. Physical Activity Best Practices

There was no specific evidence of best practices being used in the reviewed research literature on physical activity. Less than 20% of Instagram influencer physical activity posts included citations or references to scientific sources related to the information in the posts (Marocolo et al. 2021). Almost all body images showed pronounced muscles and conveyed the notion that fitness was visual-based and not related to physical performance (Pilgrim & Bohnet-Joschko 2019). No article specifically mentions using "best practice" or specific evidence about good practice to inform the intervention design or implementation. And, based on the reviewed literature, no "best practice" could be recommended other than being audience centered, having engaging content that is relevant and resonates.

7. OPTIMAL CHANNEL, FORMAT, OR DURATION

"Is there an optimal channel, format, or duration?"

Determination of optimal channel, format, or duration is contingent on a combination of factors including health consequences associated with social media, functionality, resource allocation, and impact on health behaviors. Social media functionality coupled with target group characteristics, specific health behaviors influence the choice of social media platform(s), strategies, and subsequent effects. One of the important questions to answer is which social media communication features are causally linked, or associated with health behavior change and whether these linkages vary when social media is part of a multicomponent campaign / intervention.

Social media can be used to promote mutual support and foster encouragement around shared learning experiences, while providing insights into individual perceptions about behaviors. Social media formats that: facilitate active communication, provide direction or curation, is purpose-oriented, and does not require extensive user effort demonstrate evidence of effectiveness. Even in the case of mass campaigns various social media channels, formats, or content could be used depending on specific target population characteristics and preferences.

Multi-platform social media interventions create challenges to assessing the effects of various combinations of utilized components such as posting YouTube videos on Facebook or Instagram (Ng et al. 2022). Ultimately, the choice of social media components should be based on formative research or research evidence related a particular target group, health behavior, and desired outcomes.

Several factors are applicable to determine optimal social media components in in terms of channel, format, and duration including: 1) adverse effects; 2) implementation resources; and 3) social media effects: behavior - user engagement.

1) Adverse effects

There are emerging concerns and examples of harmful health effects resulting from social media and should be assessed as part of a social media campaign/intervention development. Despite great optimism about the role of social media because of high adoption by young people, it is increasingly seem as contributing to the rise in mental health problems, violence, sadness, suicidal thoughts, attempts at suicide and among young people. For years, studies continue to show a strong correlation between social media use and mental health problems of young people (Mackson et al. 2019; Mayo Clinic 2022; Satici 2019; Wells et al. 2021). In the article "Smartphones and social media are destroying children's mental health" John Burn-Murdoch of the Financial Times wrote:

> *"The share of British teens who do not consider themselves likeable has more than doubled since 2010, which is around the time that smartphones became ubiquitous. Studies have found that the more time teens spend on smartphone apps like Instagram and TikTok, the worse their mental health is. The gradient is steepest for teenage girls, who spend significantly more time on social media apps than boys."* (Burn-Murdoch 2023).

The most recent Youth Risk Behavior Survey report of the U.S. Centers for Disease Control and Prevention noted that "teen girls are experiencing increased sadness, suicidal thoughts, and sexual violence" and

"one in five girls said they had been the target of electronic bullying, almost double the 11 percent of boys." (CDC, 2023). So, the concept of directing people, especially young people to use social media for health purposes may be counteracted by other negative consequences resulting from social media activity. For example, Instagram users who were motivated by fitness influencers to perform a physical activity spent more hours per week on Instagram checking for nutrition or exercise material than less motivated (Tricás-Vidal 2022) and following fitness influencers on primarily on Instagram was associated with higher levels of body dissatisfaction, especially among females (Bowles et al. 2021). Body image and body dissatisfaction was significantly higher for the social media group in Tang et al. (2022). Social media use fostered feelings of guilt about diet behaviors (Friedman 2022). Physical activity levels at the extremes, both high and low levels, are reinforced with more social media use whereas moderate health behaviors displayed a nonlinear relationship (Shimoga et al. 2019).

Social media interventions implicate privacy and confidentiality concerns (Arigo et al. 2018) and study participants expressed concerns about their identity or behaviors being revealed while participating in social media programs (Vogel et al. 2020).

2) Implementation Resources

Social media is often viewed as a low-cost, scalable, and useful tool to overcome traditional health communication barriers. This perception is true to the extent that one does not account for the costs associated with developing effective, appropriate, evidence-based health communication, or developing communication that is not effective or does more harm than good. Few if any standards are applicable to many types of social media health communication and they may benefit in terms of amplification and exposure from user generated actions. This creates an asymmetrical standard that unevenly distributes the costs and burdens of using social media especially for government, businesses, and public health organizations. Mass social media campaigns can be a target for criticism, debate, and extreme reactions, driven by bots, artificial intelligence, and social media users, that can easily transform into public and/or political controversies and resulting in unanticipated challenges and costs.

People with appropriate skills, time, and financial resources for the development, implementation, administration, and evaluation of social media campaigns/interventions are required. In institutions and organizations, the adoption of emerging information communication technologies is partially influenced by

employee-based factors such technology knowledge and efficacy. Staff training and support will be necessary in many cases. Additionally, it may be necessary to obtain additional equipment or services in order to implement a social media health communication program.

Research evidence provides a generalized outline of the scale of work required to design, development, administration, and monitor a social media health campaign/intervention. It requires a variety of skills, expertise, and resources in terms of staffing levels and finances. The ultimate costs are driven by the size, duration, and quality of social media interventions, but the research evidence provides little specific evidence about this dimension.

The scope of social media intervention development is effectively outlined in "Developing a Social Media Intervention to Connect Alaska Native People Who Smoke with Resources and Support to Quit Smoking: The Connecting Alaska Native Quit Study" (Merculieff et al. 2021). After formative research with the target population and pilot testing to test cultural fit, appeal, and efficacy of messages, videos and images, the project prepared and developed a content library that included "(1) welcome posts, group description, guidelines, and contact information; (2) options for Facebook cover photos; (3) 64 posts (images and text or video that included a tag line to call the Quitline or use Tribal quitting resources, similar to the CDC Tips campaign); (4) guidelines for handling inappropriate or misinformation such as deleting unrelated or false material and removing or blocking participants found violating guidelines); and (5) a list of quitting resources" (Merculieff et al. 2021).

Additional planning and/or resources will likely be required for social media interventions where counselling or moderation is provided, as it is necessary to provide training in relevant theories, health behavior change, communication, and social media engagement (Merculieff et al. 2021) (see also McKeon et al. 2021).

Resource demands can be increased by the inclusion of tools, devices, or products such as personal fitness trackers or nicotine replacement therapy, as part of an intervention. In order to provide user support for using Instagram, a project conducted weekly, (then bi-weekly), telephone support calls to identify any feasibility issues and providing troubleshooting assistance (Curtis et al. 2020). Oppezzo et al. (2021) encountered a variety of user support issues totaling more than 200 user assistance requests related to personal fitness trackers such as device functionality, syncing problems and account problems. Measurement of primary outcomes can be expensive as demonstrated in the TSP Facebook smoking cessation intervention that used verified 7-day point prevalence abstinence. However, this outcome measure required biochemical verification of tobacco abstinence that was

performed by mailing participants saliva cotinine test strips and asking them to return pictures of the results (Ramo 2019). It may also be necessary to develop and prepare appropriate instructions, guides, explanatory material such as written responses to address concerns about product quality, dosage questions, health reactions, and frequent general health questions (Phillips et al. 2023).

3) Social Media Effects: User engagement

The evaluation of social media is substantially related to the outcomes that are achieved and the evidence emphasizes health behavior change, user engagement, and user evaluations/intervention acceptability. Optimal social media channel, format, and duration components can be identified by positive/improved impacts on health behaviors in target populations, and generate high user engagement and positive user evaluations.

User engagement, such as views, likes, comments, users' interactions: engagement rate, negative feedback, and fan-total reach ratio, is important social media concept because it provides information about content that is being viewed and user engagement directly drives subsequent message exposure and of future content due to social media algorithms (Kite et al. 2019). It is possible to measure the type, amount, and level of engagement with various social media platforms and other users. User engagement is a reflection of user interests, preferences, evaluations and impact and there is evidence that it can be related to health behaviors.

Although social media platforms provide a variety of data options and analytics, this information does not measure attention, completion, and comprehension of specific formats such as video, images, and other formats. These data measure how people react to messages and "group members may still have viewed and thus passively "engaged" with content even if they did not comment or like the content" (Meacham et al. 2021). Some cross-sectional survey data in the included research described user perceptions, attitudes, and preferences about social media platforms, communication format, and message strategies providing additional perspectives about individual knowledge, attitudes and beliefs concerning social media and insights about effective social media health communication.

Social media data can be used to overcome some of the challenges related to collecting evidence. The combination of social media data and other data sources permits ongoing approaches to monitor and gather health-related data. Combining social media data with data from other existing sources enables public health organizations to monitor physical activity levels in a more timely manner than typical research approaches used for collecting related epidemiological data. For example, a secondary data analysis study of physical activity–related Twitter

hashtags that were geolocated with latitude and longitude coordinates and merged with physical activity data collected from a national US behavioral survey. The results showed that the percentage of physical activity–related tweets was significantly associated with physical activity levels at the county level (Liu, Chen and Kuo 2019).

7.1 Optimal Channel

The choice of social media channel(s) may be influenced by factors that are dynamic, largely external to actual message content, but may nonetheless impact the potential effectiveness of communication campaigns or interventions. Social media platforms are owned and operated by private companies that operate in new and changing sector. Recent changes in ownership of Twitter were the catalyst of controversial revisions in a variety of operational policies that contributed to a turbulent social media landscape, further blurring the lines for users between reality and what is fake. As a result, greater attention has been directed at alternative social media platforms such as Mastadon, Bluesky, or Threads but future adoption and usefulness of these platforms is undefined and not easily predicted.

Additionally, Twitter introduced user fees that have caused a number of organizations to withdraw from Twitter. In a separate example, Facebook recently introduced a new future orientation that revolves around virtual reality and even changed their name to Meta. Young people's use of Facebook also fluctuates over time as they find other platforms to be more appealing (such as Instagram and TikTok) yet they are drawn to platforms where they have invested in and built social networks. This is reflected in the recent very high adoption of Threads social media platform since its launch in July 2023 (100 million+ within the first week), as they promote that users of Instagram can bring in their connections. Notably, due to privacy policy issues, Threads is not available in Europe at this time. TikTok is an illustrative example of the turbulent social media landscape, with some governments, universities and businesses banning its use on devices and Wi-Fi due to privacy concerns (Maheshwari & Holpuch 2023 and McMenamin 2023). Additionally, recent changes in operating policies has caused a great deal of disruption at Reddit.

There is variation between anti-smoking, physical activity promotion, and Diet / Nutrition in terms of the most used channel, format, and duration but Facebook provides an optimal combination of features consistent with

key considerations for social media interventions (Bonar et al. 2023). Across the three topics Facebook was the most frequently used social media platform, followed by Instagram and then Twitter.

7.1.1 Anti-Smoking Optimal Channel

Facebook was extensively used although the mixed results of the campaigns/interventions reflect the challenge of developing effective smoking prevention and cessation campaigns/interventions. The research contains evidence of overall user satisfaction with Facebook interventions and campaigns. A hybrid approach that combined elements of a health campaign and personal intervention demonstrated the functional capacity of Facebook for smoking prevention in the 'I quit smoking with Facebook on March 21' campaign that resulted in 81% of participants attempted to stop smoking, but maintained abstinence was 38% at 10 days, 19% at 3 months, and 13% at 6 months (Desrichard et al. 2022; Humair et al. 2018).

Facebook user engagement has been found to be associated with positive smoking cessation outcomes. User comments posted in response to live counsellor posts increased the odds of abstinence by 10% (Thrul et al. 2020). In contrast, user engagement was greater for participant-generated posts than for moderator-generated posts, but smoking abstinence was not statistically significant (Patten et al. 2023). Greater amounts of connectivity with users was significantly associated with biochemically verified smoking abstinence for larger number of both comments and likes, although the effects differed between contemplation and precontemplation groups (Meacham et al. 2021). Users reported significant improvements in cigarette smoking abstinence outcomes at 3 months (Meacham et al. 2021(b)). One measure of acceptability of Facebook interventions is reflected by users willingness to recommend them to other people, but that does not always correspond with positive behavior changes. The intervention received positive user evaluations and 90% would recommend it to others, but there was no significant reduction in biochemically verified quitting over 12 months (3, 6 and 12 months), number of cigarettes smoked, quit attempts, or likelihood of being ready to quit (Ramo et al. 2019(b). Higher levels of peer-to-peer interaction such as providing advice, encouragement, and support was associated with positive user experiences, but user engagement and activity on Facebook declined during the course of the intervention (Heavy et al. 2022). Facebook posts which used motivational interview strategies were associated with significantly higher engagement rate, higher fan-total reach ratio, and more change talk compared to a control group (Pocs et al. 2022). User

evaluations were highest for posts that prompted thinking about post content and lowest for those involving direct action such as clicking on links, or using the information provided (Vogel et al. 2019 and Vogel et al. 2020).

In terms of user engagement, a large multi-canton Swiss anti-smoking campaign generated 2,400 posts that was the catalyst for approximately 67,000 comments (Humair et al. 2018) which contrasted with the Italian national campaign "Ma che sei scemo? Il fumo fammale" (Are you stupid? Smoking is bad) which failed to achieve substantial user engagement demonstrated by the number of views and interactions were "few and not encouraging" with only 3,747 shares and 108 comments (La Torre 2020). Additionally, participation in more active Facebook groups and above average individual Facebook activity was not associated with improved smoking outcomes. It is worth noting the effects of Twitter: content that described e-cigarettes as more harmful than smoking were associated with lower intentions to purchase e-cigarettes (Wright et al. 2021).

Survey research supports the utility of Facebook as respondents used Facebook more than once a day (83%) and spent more than 30 minutes per day (69%) on the platform. Facebook was used to connect with similar others (68.4%). Users who were motivated to quit smoking posted more frequently and were more likely to join Facebook (OR = 4.15) than non-motivated (Borrelli et al. 2021).

7.1.2 Diet / Nutrition Optimal Channel

Facebook use was much greater than Twitter and Instagram channels as reach was 100,571 followers,128,818 impressions and 9575 engagements (Grantham et al. 2022). Exposure to social media food content was positively associated with eating attitudes, behaviors, perceived norms, and food literacy among adolescents. The relationship between food exposure and intake was different depending on food type (Qutteina et al. 2022). Facebook was effectively used for diet and nutrition content such as cooking demonstrations that resulted in improved eating habits, decreased sweetened beverage intake, and increased use of food labels (Gray et al. 2022); increased fruit and vegetable consumption, increased food literacy knowledge and positive user evaluations (Ng et al. 2022); increased consumption of vegetables and whole grains (Wilcox et al. 2022); promoting user engagement for healthy diet among children (Kattan et al. 2022); increased calcium intake Rouf, Nour, and Allman-Farinelli 2020); improved nutrition and physical activity (Pope et al. 2019); and increased fruit and vegetable consumption as well as positive user evaluations (Ling et al. 2018). Although user engagement varied considerably from post to post, directing potentially interested parents from social media to the website for a diet/nutrition program was effective (Henström et al. 2022). 97% of posts were distributed through Facebook, while 84% of videos (stories) were distributed on YouTube (Te et al. 2019).

Positive or partial effects associated with Facebook use were observed for: live counselling/class sessions (Adedokun et al. 2020); distributing weight loss nutrition information, improved social support and positive user evaluations (Cavallo et al. 2021); and education about the principles of healthy eating in terms of increased knowledge, but less than school-based content (Dorić et al. 2022).

Additional evidence reinforces the use of Facebook for diet and nutrition campaigns/interventions by survey respondents who indicated that Facebook was the most popular platform for finding recipes (Nelson and Fleming 2019). Although user engagement varied considerably from post to post, directing potentially interested parents from social media to a diet/nutrition program website was effective (Henström et al. 2022). A survey using a sample of university students found that YouTube was the most used platform (96%) but only a minority (17%) of respondents actively used social media for nutrition information, while the majority (54%) engaged it only it was included in push content (Kreft et al. 2023).

7.1.3. Physical Activity Optimal Channel

The physical activity evidence is ambiguous regarding the optimal social media channel in terms of positive effectives on physical activity behaviors. The largest number of non-statistically significant intervention effects were encountered in physical activity evidence. Facebook and Instagram were frequently used for physical activity promotion research.

Physical activity levels at the extremes, high and low, were associated with more frequent social media use, whereas moderate health behaviors displayed a nonlinear relationship (Shimoga et al. 2019). Formative survey research of parents found extensive interest in family-based social media physical activity programs and Facebook use during the previous 30 days, yet slightly more than half of the respondents preferred email for physical activity content, and only 1/3 chose social media groups. For physical activity content, users preferred information regarding family activities, goal setting, and advice and tips ahead of social support and educational videos (Scott-Andrews et al. 2022).

There is evidence that some population groups have pre-existing or established preferences for particular social media platforms. Cross sectional survey respondents indicated that Instagram was the most popular social media platform for physical activity (48% of participants), with 5% for Twitter which was the next most popular (Bowles et al. 2021). Saez et al (2018) encountered substantial user reluctance to use the intervention social media channel as only 21 adolescents actually joined a Facebook group and the low participation rate hampered the meaning and validity of the study.

Positive outcome effects were observed for Facebook interventions including: increased weekly steps (Biederman et al. 2021); improved BMI, high user engagement (Cavallo et al. 2021); decreased body mass and screen time, and increased moderate-to-vigorous physical activity levels (Ling et al. 2018); increased moderate-to-vigorous physical activity (McDonough et al. 2022); the largest increase in physical activity levels coupled with motivational interview strategies (Mandic et al. 2021); minutes of walking, quality of life, total depression, anxiety, and stress scores among emergency first responders (McKeon et al. 2021); increased minutes per day of moderate-to-vigorous physical activity for university students (Pope et al. 2019); higher likelihood to be physically active (Todorovic et al. 2019). Increased motivation to perform physical activity was influenced by relatedness, and feelings of connection with other Facebook users (Divine et al. 2019). Facebook was rated as helpful, reinforced

their weight management program, and users would recommend using social media to other youth (Prout et al. 2018) and was linked with increased physical activity levels in a cannabis reduction intervention (Bonar et al. 2023).

Partial or limited effects associated with Facebook as engagement was not associated with: increased levels of physical activity but was with a running activity component (Edney et al. 2018); significant differences in moderate to vigorous physical activity levels or self-reported walking among users in three comparison groups Kernot et al. 2019; moderate to vigorous-intensity physical activity levels were lower for children of more engaged parents although they experienced improved sleep outcomes (Hammersly et al. 2020); and the control group. User evaluations were critical of Facebook (Drehlich et al. 2020). A Facebook/Fitbit user group experienced significant reductions in sedentary behavior but no change for moderate-to-vigorous physical activity levels (Johnson et al. 2022); breast cancer survivors in both groups decreased body weight by nearly the same amount (Pope 2018). Facebook ads produced many more new users than ads based on a static web site link (Kite et al. 2019). Focus group results revealed that Facebook was the most popular platform for social support as a result of its private group capabilities and current usage (Allman-Farinelli et al. 2021).

Instagram was frequently used especially for fitness influencers. Most of these accounts did not provide traditional health communication campaigns/interventions and there is little evidence related to the development, implementation, and evaluation of influencer fitness interventions. Experimental research and content analysis research focused on Instagram has reported evidence of influencer effects on increased physical activity (Duplaga 2020; Tricás-Vidal et al. 2022; Schlittchen 2020; Durau et al. 2022; Kim 2022; Bowles et al. 2021; and Marocolo et al. 2021).

Conversely, some evidence reported no effects on physical activity levels or participation in sports activities or exercise (Schlittchen 2020) but an increased body dissatisfaction (Bowles et al. 2021). The credibility of influencer-provided material is questionable as less than 20% of Instagram influencer posts provided a scientific reference that supported the communication (Marocolo et al. 2021). Inconsistent evidence about video effects found that vlogs on YouTube resulted in the control group experiencing better physical activity outcomes (Van Woudenberg et al. 2020).

2. Optimal Format

A number of interventions utilized multiple communication formats and it is challenging to isolate particular effects of different communication formats on behavior change to assess their relative value. An important theme that emerged from the evidence was the value of cultivating and leveraging some of the features of social media such as "sharing, co-creation and exchange of information between peers is a defining feature of social media" that sets it apart from other traditional communication channels. Current evidence highlights a need "to enhance user engagement with interventions to actualize their potential" (Edney et al. 2018).

7.2.1 Anti-Smoking Optimal Format

In term of perceived message effectiveness, regardless of format, social media content was associated with greater knowledge and beliefs about the harms of e-cigarettes and nearly 80% of the experiment participants indicated that they would share the social media messages, most likely in person (49%) and with friends (52%) (Lazard 2020).

Moderator/facilitator or live counselling format was used extensively in anti-smoking interventions and campaigns and demonstrated effectiveness on behavior outcomes, user engagement, and user evaluations. Live counselling was associated with improved verified smoking cessation outcomes and more user engagement for participants in "preparation", similar engagement in "precontemplation", and less engagement for "contemplation" stages of change (Thrul et al. 2020). Users identified desirable properties including the importance of social interactions; perception of health information and the appeal of online support available on Facebook (Heavey et al. 2022). This format was also used by Lee et al. (2022); Vogel et al. (2019); Vogel et al. (2020); McKelvey & Ramo (2018); Meacham et al. (2021); Meacham et al. (2021(b)); Ramo et al. (2019); and Desrichard et al. (2022). The value of this format was reinforced by participants who suggested that moderators offer more frequent contact to interact and check-in with users and to include more stories and engaging activities such as contests (Patten et al. 2023).

Importance of moderation activities was reinforced by findings that demonstrated user engagement through comments was significant, and that framing, engagement requests, and varying implied audience choice had a role on user engagement with posts (Strekalova et al. 2018).

Facebook provides the capacity to accommodate user characteristics such as stage of change (contemplation or precontemplation) which was associated with fewer comments and biochemically verified

smoking abstinence was associated with the number of user comments and user likes (Meacham et al. 2021). Themes present in user comments included: 1) coping; 2) friends and family; 3) motivation; and 4) benefits of quitting (McKelvey & Ramo 2018).

Video or live streaming format was part of several studies, but despite their appeal (because they enable culturally specific story telling content) (Sinicrope et al. 2022; Kerrigan 2019), videos that gain widespread popularity or high ratings are challenging to develop (Merculieff et al. 2021). Moreover, the research results are not entirely consistent (Lee et al. 2022; DesRichard et al. 2022; Vogel et al. 2019; and Vogel et al. 2020). For example, a nationwide campaign in Italy used four professionally produced videos (30 seconds in length), popular celebrity figures, aimed at different target populations was intended to be an innovative, social media campaign that combined anti-smoking messages with other preventive messages were not viewed by a large number of people nor was there substantial user engagement with the videos (La Torre, 2020).

7.2.2 Diet / Nutrition Optimal Format

Video or live streaming was effectively used in several diet / nutrition interventions to: share food recipes on Instagram (Martinino et al. 2021); show cooking videos on Facebook (Gray et al. 2022); increase calcium consumption (Rouf, Nour, and Allman-Farinelli 2020); distribute nutrition information on Instagram (Chan & Allman-Farinelli 2022); provide live streaming of nutrition classes on Facebook (Adedokun et al. 2020); and promote the Mediterranean diet (Ng et al. 2022). Video format messages were rated highly. Both videos and photos demonstrated effectiveness, produced more engagement compared with text only content (Cavallo et al. 2021).

Images were found to have no impact on eating intentions but were associated with negative body image and body dissatisfaction (Tang et al. 2022). Images from Instagram had a positive relationship with less cognitive user engagement such as following other users, compared to text-based format messages. However, text format had a stronger association with more cognitive user engagement relative to images (Roccapriore & Pollock, 2022).

Moderator/facilitator format was used to post user created stories (Grantham et al. 2022); videos, recipes, and offer support (Ng et al. 2022); posted various formats and generated the most user comments (Cavallo 2021); relied on semi structured scripts for discussions and questions (Wilcox et al. 2022); and achieved statistically significant improved outcomes for diet behaviors and nutrition knowledge. Polls posted by a moderator/facilitator

generated higher user engagement than other formats and open-ended questions had the lowest level of engagement (Kattan et al. 2022).

7.2.3 Physical Activity Optimal Format

Moderator/facilitator/live counselling was a format option where effective intervention effects were observed in Bonar et al. (2023); Drehlich et al. (2020); McKeon et al. (2021); Prout et al. (2018); Ng et al. (2022); and Cavallo (2021). The format was partially effective at achieving more adherence with a running activity intervention component, but not increased physical activity levels (Edney et al. 2018). Although the contribution of the challenge format was not clearly defined in the reviewed evidence it formed a part of several effective interventions (Saez et al. 2018; Rayward et al. 2019; Ling et al. 2018; and Pope et al. 2019).

Video was a popular format choice and demonstrated effectiveness for: increased physical activity, user engagement, and user evaluations (Pope et al. 2019; Prout et al. 2018); significantly increased weekly steps (Biederman et al. 2021); more engagement than text only messages (Cavallo 2021); and increased user motivation to be physically active (Tang et al. 2022).

Video combined with other formats on Instagram did not result in significant changes in physical activity measures (Curtis et al. 2020). Results of a YouTube (video) intervention did not achieve statistical significance but the authors suggested that it "could be considered as possibly non-effective but all of the findings observed were in the same hypothesised positive direction for physical activity and sedentary behaviour and the consistency and direction of the overall non-significant results could also be interpreted as a positive" (Nigg et al. 2021). Increased moderate-to-vigorous physical activity levels were associated with YouTube videos (McDonough et al. 2022). However, the control group that did not view YouTube vlogs experienced better outcomes for increased physical activity (Van Woudenberg et al. 2020).

Influencer format was extensively used in the physical activity research, but the evidence was generally based on cross sectional surveys or content analyses, as opposed to measuring intervention effects. Fitness influencers emerged as an important resource for physical activity promotion and have been associated with increased physical activity levels (Duplaga 2020). Perceptions of being encouraged to engage in physical activities by fitness influencers on Instagram was associated with significantly higher moderate physical activity (Tricás-Vidal et al. 2022) and influencers motivated users to achieve a fit body (Schlittchen 2020).

Influencer effects were mediated by several factors. Trustworthiness was identified as a key attribute for attitude formation towards influencers (Durau et al. 2022). Survey results indicated that user satisfaction with

fitness influencers on YouTube was driven by social interaction, information quality, and visual content (Kim 2022). There are concerns about information quality provided by influencers as few references or citations for message content were provided by influencers (Marocolo et al. 2021). Conversely, some research found no associations between increased physical activity levels and influencer use, but instead, more body dissatisfaction and body image concerns (Bowles et al. 2021); and no effects on participation in exercise or sports activity (Schlittchen 2020).

The potential of chatbots is technologically feasible, yet user evaluations expressed ambivalence about the feasibility of a chatbot of a physical activity chatbot on Telegram as nearly half chose "maybe", and the rest evenly divided between yes and no to a question about whether the chatbot could help increase physical activity/change your activity behavior (Larbi et al. 2021).

Different message formats are associated with various types of user engagement. Analysis of a diabetes organization's social media accounts (Facebook, Twitter, and Instagram) showed that physical activity posts received more likes (54%) than health education posts, but fewer comments and shares. Posts that included tangible assistance had six times more likes and posts that expressed support had almost 11 times more shares. Posts with two or more types of social support were the most engaging (Gabarron et al. 2021).

3. Optimal Duration

The evidence provides examples of varying campaign/intervention duration. More than 2/3 of posts occurred within the first 2 weeks of the intervention (Phillips et al. 2023). This campaign/intervention design attribute is muddled by a common pattern related to intervention participant attrition and the erosion of effects over time. A related practical issue concerns the timing of social media activity. Kite et al (2019) observed effects between day of week and time of day and user engagement: Fridays were associated with the largest number of likes and shares, and Facebook material posted between 08:00 and 17:00 received more likes and shares. Physical activity tweets were frequently posted on Mondays or during morning or late morning hours (Park 2022).

7.3.1 Anti Smoking Optimal Duration

The most widely used duration for intervention studies was 12 weeks (Emery et al., 2018; Heavy et al. 2022; Lee et al. 2022; Maier et al. 2020; Meaghan et al. 2021; Meacham et al. 2021(b); Patten et al. 2023; Philips et al. 2023; Ramo et al. 2018; Ramo et al. 2019; Thrul et al. 2020; Vogel et al. 2020).

7.3.2 Diet / Nutrition Optimal Duration

The nutrition research was very diverse in terms of intervention duration and there was no distinct pattern was evident. 6 weeks was used in the largest number of intervention studies (Coccia et al. 2020; Gray et al. 2022; Rouf et al. 2020) followed by followed by 12 weeks (Cavallo et al. 2021; Pope et al. 2019); 16 weeks (Nosek et al. 2019; Grantham et al. 2022); and 2 weeks (Doric, Ilić and Rumbak 2022; Sharps et al. 2019). The remaining intervention studies ranged between 5 days (Tang et al. 2022) and 2-3 years (unclear in the papers) (Kite et al. 2018; Kite et al. 2019).

7.3.3 Physical Activity Optimal Duration

A period of 12 weeks was the most used duration in physical activity interventions and campaigns (Cavallo et al. 2021; Curtis et al. 2020; Drehlich et al. 2020; Johnson et al. 2022; McDonough et al. 2022; Pope 2019; and Prout et al. 2018). The remainder of studies varied between 1 day and 2-3 years.

8. TARGET GROUPS

"which target groups are best reached?"

The sample populations used in the research reflects the focus of the various studies and projects. It should be noted that this orientation does not in and of itself suggest that any particular target group is best reached by social media. Study samples were coded up to two categories such as female and young adult (meaning young adult females). Some of the articles did not implement an intervention, did not use human participants, and/or used social media data. Some qualitative evidence across the three topic areas provides additional insights about user evaluations of social media and preferences for social media channel, format, content, functionality, and other

features. In general, children and younger people were the specific focus of the largest number of articles. Young adults were the most frequently used target group in each of the three topic areas. Students and female were the focus of more articles compared to other target groups in physical activity. A number of nutrition studies relied on university student samples. Most anti-smoking intervention studies included smokers.

Intervention studies include participant recruitment efforts and strategies that required formal screening and acceptance procedures for a study, whereas some social media sources did not describe procedures to target population groups or marketing/recruitment strategies. Presumably, such social media accounts relied on marketing techniques, social media engagement tools, and media exposure. Studies that utilized convenience samples generally had more female participants and there was no evidence that described or explained the gender difference in participation rates.

There is limited evidence that suggests country specific factors should not be ignored in terms of generalizing results from the research "exposure to tweets that described e-cigarettes are as or more harmful than smoking more than three times as many US participants thought that e-cigarettes were much more harmful than regular cigarettes and more than twice as many saw them as more harmful compared to the UK (Wright et al. 2021). Some articles utilized samples that were exclusively digital and obtained from social media platforms such as Facebook or Twitter and did not stipulate specific information about the location of data. Most articles were conducted in the United States, Australia, and United Kingdom. Across all three topic areas the U.S. was the location of most studies (n=40) followed by Australia (n=20) and United Kingdom (n=8). Countries are characterized by different cultures, values, experiences and policy approaches related to health issues.

The ability to reach target groups derives from social media functionality to target specific groups according to topic, health behaviors, change readiness, content, or geographic location. Social media enables tailored messages based on a variety of characteristics such stage of change. Contemplation groups established less overall connectedness between group members compared to those in pre-contemplation (Meacham et al. 2021). Live counseling generated more engagement among participants in preparation, similar engagement in precontemplation, and less engagement in contemplation (Thrul et al. 2020).

Developing content related to a target group's identities and values is valuable for effective communication. Content can be tailored to significant group characteristics by designing images, videos and text in a way that affirms a group's values, beliefs, and characteristics, using surface-level tailoring such as reflecting

characteristics of a group, such as individuals, couples, events, and symbols, and deep-level tailoring related to content structure and meaning (Vogel et al. 2020). In another example physical activity challenges were developed "specific to southeast Texas from the outset and became more so with refinement following participant feedback" (Robertson et al. 2022).

Additionally, health programs such as the Facebook "Online MedDiet Challenge" demonstrated the feasibility and acceptability of developing public health interventions for populations that reside in rural or remote areas (Ng et al. 2022). Another benefit of social media is the ability to target specific groups according to specific locations such as workplaces or educational settings such as universities (Pope et al. 2019) or specific jobs such as university-based strength and conditioning coaches (Coccia et al. 2020).

Throughout the research there is evidence of gender-based differences in study participation and behavior outcomes such as women's ratings of healthy foods were positively correlated with intentions to consume them whereas no similar links were observed for men (Nelson and Fleming 2019); differential gender-based effects of social media channels on eating disorder behaviors (Wilksch et al. 2020) and females spent more time on social media (Barna et al. 2021).

8.1. Anti-Smoking Target Groups Best Reached

Young adult smokers were the most frequent target populations in anti-smoking studies. The next largest target group was race/ethnic/linguistic minority groups.

8.2. Diet / Nutrition Target Groups Best Reached

Young adults and teens were the target group in the largest number of diet / nutrition focused social media studies.

8.3. Physical Activity Target Groups Best Reached

Students, young adults, and females were the most frequent target populations in physical activity social media studies.

Table 12: Target Population Group by topic area

Population Group	Anti-Smoking	Diet / Nutrition	Physical Activity
Full	5	1	5
Female	2	4	14
Male			
Seniors			3
Young Adults	17	6	12
Teens		7	5
Children		3	4
Students		3	18
Race/ethnicity/language minority	7	1	1
Lower Social economic status		2	1
Smokers	21		
Gender/sexual identity minority	2		
Post-partum			2
Mobility restricted		1	
Parent - Caregiver		2	9
Young Cancer Survivor			2
Pregnant		1	
Other (breast cancer survivors)			1

Cell values = number of studies

Table 13. Study location by topic area

Country	Anti-Smoking	Diet / Nutrition	Physical Activity
Australia	8	4	8
Canada	1	1	2
Croatia		1	
Belgium		1	
France			3
Germany	1	1	5
Hungary	1		

Country	Anti-Smoking	Diet / Nutrition	Physical Activity
Ireland	1	1	1
Italy	1	1	
Netherlands		1	1
Poland			1
Romania			1
Spain		1	
Switzerland	2		
United Kingdom	2	1	5
United States	15	5	20

Cell values = number of studies

9. ROOM FOR PREVENTION CAMPAIGNS

"Is there room for prevention campaigns in social media? (e.g. retweets, references to campaigns)?"

An important characteristic of social media health communication is the ease of distribution and sharing material through user content sharing such retweets link to campaigns/interventions, compared to traditional channels. This communication landscape provides a role for health authorities to leverage the functionality of social media to augment and amplify existing communication channels and formats while understanding the nature and effects of social media health communication originating from a large, diverse group of sources. There is insufficient quality evidence that identifies or isolates the specific contribution or effects of social media in broader prevention campaigns or mass media campaigns. Large campaigns from government and nonprofit organizations experienced more user engagement compared to local and smaller campaigns (Lin et al. 2023).

There is no generalized model or framework to create or predict which social media messages will achieve large amounts of exposure, views, user engagement, or otherwise go "viral". The technological capacity exists to incorporate prevention campaigns in social media platforms, but public health communication using social media will benefit from understanding the elements of effective health communication and the somewhat seemingly

random, if not counterproductive, process where message can assume a nearly autonomous life once posted online. Social media decreases the amount of control that can be imposed on messages and their interpretation. Effective evidence-based use of social media capabilities (access to large number of people, multimedia content, privacy, social network engagement) depends on quality, credible, professional content (video, images, text, message content, and competent administrative oversight).

Overall, evidence of social media effectiveness to promote and amplify campaigns and interventions is mixed. The Italian campaign was promoted on national television networks, main national and local radio stations as well as Facebook but despite achieved disappointing results in terms of user engagement (La Torre 2020). Conversely, the 'I quit smoking with Facebook on March 21' program, implemented in French-speaking cantons of Switzerland, used a more personalized approach than traditional mass media campaigns by using Facebook in conjunction with an existing anti-smoking campaign and produced encouraging results (Desrichard et al. 2022; see also Humair et al. 2018).

Some evidence highlights the effects of campaign/intervention social media advertising and marketing. Video posts did not benefit from being paid unlike the other post types in the Make Healthy Normal Campaign. Paid posts increased reach, but organic reach was associated with significantly higher engagement. There was no association between television advertising and engagement with the Facebook page (Kite et al. 2019). Directing potentially interested parents from social media to the website for program sign-up was successful (Henström et al. 2022). Campaign/intervention marketing and promotion on social media has been shown to increase visibility and participants but also results in differences in user engagement. Facebook and Google advertising for a physical activity campaign resulted in larger Facebook reach and new daily registrations compared to six weeks and one year prior. There were no group differences in usage although non-usage attrition was higher among new users. Advertising cost per user was approximately $14 USD which was comparable to other social media campaigns and traditional media costs, which averaged USD $38 per user (Rayward et al. 2019). Most new users originated from mobile devices with Facebook accounting for nearly 70% of traffic. An overall uptake (initiation) rate of 3.4% and paid Facebook and Google ads cost an average £24.73 per initiation (Emery et al. 2018). Loss-framed ads reached more users, had more clicks, and led to more accounts and quit plans being created. Loss-framed messages were more cost-effective for both initial recruitment and intervention engagement (Machado et al. 2019). The average costs were $10.00 and $40.00 per 1,000 people reached for the infographic- and video-based posts (Miller et al

2022). Female students spent more time on social media, had greater interest in diet ads had higher HEI-2015 and lower BMI than those who ignored these ads (Barna et al. 2021).

6. Conclusions

Studies that have examined social media effects on anti-smoking, diet/nutrition, and physical activity reveal different purposes such as disseminating information, replacing in-person counseling, or linking individuals with professional or peer support using a variety of different approaches including standalone campaigns/interventions or in combination with other components while utilizing various channel, format and duration combinations. Taken as a whole, the results demonstrate small to moderate positive effects on improved behavior outcomes, and somewhat better results in terms of social media user engagement and user evaluations. The research is not settled, and social media will continue to experience change resulting from technological developments, market-based factors, and better. Some of the apparent inconsistent results in the evidence reflect the type of social media content used in campaigns/interventions which contains credible, theory/evidence-based, whereas content analysis of user comments, user generated content, social media providers such as influencers includes problematic material (inadequate/incorrect information, or lack of provider information) associated with other health problems (body disorders, negative social support).

There is no question that social media offers great potential to transform health communication. The persistent dilemma confronting health communication experts, policymakers, and health providers is the considerable gap separating technological optimism and the complicated, challenging reality of developing and providing effective health communication. While it is true that social media enables wide scale reach to large numbers of people and relative ease of posting material, but these features are insufficient in and of themselves to guarantee any level of participation, engagement, efficacy, or impact. The development of specific health behavior interventions and effective messages will greatly benefit from formative research conducted with the target audiences they aim to reach in order to test relevance, appeal, messenger, and efficacy.

The time lag between campaign/intervention implementation and publication seems inversely related to the sometimes unpredictable rate of change in social media. During such periods, meaningful change, largely beyond the control of public authorities, health professionals, and researchers, can occur that alters the interpretation and evaluation of social media. As such, the feasibility or functionality of a campaign/intervention

can be transformed or even diminished from the time evidence is published and when organizations and public administrations wish to implement such evidence in their practices.

This body of research provides evidence that interventions deployed on social media are associated with positive health behavior changes, in many cases. Health behaviors are nuanced, and the effects of social media varies according to the particular stage of behavior change, liking of messages, credibility of sources, and level of user engagement with an intervention. Additionally, the research evidence suggests that social media use and platforms varies across age groups and over time. In particular, young adults and teens appear ambivalent about Facebook and prefer Instagram (at least at this moment in time). It is difficult to reach definitive conclusions about the effects of individual social media components as they are frequently bundled together, but there are indications that video and image message formats are preferred compared to text only messages. Overall, a sense of community, connectedness, and ties among participants emerged as an important factor contributing to effective interventions.

User generated content is a uniquely innovative social media feature, but at the same time it is the source of questionable information, misinformation, and falsehoods. Ultimately, anyone or 'anybot' can post material on social media because it is largely unmoderated and unregulated. The reviewed literature does not reflect a consensus on strategies to identify or respond to problematic, low quality, flawed messages. Evidence from the research provides examples of social media content, especially originating from influencers, that was inaccurate, discretely promoted unhealthy products, and may contribute to negative attitudes and behaviors. In summary, the research evidence portrays a diverse field of research that reflects the variety of social media, and the way people and organizations use it for health promotion and prevention communication. Although it is important not to overgeneralize about social media, several notable themes are apparent at this time.

1) There is widespread agreement and anticipation about the potential benefits for health communication that can arise from using social media especially in terms of distributing information, implementing interventions, and enhancing access to support for people. However, the popularity and use of various social media platforms varies by health topic and user groups, and changes over time, as do preferences about various message format options.

2) Social media functionality permits the emergence of unpredictable and challenging conditions that pose substantial problems for health communication such as misinformation or disinformation. Additionally, there is a risk of undesirable health behaviors and outcomes resulting from social media sources such as influencers who may not possess appropriate credentials, education, or training to dispense health information, and users who spread hate and encourage violence and harm. Moreover, there may be subtle, not even intentional, results that encourage negative attitudes, such poor body image, feelings of sadness, or unhealthy diets or food choices. Although, some features of this dilemma were apparent in the research literature, the prospect of an effective approach to address the risks of largely unregulated, widely available health communication, is warranted.

3) From the perspective of social media users, there is an apparent prioritization of obtaining and providing support with other users. An important theme underlying users' sense of desirable social media experiences relates to the presence of consecutiveness with other users rather than be taught or subjected to education only. Increased levels of connectivity contribute to more social media engagement, offline engagement in healthy activities, and desirable outcomes.

4) There is very little evidence about the administrative and operational requirements associated with developing and implementing social media initiatives which can be rather considerable in the context of an effective intervention or program. Whereas an individual or organization can choose to post and engage in social media for whatever reason and with little concern for evidence-based health communication at little or no cost, the same option does not exist for public authorities or health providers. This disparity in required resources creates an imbalance that can be intensified by limited ability of many people to comprehend the variety and range of information available online.

Given the evidence published in the reviewed literature, combined with expertise and experiences of the author of this report, it is clear that social media is an important channel to promote health of young people. But using social media comes with challenges, including the investment of limited resources, the way in which young people use social media, and dealing with misinformation. Using social media as an amplifier of effective health communication pushing audiences to other digital and offline health promoting messages and activities versus being a primary or sole channel may have more benefits in short term and long-term health promotion strategies.

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8. Appendices

A. Description of included studies

1. Summaries of articles
    1.1 Anti-Smoking
    1.2 Diet / Nutrition
    1.3 Physical activity
2. Non-intervention study designs

B. Code sheet

C. Sample communication messages and strategies

1. Anti-Smoking
2. Diet / Nutrition
3. Physical activity
4. Physical activity AND Nutrition

Appendix A. Description of included studies

1. Summaries of articles

1.1 Anti-Smoking Articles

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Amato et al. (2019)	Content analysis	Multiple		Web program Become an Ex	User generated posts and comments.	Inferred user smoking status at the time posts and comments are made. Validated by comparison with self-reported 30-day point prevalence abstinence.	Unambiguous inferred status, and self-reported abstinence at 3-month follow-up closely matched. Posts indicating abstinence were posted soon after starting the intervention (median = 14 days).	
Borrelli et al. (2021)	Cross sectional survey	Facebook				Examined Facebook use and social support and whether Facebook use differed by motivation to quit. Smoking behaviours measured with a survey assessing motivation to quit within 30 days. Also measured reasons for social media use, attitudes and social support	Social media was part of respondents' daily activities (92.9%); used Facebook more than once a day (83%) and spent more than 30 minutes per day (69%). Facebook was used to connect with similar others (68.4%), obtain health information (62.5%); 88% said that they would join a Facebook program to help them quit smoking.	Larger numbers of Facebook friends and greater amounts of Facebook use were associated with more perceived social and emotional support. Users who were motivated to quit smoking posted more frequently (odds ratio [OR] = 1.56), and were more likely to join Facebook (OR = 4.15) than non motivated.

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Chalela et al. 2022	Young adults, Spanish language	Facebook	10 (days)	Text	Content consisted of prompts, motivational messages, and messages about the topics sequenced according to the enrollees' progress from prequitting preparation through initial and longer-term cessation.	Outcome was self-reported 24-hour point prevalence abstinence (no smoking in the past day).	39% of users (n=926) were ready to make a quit attempt, and 3.1% of those users reported that they were tobacco free 1 month later.	Among the 926 (49%) who were ready to "quit tomorrow", 98 (11.3%) reported being not smoking at 1-week, and 26 (3.1%) at 4 weeks. Among not ready to quit the next day, but established a quit date within 2 weeks, (2.8%) reported abstinence at 1-week follow-up, and 12 (1.3%) reported being tobacco free at 4 weeks.
De Santo et al. 2022	Secondary data analysis	Reddit		Text	User posts from a Reddit stop smoking group.	Outcome was level of user engagement related to classified user posted content.	Most frequent topics included encouragement, general information, personal experiences, nicotine substitutes and advice. More than 1/3 of posts offered support.	Higher motivated users participated more actively in the group. Providing and seeking social support the social media platform were identified as the primary motivations to contribute by users.
Desrichard et al. 2022	Adult smokers	Facebook	24	Support from a team of smoking cessation experts and doctors, Daily Facebook posts, tips about managing abstinence, interaction with other participants including advice and encouragement and free phone counselling.	The 'I quit smoking with Facebook on March 21' (2017) campaign was a collective quit attempt based on the Stopober campaign. Content was designed to provide encouragement for users and included support from a team of smoking cessation experts and doctors, tips about managing abstinence, interaction with other participants such as providing advice and encouragement.	Outcome was continuous abstinence rate from smoking measured with the question 'Did you start smoking again since the beginning of the program?' with 5 response options. Measured at three time points after the conclusion of the campaign.	At 10 days, 37.9% of the sample maintained abstinence, 3 months at least 18.8% of the sample were still abstinent. At 6 months at least 13.1% remained abstinent.	
Emery et al. 2018	Experiment, secondary data analysis	Facebook	12	Google AdWords (text) search-based and Facebook banner ads (text and image).	Marketing and promotion of smoking cessation text intervention.	Outcome was cost per initiation (Incremental Cost-Effectiveness Ratio) in a Facebook campaign and user engagement.	Facebook ads promoting a anti-smoking program generated more user visits, but a lower proportion of people starting the program	Most new users originated from mobile devices. 2754 total ad clicks and Facebook accounted for nearly 70%. Overall uptake (initiation)

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							compared to Google search and no-cost ads posted on health organization web sites.	rate 3.4%. Paid ads cost an average £24.73 per initiation. User engagement was high as over half of initiators set a quit date and approximately two-thirds continued with *MiQuit* to conclusion.
Heavey et al. 2022	Adults	Facebook	12	Facilitator was used who was a trained stop smoking advisor. Video format to provide interaction similar to face to face meetings.	Content consisted of an adaptation of "standard group-based behavioral support" led by a trained stop smoking advisor providing peer-to-facilitator and peer-to-peer interaction that essentially replicated face to face group-based sessions.	Outcome was self-reported seven-day point prevalence abstinence and smoking-related attitudes measured by Fagerström Nicotine Dependence Score, Smoking Abstinence Self-Efficacy Score, Contemplation Ladder, and Motivation to Stop Smoking Scale. Also included user engagement measures activity such as comments, 'likes' and number of views of videos.	Participation in more active Facebook groups, above average individual Facebook activity, and use of smoking cessation aids was not associated with improved smoking outcomes. Higher levels of peer-to-peer interaction such as providing advice, encouragement, and support was associated with positive user experiences. User engagement and activity declined during the course of the intervention.	25% of participants reported 7-day point prevalence abstinence Users in a more active group had better experiences and approximately 90% agreed that the intervention "helped me to quit or reduce smoking" compared to 33% in a less active group. Users identified desirable factors including the importance of social interactions; perception of health information; and appeal of online support.
Hefler et al 2019	Content analysis, focus groups	Facebook	24	Text, images and video.		Outcome was weekly choice of tobacco control messages to post on Facebook made by participants. Options were developed by the project team and three options were provided to participants.		Anti smoking content that was "child-focused, featured Indigenous content, practical, relevant and credible, consisting of direct and unambiguous messages were most preferred as opposed to "disgusting imagery about health impacts, were focused on the environment, or were ambiguous or sarcastic".
Hefler et al. 2020	Secondary data analysis	Facebook				Analysis of the reach and user engagement with Facebook smoking prevention and cessation messages posts from	Tobacco control posts were coded for: service posted, tailored First Nations Australian content, local or	Compared to health services posts content created by other sources had greater reach (adjusted incident rate

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						Aboriginal Community Controlled Health Services.	nonlocally produced content, video or nonvideo, format, and emotional appeal. Overall reach, shares, and reactions were calculated.	ratio [IRR] 1.92), reactions to posts (IRR 1.89), and shares (IRR 2.17). First Nations content compared with posts with no First Nations content (IRR 1.71,.
Humair et al. 2018	Adults, smokers	Facebook	24	A team of smoking cessation experts and doctors. Community managers monitored Facebook activity; counsellors provided personalised counselling; and support from peers for 6 months. Text, images.	Daily posts, tips about managing abstinence, interaction with other participants including advice and encouragement, and free phone counselling. Personalised counselling included help for cessation plans, relapse prevention strategies and use of nicotine replacement.	Based in 4 cantons in Switzerland and the outcome was the effects on self reported continuous smoking abstinence, smoking reduction and cessation with occasional smoking of a Facebook campaign to quit on March 21, 2017. Also measured user engagement number of posts & # of comments	Evaluation surveys were conducted (1 week, 3 weeks and 3 months). 81% of participants attempted to stop smoking. At 6 months,13.5% reported total smoking abstinence while 19% were trying to quit.	"Community dynamics, a strong intention to quit and relapse prevention strategies predicted success while high nicotine dependence, exposure to smokers and negative affect were linked to not quitting." 2400 posts, which generated 67000 comments
Kerrigan 2019	Case study, content analysis	Facebook		Paid group members paid to share quit smoking messages on their personal Facebook accounts.	Cultural tailoring of tobacco control messages was achieved by having trusted local health staff sharing, and endorsing, messages regardless of whether the content was Indigenous specific.		Content was compassionate, non-coercive in contrast to fear-inducing health warnings prevalent in tobacco control.	
La Torre 2020	Smokers	Facebook	Unclear	Videos "Ma che sei scemo? Il fumo fammale" (Are you stupid? Smoking is bad).	The video content was not examined in detail, but the language and message framing was described as "dismissive manner and could be viewed as offensive.	Outcome was social media engagement with Facebook anti-smoking videos measured using the number of visitors, registered users, and followers. the number views and interactions including "likes", "comments", and "shares".		Campaign included four video professionally produced 30 second long videos aimed at different targets using popular celebrity figures and was intended to be an "innovative, social media campaign combining anti-smoking messages with other preventive messages."
Lazard 2020	Experiment, adolescents	Instagram		Image-based, quizzes, and text.	One of three social media formats, participants in	Rated perceived message effectiveness using the three-item University of North		Social media messages led to greater knowledge and beliefs about the harms of e-

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					format conditions viewed six unique topics.	Carolina perceived message effectiveness (PME) scale. Outcomes were e-cigarette knowledge and beliefs. Message reactions and sharing preferences were also assessed.		cigarettes regardless of format. 79% reported they would share the social media messages, most likely in person (49%) and with friends (52%).
Lee et al. 2022	Young adults, secondary data analysis	Facebook	12 (original intervention)	Based on Ramo et al. 2018 The *Commune Smokefree Social* Facebook, used trained smoking-cessation counselors as facilitators who made posts for 90 days, weekly one-hour "live" sessions conducted by trained smoking-cessation specialists, weekly one-hour student pharmacist sessions to address questions regarding nicotine replacement therapy and smoking-cessation medications.	Facebook content was based on the U.S. Clinical Practice Guidelines for smoking cessation and the Transtheoretical Model tailored to readiness to quit ("Getting Ready" or "Not Ready"). Getting ready group posts focused on actionable items, such as a quit date or behavioral modifications; whereas not ready group content was encouraging and informational about the benefits of quitting or the harms of smoking.	User attitudes and beliefs about nicotine replacement therapy expressed in posts. The outcome was smoking intentions using a question from the Fägerstrom Test for Nicotine Dependence to categorize nicotine dependence, "How soon after you wake up do you smoke your first cigarette?" Study was part of quality improvement efforts for the clinical smoking-cessation service.	Four most-prevalent themes identified: (1) interest, (2) benefit, (3) knowledge, and (4) flavor. Focused on Getting Ready to quit users.	
Lin et al. 2023	Content analysis	Facebook			Collected 3515 posts and 28,125 comments from 7 large national and local anti-tobacco campaigns on Facebook between 2018 and 2021, including the Real Cost, Truth, CDC Tobacco Free, the Tobacco Prevention Toolkit, Behind the Haze VA, the Campaign for Tobacco-Free Kids, and Smoke Free US campaigns.	Content analysis of anti-tobacco campaigns on Facebook using machine learning and natural language processing methods.	Users were more likely to engage in negatively framed campaign posts. Negative posts tended to receive more negative comments (odds ratio [OR] 1.40), Positively framed posts generated more negative comments (OR 1.41) as well as positive comments (OR 1.29).	Large campaigns from government and nonprofit organizations had more user engagements compared to local and smaller campaigns.
Machado et al. 2019	Experiment	Facebook			Loss- and gain-framed messages about smoking were created and used in Facebook ads.	Compared the effectiveness of loss- and gain-framed messages in the online recruitment of smokers via	The ads cost BRL 647.64. Gain-framed ads reached 174,029 people and 2,688 clicks, loss-framed ads	Loss-framed ads reached more users, had more clicks, and led to more accounts and quit plans being created.

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						Facebook Advertising. Data were collected from the Facebook Ads. 6,350 users clicked on one of the ads and 1,731 were redirected to the intervention.	reached 180,527 and 3,662 clicks. The cost of click was BRL 0.12 per gain-framed ad and BRL 0.09 per loss-framed ad.	Loss-framed messages were more cost-effective for both initial recruitment and intervention engagement.
Maier et al. 2020	Secondary data analysis, young adults	Facebook	12	Smoking Tobacco and Drinking (STAND) program. Baseline measures	Transtheoretical Model of Health Behavior Change stage of preparation vs. contemplation or pre-contemplation	Examined baseline differences among participants according to their readiness to quit cigarette smoking. among young adults and engage in high episodic drinking. average number of cigarettes smoked per day and number of cigarettes smoked in the past week. The Fagerstrom Test for Cigarette Dependence was used to measure cigarette dependence. Participants indicated on how many days in the past month (0, 1–9, 10–19, 20–29, 30+) they had used cannabis and how cannabis was used	Readiness to quit cigarette smoking among young adults who drink was positively associated with importance to reduce alcohol use, but not with use patterns or levels of dependence.	One third of participants were ready to quit smoking. were significantly (1) older, (2) more likely to rate desire to quit cigarette smoking as high, (3) more confident of expected success, (4) more likely to have used NRT in the past 30 days, and (5) more likely to rate the importance to reduce alcohol use as high. No differences of tobacco, alcohol, or cannabis use between groups.
McCausland et al. 2020	Content analysis	Twitter			Identified discussion topics and patterns over time, and described important voices, message frames, and sentiment surrounding e-cigarette discussions on Twitter.	4432 vaping-related posts and retweeted by Australian users were analyzed.	Themes about vaping included: framing e-cigarettes as safer than cigarettes; federal government lacked competence or evidence for vaping policies; and objections to claims of progressing from e-cigarettes to smoking.	Positive sentiment (84.70%) was most prevalent, vape retailers and manufacturers (26.20%), the general public (24.35%), and e-cigarette advocates (23.42%) were the most frequent posters.
McKelvey & Ramo 2018	Content analysis	Facebook		Based on Ramo et al. 2018. User comments that addressed different issues encountered during	Comments posted by users in the Tobacco Status Project.	Thematic description of user comments posted on Facebook.	Identified themes included: 1) coping; 2) friends and family; 3) motivation; and 4) benefits of quitting.	

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				smoking cessation attempts.				
Meacham et al. 2021	Young adults	Facebook	12	Based on Ramo et al. 2018.	Facebook message content was based the US Clinical Practice Guidelines for smoking cessation and the Transtheoretical Model and tailored on change status ("Getting Ready" or "Not Ready"). Post content included questions, prompts or encouragement to respond to posts, or liking posts/comments posted by other users.	The effects of group connectedness on smoking behaviors measured by 7-day biochemically verified smoking abstinence measured by mailed cotinine saliva test kit that users sent a photo of the results. Group connectedness (centrality and density). Centrality measured individual connectedness in a group through engagement with the same content. Density was the extent of connectedness among all members.	Greater within group connectedness among Facebook users, measured by engagement, was significantly associated with biochemically verified smoking abstinence.	Theory and stage of change are relevant for designing content. Contemplation (vs. precontemplation) was associated with less overall connectedness between group members. Individual centrality was significantly associated with biochemically verified smoking abstinence for both comments and likes.
Meacham et al. 2021(b)	Young adults	Facebook	12	Based on Ramo et al. 2018 Moderator, images, videos, and text consistent with young-adult smokers to motivate participation.	The Smoking Tobacco and Drinking (STAND) content was based on NIAAA Rethinking Drinking guide and the Guide to Alcohol Screening and Brief Intervention for Youth.	Comparison of STAND with TSP interventions. Outcome was verified and self-reported 7-day smoking abstinence via remote salivary cotinine and self-reported number of. cigarettes smoked in the past week. User engagement was measured by the number of comments from users. Acceptability was measured according to ease, comprehensibility, helpfulness, and likability of the intervention.	Participants reported significant improvements in cigarette smoking and alcohol use outcomes in both groups. At 3 months smoking abstinence was 3.5% in STAND and 4.3% in TSP. At 12 months smoking abstinence rates were 3.5% in STAND vs. 0% in TSP (biochemically verified) and 29.4% in STAND vs. 25.5% in TSP (self-reported).	
Merculieff et al. 2021	Content analysis, focus groups	Facebook		10 video post options, and 4 posts with text and images	Culturally tailored content was developed collaboratively with target group members who identified preferred content including story and	To evaluate the cultural fit, appeal, and efficacy of existing content from reputable sources and to seek input/advice on preferences		Users did not rate any video highly in all criteria. More effective Facebook videos were culturally relevant.

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					the storyteller, favorite video ratings & recommendations	for social media intervention content.		
Miller et al 2022	Secondary data analysis, content analysis	Facebook			Two message versions were used for Facebook advertisements —a static infographic and a video containing an animated version of the infographic.	Evaluated the efficacy of health messages in Facebook Ads focused on reducing tobacco smoke exposure during pregnancy. Reach and user engagement with each message version was measured. User comments were examined using content analysis.	There was no user engagement with the video. The infographic was liked (n = 157), given alternative likes (n = 59), shared (n = 171 to 341), and commented on (n = 221). About one-quarter of comments contained a personal narrative. Comments were more often negative (16.6% vs 3.9%) and expressed skepticism more often than message acceptance	The average costs were $10.00 and $40.00 per 1,000 people reached for the infographic- and video-based posts.
Patten et al. 2023	Adults, Indigenous population	Facebook	12	Moderators (Alaska Natives) who posted images, text, polls, and or videos. Storytelling that was culturally congruent for Alaska Native people.	Content development followed the approach used in the CDC Tips from Former Smokers educational mass-media campaign including digital storytelling and connecting individuals, and evidence-based cessation treatment resources. Tips included factual, graphic, emotional, and true stories told by former smokers.	Smoking behaviour was measured with biochemically confirmed seven-day point prevalence smoking abstinence and self-reported abstinence from cigarette smoking for the last 7 days. Additional outcomes included user engagement, such as likes, and user satisfaction measured with the social media usability scale.	User engagement was greater for participant-generated posts than for moderator-generated posts. Participants expressed desire for more frequent contact with moderators to interact and check-in with group members, and to include more stories and engaging activities such as contests.	Not statistically significant results. Use of cessation treatments was about double for intervention group. Intervention and control group abstinence at 1 month (3.2% vs. 3.3%) but higher for the intervention group at 3 months (6.5% vs. 0.0%. Self reported abstinence was higher than biochemically verified.
Philips et al. 2023	Adults	Twitter	12	Text	Content consisted of daily discussion topics, links, and information. Information emphasised efficacy of nicotine replacement therapy (NRT). Users were assigned a peer-buddy and encouraged to post to their buddy and others at least daily.	Outcome was self-reported smoking abstinence measured with question “Over the past 7 days, how many cigarettes have you consumed?” Additional outcome was nicotine replacement therapy use during the past week, measured by asking “Over the past 7 days, how many times did you use FDA approved	Exposure to positive nicotine replacement therapy sentiment was associated with increased NRT use and smoking abstinence whereas posts about disliking or not needing NRT were related to less NRT adherence. More than 2/3 of NRT-related posts occurred within the first 2 weeks of the intervention.	

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						NRT (eg, patches, gum, spray, lozenges, etc.)?"		
Phua 2019	Cross sectional survey	Multiple				Examined the effects of joining and active participation in electronic-cigarette-related social media communities, along with e-cigarette-related subjective norms, efficacy and intentions to quit.	Results (n = 1016) indicated that greater e-cigarette-related social media use, more positive e-cigarette-related subjective norms and greater identification with other e-cigarette users, resulted in significantly more negative attitudes toward quitting, lower self-efficacy and lower intention to quit.	
Pócs et al. 2021	Secondary data analysis	Facebook		User comments and reaction buttons.		How Facebook users' interactions correlate with organic reach and user engagement.	Significant negative correlation between organic reach and the "like" reaction (r=–0.418). The strongest significant positive correlations for organic reach were observed with the "haha" reaction (r=0.396), comments (r=0.368), and the "love" reaction (r=0.264)	
Pocs et al. 2022	Content analysis	Facebook		Posts	User comments.	Primary outcomes was user engagement measured by negative feedback and fan-total reach ratio. Secondary outcomes included describing Facebook comments in terms of motivational language - "change talk and sustain talk"		Facebook posts which used motivational interview strategies were associated with significantly higher engagement rate, higher fan-total reach ratio, and more change talk compared to a control group.
Ramo et al. 2019	Young adults, focus groups	Facebook	4	Based on Ramo et al. 2018 About the TSP. "The precontemplation group received messages incorporating the 5Rs (relevance, risks, rewards, roadblocks, repetition) core motivational	"Thinking About Quitting" group posts emphasized decreasing the negatives of smoking, and environmental re-evaluation (identifying negative effects of smoking on others and positive effects of change). "Getting ready to	Outcome was user evaluations of the Facebook STAND program. Focus group participants preferred to target each substance individually and post frequency to about one per day.	User recommendation to others, provided helpful information. Participants expressed mixed reactions to joining a group on Facebook targeting smoking and/or drinking.	STAND intervention was rated by 91% of (22/24) participants as easy to understand, by 83% as providing sound advice, by 87% (21/24) as a program they would recommend to others.

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				interviewing techniques of expressing empathy, rolling with resistance, supporting self-efficacy, and developing discrepancy; and Transtheoretical model strategies of increasing the pros of quitting, raising consciousness about quitting smoking, and environmental opportunities to quit smoking (e.g., clean indoor air laws)."	quit" posts focused on self-liberation (e.g., making a commitment to quit), stimulus control (e.g., removing smoking paraphernalia from the home), and counter conditioning (e.g., engaging in alternative behaviors)." From Ramo et al. 2015			
Ramo et al. 2018	Young adults	Facebook	12	Moderated, included weekly 'The Dr Is In' live sessions with a PhD-level smoking cessation counselor, provided limited content for discussion and participants could ask questions and receive support. Preparation groups, six manualized 45-minute cognitive–behavioral treatment (sessions were delivered biweekly. Daily automated posts contained text, polls and images.	Content was based on the US Clinical Practice Guidelines for smoking cessation and the transtheoretical model of behavior change. Content was designed to reflect the experience of young adults and encourage user engagement especially comments.	Biochemically verified 7-day abstinence over 12 months (3, 6 and 12 months), and user evaluations.	Participants in TSP had more engagement and rated the intervention more favorably than those in the control condition. 90% of would recommend it to others.	Did not reduce significantly the odds of a biochemically verified quit over 12 months (3, 6 12 months) for reduction in cigarettes smoked, quit attempts or likelihood of being ready to quit or quit.
Russell et al. 2022	Content analysis	Twitter		Text	Used tobacco-related keywords such asvape, ecig, smoking, juul) and alcohol-related filters including drunk, blackout* to produce a sample of alcohol- and tobacco-related tweets.	Measured user sentiment related to use of alcohol and tobacco; increased susceptibility to tobacco use when consuming alcohol; and the role of alcohol in contributing to failed smoking quit attempts.	Most tweets were pro co-use of alcohol and tobacco (75%). About 10% reported increased susceptibility to tobacco use when intoxicated.	Non-regular tobacco users reported cravings for and tobacco use when consuming alcohol despite disliking tobacco effects such as the taste, smell, and/or negative health consequences. Regular tobacco users reported using

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								higher quantities of tobacco when intoxicated.
Sahin and Kaya 2023	Content analysis	YouTube		Video	Content was information related to varenicline.	The primary outcome was the quality, reliability, and usefulness of videos based on DISCERN and Global Quality Scale.		78% of evaluated videos were classified as useful, while 22% were misleading. The DISCERN and Global Quality Scale scores of misleading videos were significantly lower. Independent users and media sources produced nearly all the misleading videos.
Sinicrope et al. 2022	Focus groups, cross sectional survey	Facbook			Culturally based digital storytelling approach. Content adapted from the effective Centers for Disease Control and Prevention Tips from Former Smokers campaign and the ANTHC library of digital stories.	Described: training process for moderators to facilitate group engagement and community; and intervention prototype development and testing. Intervention was designed to use evidence-based cessation treatments.	Included recommendations for best practices stemming from lessons learned from the CAN Quit prototype.	
Strekalova et al. 2018	Content analysis	Facbook		Posts	Posts from Tobacco Free Florida Facebook page were framed as either dominant-submissive or affiliate-disaffiliate.	How message framing influenced user engagement with an implied audience of either smokers, nonsmokers, active quitters, or a mixed audience, and the effects of requests for user engagement such as comments, likes, or shares.		User engagement through comments was significant, and showed that framing, engagement requests, and varying implied audience choice influenced user engagement with posts.
Thrul et al. 2020	Young adults, secondary data analysis.	Facebook	12	Based on Ramo et al. 2018 Daily automated posts contained text, polls and images. Weekly counselling sessions (*Ask the Doctor Session)* where participants "could share any questions or issues that they wanted to discuss regarding smoking	Content obtained from Tobacco Status Project Based on Transtheoretical model of behavior change, U.S. Clinical Practice Guidelines, motivational interviewing, and based on readiness to quit.	The primary outcome was 3-month verified abstinence from smoking. User engagement measured by the number of comments. Post type was categorised according to whether the source was automated or a counsellor.	(40.6%) of users commented at least once during a live session, The extent of user engagement such as number of comments, in live counseling predicted 3-month abstinence (Odds Ratio=1.10). Users posted comments on half of the live counsellor posts and each	Moderator/facilitator/live sessions demonstrated effectiveness. Live counselling generated improved verified smoking cessation outcomes and more user engagement for users in preparation, similar engagement for precontemplation and less

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
				or quitting. The live counselling sessions were conducted by a medical doctor. The sessions were not formally scripted to allow for user-driven content."			additional comment increased the odds of abstinence by 10%. Timing of posts was significantly negatively related to user engagement across readiness to change categories.	engagement in contemplation.
Vogel et al. 2020	Young adults, sexual / gender minority	Facebook	12	Based on Ramo et al. 2018 Daily automated posts contained text, polls and images. For those not ready to quit smoking, daily posts primarily focused on participants' motivation for change, anticipated barriers to change, and awareness of the risks of continuing to smoke. For those ready to quit, messages were designed to help participants prepare to quit smoking.	The Put It Out Project was adapted from the Tobacco Status Project. Content was based on the U.S. Clinical Practice Guidelines for smoking cessation, the Transtheoretical Model and motivational interviewing. Tailored according to readiness to quit smoking. content consisted of daily posts and encouraged users to comment.	Outcomes of the Facebook intervention were "biochemically verified smoking abstinence, self-reported 7-day point prevalence abstinence, reduction in cigarettes per week from baseline, making a quit attempt, and stage of change" measured with Smoking History Questionnaire. Nicotine dependence was measured with the Fagerström Test of Cigarette Dependence. Readiness to quit smoking was measured using the Stages of Change Questionnaire	Positive user evaluations Users rated it positively. All participants reported viewing at least half of the posts and a majority viewed all posts, and users posted comments on half of the posts.	
Vogel et al. 2019	Young adults, sexual / gender minority	Facebook	4 (30 days)	Feasibility of Vogel et al. 2020 3 posts per day.	Vogel et al. 2020, plus tailored on basis of sexual/gender identity, such some "posts were surface-level tailored, such as replacing an opposite-sex couple image with a same-sex couple."	User engagement and acceptability of a Facebook anti-smoking intervention measured with user engagement data and survey questions.	User evaluations were positive as 83% would recommend this program to others. Agreement was highest for statements involving thinking about the posts, and lowest for those involving direct action such as clicking on links, 66% of users viewed all the posts.	
Watti et al. 2022	Content analysis	Facebook		Reaction buttons and user comments.	Facebook campaign "Cigarette break" provided by researchers was designed to	The effects of using engagement buttons such as Like or Haha', or 'Wow'.	No linkage between Facebook user engagement buttons and	No significant effects between user comments and inclusion of processes of

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
					"avoid intimidating and judgmental content" using a motivational interviewing approach.	Whether user comments included processes of change or motivational references ("processes of change", "motivational language") related to smoking cessation.	comments about change or motivation About 20% of Facebook users who posted a comment also used a reaction button,	change or motivational references related to smoking cessation and reaction button combinations.
Wright et al. 2021	Experiment, survey. UK/US	Twitter		Text-based tweets.	Existing Twitter posts that contained content about e-cigaretttes.	Primary outcomes were self reported intentions and attitudes about e-cigarettes compared with regular cigarettes after exposure to misinformation about e-cigarettes on Twitter, measured with questions about intention to quit smoking cigarettes, intention to purchase e-cigarettes, and perceived relative harm of e-cigarettes compared with smoking.	Tweets describing e-cigarettes as more harmful than smoking were associated with lower intention to purchase e-cigarettes.	

BOLD = shown in Appendix C: sample content and strategies

1.2 Diet / Nutrition Articles

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Adedokun et al. 2020	Adults, low income	Facebook	1 school semester	Live streaming of nutrition focused counselling/class sessions on Facebook.	Information and educational content using face-to-face classes compared to Facebook Live classes.	Outcome was diet quality measured by the Healthy Eating Index score (2010)9 based on 24-hour food recall. Web-based Nutrition Education Evaluation and Reporting System that has an algorithm to calculate healthy eating scores from participants' 24-hour food recall.	Users in both groups experienced similar levels of improvement in food resource management and diet quality.	Live streaming of counselling/class sessions on Facebook was seen as a comparable substitute for face-to-face approaches typically used for nutrition education.

Barklamb et al. 2020	Secondary data analysis, content analysis	Facebook and Instagram			Six posts from both Facebook and Instagram's 10 most successful nutrition and food-related accounts were analysed across four fields. from Australian users for each topic.	To identify post strategies associated with higher engagement in nutrition and food-related posts.	Lifestyle personalities recorded the highest absolute engagement, while health promoters had the highest engagement relative to number of followers.	Higher Facebook engagement included using hashtags and prompting engagement through announcements. Higher Instagram engagement was associated with higher caption counts, providing health information links, prompting user engagement that required an action, and using humorous strategies.
Barna et al. 2021*	Cross sectional survey	Multiple		Advertisements		The main outcomes were time spent on social media and participants' views concerning the impact of social media advertisements on nutrition and physical activity. Nutrition behavior was measured with the Healthy Eating Index-2015 (HEI-2015)	Female students spent more time on social media, had greater interest in diet ads had higher HEI-2015 and lower BMI than those who ignored these ads.	
Cavallo et al. 2021*	Adults, low socio economic status	Facebook	12	A moderator, (Master's-level nutrition student), provided educational content, videos, images text and encouraged social support among users.	Content consisted of education, recipes, goal setting, ask a Dietitian, content announcements, competitions, and questions	Outcomes were physical measures performed by project team members, intervention acceptability and nutrition knowledge obtained from a validated questionnaire, social support was measured by the Friend Social Support and Eating Habits Scale.	Users experienced weight loss of approximately 1kg and increased positive *dietary* social support. User engagement was substantial and nearly all users (96%) would recommend the intervention to a friend. Mean weight loss was 1.07 kg ($p = .0498$), and participants reported increases in positive dietary social support.	Video format messages were rated highly. Both videos and photos demonstrated effectiveness, produced more engagement compared with text only content, Moderator posts related to user experiences *and goal setting* received more comme nts from participants than others posts. Users rated testimonials (72%), recipes (62%), group challenges (62%) and group polls (55%) as extremely or very valuable.
Chan and Allman-Farinelli 2022	Cross sectional survey	Instagram		Video, text and images.	Potential Instagram posts.	Preferences for text/icon, (ii) realistic image, or (iii) video format according to likelihood of engagement, visual preference, motivation to		Instagram video posts obtained more user engagement and were rated as more motivating for changing eating behaviors, and offered the most relevant food and nutrition material

						change eating behaviors, and relevancy of information.		compared to other types of posts .
Coates et al. 2019	Content analysis	YouTube		Influencer video posts	Examined food and beverage cues featured in YouTube videos from 2 influencers popular with children.		27 videos (7.4%) did not feature any food or beverage cues. Cakes (9.4%) and fast foods (8.9%) were most frequent less frequent were healthier products such as fruits (6.5%) and vegetables (5.8%). Overall, cues classified as less healthy (49.4%) compared to healthy (34.5%).	
Coccia et al. 2020	University students	Twitter	6	Text	Content based on the health belief model and provided informational content to improve nutrition knowledge, dietary practices, body mass index (BMI), self-efficacy, and social support among university athletes.	Outcome was nutrition knowledge, self reported fat intake and BMI change resulting from a Twitter intervention.	Increased nutrition knowledge reduced fat intake and decreased BMI.	
Doric, Ilić and Rumbak 2022	High school students, adolescents	Facebook	2	Facebook educational intervention challenge and school-based sessions, designed and delivered by a nutritionist, provided students information about healthy eating and food traffic light label system	Educational interventions (Facebook and school-based sessions) focused on principles of healthy eating and food traffic light label system. Education content based on the DESIGN framework for creating educational interventions based on social cognitive theory and the knowledge-attitude-behavior model.	Outcome was nutrition knowledge measured with a nutrition knowledge questionnaire and frequency of beverage and snack food consumption.	Both intervention groups had increased nutrition knowledge, but the school-based content had larger effects than the Facebook group. Both groups reported less frequent consumption and quantity of healthier and unhealthier food and beverages as snacks.	

Duplaga 2020	Cross sectional survey	Multiple		Influencers			A survey of young adult women revealed that use of fitness influencers was significantly associated with the consumptions of fruit and vegetables and physical activity.	
Feijoo et al. 2022	Focus groups, youth	Multiple		Influencers	To describe social imaginary in influencers' messages.		Respondents indicated that they primarily receive commercial messages about food and products related to physical appearance, such as makeup or clothing, from influencers;	persuasive tactics used on social networks, such as the construction of a perfect, aspirational world, which minors absorb and accept as part of the digital environment and end up incorporating into their behavior on social networks.
Friedman 2022	Content analysis	Multiple				Explored the influence of social media on young adults' dietary behaviors.	Some participants described exposure to web-based health-focused content produced feelings of guilt about their behavior, which was more prominent among females.	Participants described how social media influenced their decisions to change health behaviors through access to social support and health information.
Gil-Quintana. 2021	Secondary data analysis	Instagram			Content consisted of 54 posts about breakfast.	Analysed the effects of sample of Realfooder content providers on Instagram followers user engagement, interaction and consumption.	Majority female between 18 and 24 and between 35 and 44 years old. Linked food interests to body identity and recreational activities.	
Grantham et al. 2022	Adults	Facebook, Instagram, and Twitter	16	Facilitiators (dietitian and nutrition student), and text.	Focused on sharing stories. 75 stories were submitted by users on a variety of topics such as grocery shopping, traditional skills, and gardening, and 42 stories were posted and 194 shared posts across various social media platforms (Facebook: n=100; Instagram: n=55; and Twitter: n=39).	User engagement in terms of followers, impressions, engagements, likes and comments. Described the implementation process for a social media campaign (#eatwellcovid19) and evaluated campaign performance using social media platform data and as well as user evaluations perspectives.	On Facebook, reach was 100,571 followers, 128,818 impressions, and 9575 engagements; Instagram 11,310 followers,14,145 impressions, 823 likes and 15 comments.	On Twitter, 15,199 impressions and 424 engagements. Featured story posts had the most engagement on Facebook and the most likes and comments on Instagram.

Gray et al. 2022	Pregnant women, low income	Facebook	6	Cooking demonstration videos	Nutrition education intervention adapted the Cooking Matters curriculum, based on the social cognitive theory and adapted for use on social media. Also included healthy pregnancy and food assistance components.	Principal outcome was food and beverage consumption measured with the the food behavior checklist, and the perceptions of meal planning and cooking questionnaires. Facebook user engagement was measured weekly with the number of likes on posts, and goal setting.	Users significantly improved eating habits, decreased sweetened beverage intake and increased use of food labels. Perceptions of meal planning and shopping and cooking were significantly improved.	Facebook cooking demonstration videos were given the most frequent 'likes'.
Henström et al. 2022	Secondary data analysis	Facebook				Evaluated Facebook reach and user engagement with intervention (PICNIC) online components.	Intervention posts shared on Facebook (4–5 posts/week) typically reached only a portion of PICNIC followers, but also reached a wider audience through their friends.	Facebook users engaged in PICNIC posts, although the level of user engagement varied considerably from post to post. Directing parents to the website for program sign-up was effective.
Hoare et al. 2022	Content analysis	Instagram		Images.	Posts		Almost half of examined Instagram posts containing nutrition hashtags depicted unhealthy food or beverages and the majority of images displayed young, healthy-weight female adults.	
Jebeile et al. 2021	Content analysis	Instagram		Images and text.		Described weight loss imagery visible on an adolescent Instagram account.	208 (34.7%) images were of individuals, predominantly females (83%). Body types were thin (31%), average (43%), or higher weight (6%). Almost half of body images had fitness/muscle framing or sexualized poses (21%).	From 165 (27.5%) food images, 71% were nutrient-dense and 29% energy-dense. From 93 (15.5%) text-focused images, 46% related to weight loss programs/products and about 15% provided nutrition or exercise information.
Jenkins et al. 2020	Experiment, university students	Instagram		Influencer	Posts and simulated posts	Explored young adults' perceptions of the authenticity and trustworthiness of influencer Instagram posts.	Participants viewed a real-life Instagram profile and simulated posts. Main outcomes were post authenticity and trustworthiness, and emotional message appeals measured with Likert survey items.	High heroic message appeal (1 standard deviation above mean) significantly increased perceived authenticity of the NPs post only ($p = 0.01$).

Kabata et al. 2022	Content analysis	Instagram		Text and images.	Posts	The main outcome was user engagement, including likes, comments, and user engagement with different types of Instagram posts in terms of topic content (dietetics, fitness, motivation, other) and nutrition information quality.	The quality of Instagram content related to nutritional knowledge was found to be extremely low (94% of reviewed posts). User evaluations indicated that posts classified as dietetics were most liked and rated as having the highest quality information.	Motivational posts had the most engagement. Posts with cooking recipes received the most user comments.
Kattan et al. 2022	Children, low socio economic status	Facebook	20	A moderator made daily posts that contained polls, information, healthy recipes, and open-ended questions to promote healthy diet and dental health in children. Polls gauged user interest in topics.	Content reflected the information motivation behavior model. Information to promote healthy diet and dental health in young children. Posts were informational and provided healthy recipes and open-ended questions intended to engage users. Information was based on the 2020 Dietary Guidelines for Americans.	Outcome was user engagement with moderator posts measured with Facebook data for replies, reactions, poll votes and impressions.		Polls had the most user engagement compared to informational posts and sharing recipes. Posts with open-ended questions experienced the lowest level of engagement.
Kite et al. 2019	Facebook users (adults), content analysis	Facebook	104 - 156 (unclear)	Government health campaign Facebook page. Text, images, links, and video.	Content was intended to provide information using a conversational and supportive approach to improve food consumption, ancrease physical activity and provide information related to government programs.	To determine use and user engagement of Make Healthy Normal Facebook page.	Posts on Mondays received less engagement and posts on Fridays and made between 8 AM and 5 PM received more user engagement. No association between television advertising and engagement with the Facebook page.	Video posts did not benefit from being paid unlike the other post types. Paid posts increased reach, but organic reach was associated with significantly higher engagement.

Kite et al. 2018	Cross sectional survey, focus groups	Facebook	104 - 156 (unclear)	Government health campaign Facebook page. Text, images, links, and video.		Most common reported reason for liking the page was to get ideas, help, support, motivation, or inspiration (38%, n = 120). Other common themes included feeling that the campaign aligned with their personal values or interests (29%, n = 94); finding the content to be informative, practical, relevant, or helpful (17%, n = 53).	38% (n = 121) of responses for liking the MHN page was that it provided sensible, practical, simple, or helpful tips. The next most common category of response (15%) was that the content was interesting, high quality, engaging, sharable, or inspiring. Only 7% stated that the page needed more of particular content type, for example, videos, tips, testimonials, or links.	
Kreft et al. 2023	Cross sectional survey, university students	Multiple				Measured social media use as a source for obtaining nutrition information and evaluated accuracy of information.	YouTube was the most used platform(96%). Females used social media significantly more than males. A minority (17%) of participants 'actively' turn to social media for nutrition information, while the majority (54%) engaged it only if it appeared in their feed.	Respondents preferred: nutrition content that provided information such as 'what to eat in a day' (83%), and registered dietitian (64%) for nutrition information. Relatability with influencers was linked to following and 16% trusted health influencers.
Ling et al. 2018	Parents of head start children	Facebook	10	Text, challenges.	Actor–Partner Interdependence Model health information, family fun activities, and behavioral change strategies and tips, and encouraged interactive positive communication to promote peer support.	Fruit and vegetable intake was measured with the Block Kids Food Screener. User evaluations based on enrollment rates; attrition rates; attendance rates; and challenge quiz completion rates and user acceptability.	Increased fruit and vegetable intake. Decreased body mass, and screen time. About 94% of caregivers were satisfied with the program, and 97% would recommend the program to others and/or participate again.	
Lynn et al. 2020	Content analysis	Twitter			Posts	Identified and described influential actors and main topics of interest using 'healthy diet' discourse on Twitter consisting of more than 1.2 million posts over a 16-month period.	Majority of actors were non-health professionals, bot use was widespread. Main topics were diet, nutrition, exercise, weight, disease, and quality of life.	

Martinino et al. 2021	Adults	Instagram	3	Text and images.	Content was intended to provided a creative interface that could quickly and clearly disseminate messages. Shared different healthy recipes.	Objective was to promote healthy habits and provide high-quality content that was easy to use and share. To assess the efficacy of ChefTaste and evaluate how fast a new account could influence users.	Users who followed any healthy food account had a higher probability of eating better (OR=1.50), more cautious about food consumption (OR=1.67) and peformed more exercise (OR=1.46).	
Mete et al. 2019	Content analysis	Blogs				Explored characteristics of popular healthy eating blogs in the Australian context.	Four main features were identified: (i) a stated purpose for posts; (ii) understanding user population preferences; (iii) consistent writing style, vocabulary and layout; and (iv) communicating healthy eating information in a practical manner.	
Meyerding & Marpert 2023	Content analysis	Multiple		Influencers and videos.	Influencer posts.	Identified foods and beverages featured in videos provided by the four most popular German children influencer channels.	Influencer videos targeted at teens contained food or beverages(70%) and the most frequent product categories were chocolate, candy, and soft drinks. 66% received the lowest Nutri-Score ratings.	
Minadeo et al. 2022	Content analysis	Tik Tok			Food, nutrition, and weight-related posts.	Identified key themes in TikTok videos (1000) gathered from10 popular nutrition, food, and weight-related hashtags each with over 1 billion views. The one-hundred most viewed videos were downloaded from each of the ten chosen hashtags.	Key themes included glorification of weight loss, positioning of food to achieve health and thinness, and the lack of expert voices providing nutrition information.	The majority of posts presented a weight-normative view of health, with less than 3% coded as weight-inclusive. Most posts were created by white, female adolescents and young adults.
Nelson and Fleming 2019	Content analysis, cross sectional survey	Instagram		Images	Content included different types of food.	Outcome was user perceptions of food health and likelihood of consumption. Food, displayed in images contained in Instagram posts, as well as diet, attitudes, and social media use.	Information about user-posted content such as the presence of icons, number of likes, or caption included with photos posted on Instagram had no effects on user engagement.	Facebook was the most popular platform for finding recipes according to respondents. Men rated unhealthy foods as significantly healthier than women. Women's ratings of healthy foods were associated

								with how likely they would consume them, unlike men.
Ng et al. 2022	Adults, older	Facebook	4	Moderators posted infographics, live question and answer sessions with nutrition experts, how-to videos from YouTube and recipes on Facebook to promote the Mediterranean diet.	Mediterranean style recipes, videos, tips, and other messages were shared weekly. Content was was supportive and encouraged user motivation and peer support. Informational component during live Facebook "Question and Answer" sessions.	The primary outcome for the Facebook study was food literacy and fruit and vegetable consumption per day. Food literacy was measured with a food literacy questionnaire based on the Expanded Food and Nutrition Education Program. Fruit and vegetable consumption was assessed using questions from the National Nutrition and Physical Activity Survey.	Facebook group experienced statistically significant increased fruit and vegetable consumption and increased food literacy knowledge.	User acceptability for the intervention where the majority of participants lived in a rural area.
Nosek et al. 2019*	Women, mobility impaired	Second Life	16	Digital, virtual reality.	Informational content based on a diabetes prevention program.	Outcomes were self reported differences in weight, waist circumference, diet, physical activity, self-efficacy for diet and physical activity, nutrition knowledge and social support for weight management and feasibility/user engagement.	There were significant improvements in diet physical activity, and self-efficacy. Most users attended more than half of the 2nd Life weekly sessions.	Reduced body weight and waist circumference. Users lost an average of 3.31% body weight and 3.58% waist circumference.
Nour et al. 2019		Facebook	4	Text, images, videos coupled with smartphone app.	Informational content such as cooking videos and social support.	Outcome was change in vegetable consumption (servings per day) at 4 weeks. Engagement was measured as a secondary outcome.	The impact was negligible. App use halved over the 4-week period.	Most popular Facebook posts (ie, viewed by ≥80% of participants) were recipes with time-saving elements (eg, using frozen vegetables) and those that offered vegetable preparation hacks
Okpara et al. 2022	Adults, African American	Facebook	104 (source intervention)			To determine if distrust in social media among the Nutritious Eating with Soul (NEW Soul) participants influenced enrolment Facebook diet component.	Social media distrust questionnaire at 3-months (n = 85) were asked to join Face-book intervention.	No significant association between participants' social media distrust and Facebook enrollment.

Pancer et al. 2022	Experiment	Facebook		Food preparation videos.	Demonstration videos (n=4, 30 seconds length) selected from a separate food-related Facebook account that distributed food videos.	Outcome was intention to consume healthy, calorie-light meals and user engagement after being exposed to different types of food preparation videos measured from extremely unlikely to extremely likely and user engagement was measured by likes, shares, and follows.		More engagement intentions with with less-healthy, calorie-dense food media than healthier, calorie-light meals.
Pilař et al. 2021	Secondary data analysis	Instagram				Identified main topics associated with healthy food on Instagram using via hashtag and community analysis based on 2,045,653 messages created by 427,936 individual users.	The results showed that users linked healthy food with healthy lifestyle, fitness, weight loss and diet. Focused on vegan, homemade, clean and plant-based.	
Plaisime et al. 2020	Cross sectional survey, focus groups youth (13 - 18)	Multiple				Identified (1) social media use practices, (2) strategies to effectively engage teens on social media, and (3) recommendations for teen health promotion on social media.	About 95% of teens used social media, 3.5% reported using it to seek health-related information. There was reported health information seeking (66.7% to 91.7%) on specific topics such as fitness, sexual health, and nutrition	Many teens could not identify reliable sources of information. Teens indicated that health messages should be attractive and tailored.
Pope et al. 2019*	University students	Facebook	12	Exercise demonstration videos, text information, links to web-based resources, step count competitions, and discussion questions.	Information content was based on social cognitive theory and social determination theory for physical activity and nutrition education.	Dietary behaviors were examined using the National Cancer Institute's Automated Self-Administered 24 hour (ASA24) food recall.	Experimental group increased 4.2 min/day compared to1.6-min/day (control group) in moderate-to-vigorous physical activity	Decreased daily caloric intake was observed for both groups (experimental: –41.0 calories, 0.9%; control: –4.6%). The control group had slightly increased vegetable consumption at six weeks but not observed at 12 weeks.
Qutteina et al. 2022	Cross sectional survey, students (11 - 18)	Multiple			Assessed the relationship between exposure to social media food messages and self-reported adolescent eating outcomes including food intake, as well as perceived norms and food literacy.	Exposure to social media food content was positively associated with eating attitudes, behaviours, perceived norms and food literacy among adolescents. The relationship between food exposure and intake was		

						different depending on food type.		
Raber et al. 2022	Content analysis	Tik Tok			Content provider account information.	Availability of content provider credentials in account information page.	Just over half of TikTok content providers related to the Mediterranean diet provided health credentials in their account information page, and the corresponding information was more detailed and higher quality than other content providers.	
Roccapriore & Pollock 2022	Content analysis	Instagram		Images and text.		Different levels of user engagement with social media.		Image posts on Instagram displayed a positive relationship with less cognitive engagement, such as following other users compared to text-based format messages. Text format had a stronger relationship with cognitively effortful engagement than image posts
Rouf, Nour, and Allman-Farinelli 2020	Young adults	Facebook	6	Videos, images, and text.	Education, informational and supportive based Behavior Change Wheel system that behaviour results from COM-B capability, opportunity, and motivation to perform a certain behavior and intervention functions for the components.	The primary outcome was change in calcium intake measured by consumption of milk and other calcium-rich foods, using a calcium-specific food frequency questionnaire. Acceptability of the Facebook program was assessed with questions about ease of use, usefulness of program, likelihood of recommendation to others, and overall enjoyment.	Facebook group users were 1.5 times more likely to increase milk consumption category compared with control group users.	

Sabbagh et al. 2020*	Content analysis	Twitter, Facebook and/or Instagram		Influencer blog posts.	Recipes.	Rating of most recent shared recipes. Credibility indicators were assessed for themes related to: 'transparency', 'use of other resources', 'trustworthiness and adherence to nutritional criteria' and 'bias'.	Two influencers weight management blogs were qualified to provide nutrition and diet advice whereas the rest (n=7) had limitations and most were not credible	
Saez et al. 2018*	Adolescents, low socio economic status	Facebook	Academic year	Challenges for physical activity and diet.	Content was based on The Reader-to-Leader Framework.	Outcome was change in diet and physical activity levels resulting from school-based sessions instruction and and a Facebook group, as well as user evaluations of Facebook from face to face interviews.	Only 8.0% (21/262) of adolescents in the study participated in the Facebook group.	
Sharps et al. 2019*	Young adults, adolescents, university students,	Instagram 9. Content example	2	Images	Images of differently sized food portions.	The outcome was self reported frequency of consumption and liking of various food items, consumption intentions related to food portion size.	Instagram intervention was associated with reduced HED snack portions and SSBs and smaller desired portions of HED snacks for peers but not in the adolescent group.	
Smit et al. 2020	Surveys (over 3 years), children (8 - 12)	Vlogs		Vlogs		Examined the impact of vlogs on children's unhealthy dietary behaviors such as the consumption of unhealthy beverages and snacks.	Self-reported frequency of watching vlogs influenced consumption of unhealthy beverages 2 years later, but not unhealthy snacks consumption.	
Sütcüoğlu et al. 2023	Content anlaysis	YouTube		Video	Posts related to nutrition and diet.	The outcome was quality rating according to DISCERN criteria.	Only 21% of videos were rated as good or excellent.	
Tahmasebi et al. 2021	Females, overweight	WhatsApp	8	Text messages about weight loss weight loss challenges and solutions, five times a week.	Content of daily messages included weight loss tips, food information, lifestyle, behavior guidelines, and motivational messages. Users shared information, asked questions, replied to each other's questions.	Examined the effects of using social media as an additional tool for a weight loss program on follow-up rate.	After one month attrition in each group (ranged between 65-69%).	After two months, the Whatsapp group had the highest follow-up rate (26.5%) which was significantly higher compared to the control group (8.9%).

Tang et al.* 2022	Experimental, content analysis	Instagram	5 (days)	Full body images/video of mothers with their infant child visible in most posts.	The content was gathered from user content on Instagram, Facebook, TikTok, Twitter, and Snapchat. Social media posts from TikTok included the original TikTok video.	Outcome was level of inspiration to be physically active. Eating attitudes were measured using the Eating Attitudes Test (EAT-26). Eating behaviour was measured using the Dutch Eating Behaviour Questionnaire.		No significant differences were found for being inspired to eat healthy between the two groups. Body image and body dissatisfaction was significantly higher for the social media group
Te et al. 2019	Content analysis	Multiple		Sccial media, sugar-sweetened beverage campaigns.		Identified social media health campaigns against sugar-sweetened beverage consumption, social media platforms used, types of materials distributed, and health messages.	34 social media campaigns, most based on Facebook and YouTube. Obesity/overweight, diabetes, and cardiovascular diseases were the most frequently mentioned health messages in the campaigns.	97% of articles were distributed through Facebook, while 84% of videos (stories) were distributed on YouTube.
Turnwald et al. 2022	Content analysis	Multiple		Influencer	Posts	Quality assessment of influencer accounts.	Celebrity social media accounts with healthy Nutrient Profile Index scores were associated with fewer likes and comments compared to the 90% that had lower ratings and would not comply with UK youth advertising policy.	
Von Mettenheim & Wiedmann 2019	Experiment	Multiple		Influencer		The outcome was the effects of two influencer archetypes, (attractive influencer and a sporty influencer) in healthy nutrition messages.	For the attractive influencer, there was a small overshadowing effect. The sporty influencer did not cause overshadowing.	The sporty influencer had more effects on highly involved consumers. The opposite was true for low-involved consumers: the attractive influencer had a stronger impact.
Wilcox et al. 2022	Pregnant women	Facebook	32	Facilitators used semi-structured scripts, text, podcasts, in person and phone-based components.	Content was based on social cognitive theory. Information about physical activity, healthy eating, and pregnancy and focused on improving diet, increasing physical activity, and achieving healthy gestational weight.	The primary outcome was self reported gestational weight gain, diet quality using the National Cancer Institute's Healthy Eating Index-2015 (HEI-2015) algorithm and self reported physical activity levels.	Increased consumption of vegetables and whole grains.	

Wilksch et al. 2020	Cross sectional survey	Facebook, Instagram, Snapchat, and Tumblr.				Examined the relationship between social media use and disordered eating measured with the eating disorder examination-questionnaire [EDE-Q]), and social media use engagement measures.	75.4% of girls and 69.9% of boys had at least one account and Instagram was the most common, (68.1% girls and 61.7% boys). Eating disorder scores were significantly higher for girls and boys with each type of social media account, except for Facebook and Instagram for girls.	Girls with Snapchat and Tumblr accounts and boys with Snapchat, Facebook and Instagram were significantly more likely to have both eating disorder behaviors and over-evaluation of shape and weight.
Xu and Cavallo 2021	Secondary data analysis	Facebook	12 (origin study)			The outcomes were weight loss, user connectivity, self efficacy and social support.	Increased number of posts, comments, and reactions significantly predicted weight loss; receiving comments positively predicted changes in self-efficacy.	The degree of user connectivity showed small effects on perceived social support. Self-efficacy mediated the link between receiving comments and weight loss.

* also examined physical activity / **BOLD** = shown in Appendix C: sample content and strategies

1.3 Physical Activity Articles

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Allman-Farinelli et al. 2021	Focus groups, young adults	Multiple				Preferences and attitudes related to social media components for weight gain prevention.	Facebook was the most popular platform for social support as a result of its private group capabilities and current usage. Participants preferred to be grouped with strangers who shared similar goals in smaller numbers of people.	
Barna et al. 2021*	Cross sectional survey	Multiple		Advertisements		The main outcomes were time spent on social media and participants' views about the impact of social media advertisements on nutrition and physical activity. Physical activity was based on the IPAQ questionnaire (short version).		Increased physical activity for male and female respondents, reduced BMI by 2.9 units (male) and by 2.8 units (female) was observed with high interest in fitness programs promoted on social media.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Berg et al. 2020	Adults	Instagram	4	Text, links, and images.	Content was developed to improve knowledge and attitudes towards physical activity using self-determination theory and the dualistic model of passion.	Outcome was level of user autonomy and awareness of basic needs satisfaction achieved through physical activity, as well as passion toward physical activity. Additional outcome was level and type of passion for physical activity measured with a six-item passion scale.	Intervention did not result in increased user passion for physical activity, but positive emotions increased for the intervention group. User engagement was high as more than 80% of participants read all posted material.	
Biederman et al. 2021	African American women	Facebook	5	Weekly educational posts, video messages, and biweekly question-and-answer sessions with other users.	Tips and information.	Outcome was weekly daily steps and number of days of physical activity while using Omron Alvita pedometer.	Facebook participants significantly increased weekly steps by 190%. Nearly 80% of participants reported being active two or more days per week compared to baseline.	
Bonar et al. 2023	Young adults, canabis users	Facebook	8	Facilitators - e-coaches (master's-level staff) who posted content (6 posts/day) consistent with weekly themes.	Motivational Interviewing, cognitive-behavioral framework, harm reduction approaches across consumption modalities, and psychoeducation about potency and risks	Physical activity, and canabis use. Feasibility, acceptability user engagement, and preliminary outcomes.	Cannabis use in the intervention conditions. Increased physical activity ranged from 38.9% to 80.0%. Total costs for recruitment advertising were $971.01 ($16.18/participant enrolled).	Intervention groups showed larger reductions in cannabis consequences and cannabis-impaired driving over time than the control condition.
Bowles et al. 2021	Cross sectional survey	Facebook and Instagram		Influencer	Posts	Outcome was physical activity based on number of days per week survey participants exercised on average during the previous month and social media usage, related to social media fitness influencers,	Instagram was the most popular social media platform for fitspiration (48%), with 5% for Twitter.	Following fitness influencers was predominantly female and not associated with physical activity levels. Users of fitness influencers were more likely to express dissatisfaction with their bodies compared to other participants.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Burke and Rains 2019	Cross sectional survey	Multiple		Multiple	Posts received during the previous 30 days from most frequently used social media platform.	Whether social comparison theory explained weight concerns. Social comparison was measured with upward physical appearances comparisons scale and the downward physical appearances comparisons scale Weight concern was assessed using a 5-item weight concern scale.		As the number of others' exercise-related posts increased, respondents reported greater weight concern and this was stronger among respondents who felt more similar to the members of their networks who made physical activity posts.
Cavallo et al. 2021*	Adults, low socio economic status.	Facebook	12	Moderator provided educational content consisting of text, images, links, and videos.	Content was related to goal setting, education, questions and encouraged social support among Facebook users.	Primary outcomes of Facebook/Fitbit intervention were physical activity levels measured by the number of steps, reduced BMI and social support from other users, physical measures obtained by project staff. Nutrition knowledge measured with a validated nutrition knowledge questionnaire, Social support was measured by the Friend Social Support and Eating Habits Scale	96% of users indicated they would recommend the intervention to a friend. Mean weight loss was 1.07 kg and participants reported increased positive dietary social support. Engagement in the pilot intervention was high.	Video format messages were rated highly. Both videos and photos demonstrated effectiveness, produced more engagement compared with text only content, Posts by the moderator related to user experiences *and goal setting* received more comme nts from participants than others posts. Users rated testimonials (72%), recipes (62%), group challenges (62%) and group polls (55%),, as extremely or very valuable. Did not analyse Fitbit data.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Curtis et al. 2020	Young adult females	Instagram	12	Daily posts used text, video demonstrations.	Posts were created using existing and purpose-designed content. Prescribed running and body weight exercises to complete three times per week. Content was informational and encouraging such as video demonstrations and motivational quotes "It's not about having time. It's about making time"), and informational posts (the benefits of exercise; how to stretch).	The primary outcome of the Instagram intervention was number of days and average time per day of vigorous physical activity, moderate physical activity and walking measured using the International Physical Activity Questionnaire short form (IPAQ-s). Other measures included cardiorespiratory fitness ratings and muscle strength using items from the International Fitness Scale (IFIS)	No significant changes in physical activity, and user engagement was modest partially "because it did not include user social interaction and the automated delivery of messages."	
Divine et al. 2019	Cross sectional survey	Facebook					Respondents indicated that autonomous forms of motivation were influenced by relatedness, and feelings of connection developed through interactions with other Facebook users.	
Drehlich et al. 2020	Adolescents	Facebook	12	Moderated (study instigators) posed messages 2-3 times per week.	Questions, interaction with other participants, and engagement with posted content that related to the weekly missions.	The main outcome was adolescents' acceptance of wearable activity trackers (Fitbit) used in combination with social media for a physical activity.	User evaluations indicated that Facebook content was useful in motivating them to engage in physical activity but ease of use was hindered by a platform that design consisted of several independent components that were not linked well.	Users expressed preferences for using alternative social media. Fitbit device required effort to use, which negatively impacted perceived ease of use.
Duplaga 2020*	Cross sectional survey	Multiple		Influencer			Nearly 30% of respondents viewed fitness influencers at least once a week.	Survey of young females revealed that following fitness influencers was significantly associated with improved physical activity levels and consumption of fruit and vegetables.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Durau et al. 2022	Cross sectional survey	YouTube		Video, influencer.		Outcome was intentions to engage in physical activity, stemming from the effects of perceived trustworthiness, expertise and attractiveness of YouTube influencers.	Trustworthiness, expertise and attractiveness of YouTube fitness influencers motivates users to engage in physical activity. Trustworthiness had the strongest effects on attitude toward the influencer for males and females Expertise had the strongest influence on motivating power for women	Trustworthiness was important for all participants in relation to attitude formation towards fitness influencers. Motivating power had significant positive effects on intentions to exercise for both genders, Attitude toward an influencer had significant positive effects on intentions to exercise for frames but not males.
Easton et al. 2018	Focus groups, interviews	Multiple		Influencer	Explored how people viewed Fitspiration on social media including why and how they engaged with influencers and how it affected their thoughts, emotions, behaviour and health.	Main themes identified including: 1) social media potential to support healthy living, 2) presence of unrealistic, untrustworthy content, 3) social media has negative effects on emotional wellbeing, and 4) vulnerability to harm and the need for protective structures.	Participants described a desire to gain information as a primary reason for using Fitspirational; specifically interested in gaining information related to exercise techniques, healthy recipes, and workouts.	
Edney et al. 2018	Adults	Facebook	8	Moderator posted new daily messages categorized as: moderator-initiated running program, multimedia, motivational, opinion polls, or discussion question and user initiated experience shares, or questions.	Content was motivational and designed to encourage physical activity and promote participant sharing about experiences shares and questions.	Outcome was physical activity levels measured with the Active Survey (AAS) and user engagement outcomes were measured by number of likes, comments, poll votes, and photo uploads with various types of posts such as moderator, or user initiated posts.	Engagement with Facebook group was not associated with increased physical activity, but was linked with a running activity component.	Opinion polls posted by a moderator produced the highest level of engagement, and likes were the most common type of user engagement with content.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Gabarron et al. 2021	Content analysis	Facebook, Twitter and Instagram			Social media posts from a diabetes organization promoting physical activity.	The main outcome was type of message content and the level of user engagement resulting .	Posts that contained two or more types of social support were the most engaging 3 times more likes, 2 times more comments, and over 6 times more shares more likes than health education posts.	Physical activity posts received more likes (54%) than health education but had fewer comment and shares. Posts that contained tangible assistance had 6 times more likes, and posts that expressed support had almost 11 times more shares. Posts with two or more types of social support were the most engaging.
Gilbert et al. 2021	Experiment University students	Facebook			Posts. Gain/loss framed.	The primary outcomes were the effects on motivation and physical activity behaviour resulting from framed messaging on social media in university students. Gain- and loss-framed messages communicated the mental health outcomes of physical activity.	Both type of framed messages increased motivation for: physical activity (gain 9% and loss 10%); exercise (gain 16% and loss 14.6%); active travel (gain 18%, loss 19%). No meaningful differences between gain framed or loss framed messages were observed.	
Goodyear et al. 2019	Surveys, (three waves) high school students	Multiple				The main outcome was health related behaviors and the influence of social media.	Identified five forms of content: (i) automatically sourced content; (ii) suggested or recommended content; (iii) peer content; (iv) likes; and (v) reputable content.	
Goodyear et al. 2021	Cross sectional survey, focus groups	Multiple				The outcome was the impact of social media use on self reported physical activity and diet-related behaviours, and self-perceived quality of life during COVID-19 using purpose specific questions.	Perceived value of social media for health influenced its effects Social media influencers, peers/family members, and official organisations influenced the consumption of health-related social media information.	Respondents reported that social media facilitated the self-management physical activity, diet and quality of life, through access to information to inform workouts and dietary quality, and provide opportunities to interact with peers, family members and within social groups.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Hammersly et al. 2020	Parents of school aged children	Facebook	11	Used a facilitator - dietitian. Formats included text, videos, activities and goal-setting components.	Based on social cognitive theory the content provided feedback and reinforcement as well as social support enhancing self-efficacy, addressing barriers, and providing discussions.	Outcomes were BMI, moderate to vigorous intensity physical activity, and sedentary time measured using Actigraph GT3X+ accelerometers. User engagement was based on total comments and posts.	Large number of people joined the Facebook group but user acceptability was lower than predicted coupled with limited user engagement and modest use.	Moderate to vigorous-intensity physical activity levels were lower for children of more engaged Facebook parents although they experienced improved sleep outcomes.
Johnson et al. 2022	Young adults, cancer survivors	Facebook	12	Moderated by staff, who provided participants with badges for weekly physical activity and participation achievements.	Guided by self-determination theory the content was designed to encourage users and promote discussions about experiences related to physical activity goals & Fitbit use	Primary outcome was physical activity levels measured by a Fitbit. User engagement was measured with Facebook data for comments & posts	The Facebook/Fitbit user group experienced significant reductions in sedentary behaviour but no changes for moderate-to-vigorous physical activity levels.	
Kernot et al. 2019	Women, postpartum	Facebook	7 (50 days)	Text, images, and shared step counts	Content was developed on the theory of planned behavior and provided encouragement and motivation by posting step counts.	Outcome of program was amount of moderate to vigorous physical activity measured with an accelerometer/self-reported walking levels and user engagement.	No significant differences in moderate to vigorous physical activity levels or self-reported walking among users in three comparison groups. There was high user engagement as users averaged 26 visits during the intervention.	
Kim 2022	Cross sectional survey	YouTube		Influencer, videos.				Users highest rated characteristics for YouTube fitness influencers were social interaction, information quality, and visual content.
Kite et al. 2019*	Adults	Facebook	104 - 156 (unclear)		Content was intended to provide information using a conversational and supportive approach to increase physical activity improve food consumption and provide information related to government programs.	Primary outcome was user engagement, measured by "liking," sharing, commenting, or clicking on any content, with paid and organic Facebook content and different measures of exposure to the content such number of unique users reached and total count of impressions		Video posts do not benefit from being paid, unlike the other post types. the lack of association between television advertising and engagement. A need to consider how best to link different channels to amplify effects.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Kite et al. 2018*	Cross sectional survey, focus groups	Facebook	104 - 156 (unclear)	Government health campaign Facebook page. Text, images, links, and video.		Most common reported reason for liking the page was to get ideas, help, support, motivation, or inspiration (38%, n = 120). Other common themes included feeling that the campaign aligned with their personal values or interests (29%, n = 94); finding the content to be informative, practical, relevant, or helpful (17%, n = 53).	38% (n = 121) of responses for liking the MHN page was that it provided sensible, practical, simple, or helpful tips. The next most common category of response (15%) was that the content was interesting, high quality, engaging, sharable, or inspiring. Only 7% expressed preference for more particular content type such videos, tips, testimonials, or links.	
Larbi et al. 2021	User evaluations	Telegram	1 day	Chatbot	Content for a chatbot using Telegram was designed to motivate users to be physically active with interesting communication. Content was designed to be a "friendly and empathic backslapper that informs users of step counts and encourages them to increase their daily step count."	The primary outcome was whether a perceived impact of a chatbot based on the Chatbot Usability Questionnaire "Do you think MYA, telegram chatbot, could help you in increasing your physical activity/change your activity behavior? ,	Half of users (n=14) responded "maybe", 7 answered "yes" and 7 answered "no".	
Leigh et al. 2021	Secondary data analysis	Facebook		Four Facebook advertisements for The Healthy Adaptations for Life campaign.	Facebook ads aimed at women of reproductive and menopausal ages to promote specific nutrition and physical activity	Financial cost of advertisements per user engagement.	The ads reached 57 199 women with 1865 clicks, and $0.30 cost per engagement.	

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
					recommendations for pregnancy or menopause.			
Ling et al. 2018*	Parents of head start children	Facebook	10	Text, challenges.	Content was based on the Actor–Partner Interdependence Model health information, family fun activities, and behavioral change strategies and tips, and (b) encouraged interactive positive communication to promote peer support.	The outcome was health behaviours including physical activity levels. Moderate to vigorous physical activity was measured with a daily steps, measured by an ActiGraph GT3X-plus accelerometer as well as body mass index. User evaluations based on enrollment rates; attrition rates; attendance rates; and challenge quiz completion rates; and acceptability.	Users displayed improved outcomes in body mass, screen time, increased moderate-to-vigorous physical activity levels and fruit and vegetable consumption. Almost all caregivers expressed satisfaction with the Facebook program, and would recommend it to others and/or participate again.	
Liu et al. 2019	Secondary data analysis, content analysis	Twitter		Text	Physical activity–related hashtags used to classify geolocated tweets. merged with physical activity data collected from a national US behavioural survey and geotagged with latitude and longitude coordinates.	The outcome was the association between Twitter content and county-level physical activity levels.		There was a significant association between physical activity related tweets and physical activity levels in US counties. Sentiment analysis showed that 7.31% of the physical activity tweets were positive about physical activity.
Liu et al. 2021	Content analysis posts of young adults	Instagram		Video posts.	Instagram posts related to physical activity during prior 12 months before assessment.	Physical activity related use such as the number of related physical activity posts, fitness-related followers, and the number of likes, were associated with exercise identity; and weekly physical activity measured with a questionnaire.	The percentage of physical activity posts and fitness-related Instagram followers were significantly associated with exercise identity. The average number of "likes" received was not significantly associated with exercise identity.	Exercise identity significantly influenced the relationship between the percentage of physical activity related posts and physical activity. Exercise identity did not significantly influence the relationship between number of "likes" received posts and physical activity.
Mandic et al. 2021	University students	Facebook	24	Text and images.	Motivational approaches to increase physical activity.	The primary outcome was change in physical activity measured by total number of Metabolic Equivalent of Task	Increased physical activity levels for Facebook users compared to control group but more for	

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
						using the the International Physical Activity Questionnaire - Short Version (IPAQ-SV).	Facebook and motivational interview group.	
Marocolo et al. 2021	Content analysis	Instagram		Influencer	Influencer quality.	Quality. Less than 20% of Instagram influencer posts provided a scientific reference that supported the communication.		
McDonough et al. 2022	University students	YouTube	12	Videos	Aerobic and muscle-strengthening physical activity videos grounded in social determination theory.	Primary outcome was moderate-to-vigorous physical activity and secondary outcomes were sedentary behavior, light physical activity, and sleep quality (measured using ActiGraph accelerometers) as well as self-determination theory-related motivation.	Significant effects on moderate to vigorous physical activity, sleep efficiency, muscle-strengthening physical activity frequency, and perceived physical activity barriers.	
McKeon et al. 2021	Emergency first responders	Facebook	10	Facilitators (exercise physiologists) posted content and guided user discussions, exercise demonstration videos, information links to web resources, and step count competitions. Other outcomes related to mental health symptoms, sleep quality, quality of life, and physical activity levels.	Provided weekly education and motivation content such as goal setting, overcoming barriers to exercise, and reducing sedentary behavior. Topics included goal setting, overcoming barriers, reducing sedentary behavior, and improving diet. Users were encouraged to respond to posts with likes and comments.	Outcome was physical activity levels measured with a physical activity vital signs questionnaire	Significant improvements in minutes of walking, quality of life, total depression, anxiety, and stress scores were observed.	
Morrow et al. 2021	Content analysis	Twitter and Facebook			User experiences of engaging in physical activity as a child with type 1 diabetes. Stories (posts) were thematically analysed	42 participants provided 68 posts (44 replies from Twitter, 24 from Facebook). Six key factors emerged: (1) Acceptance; (2) Education and		

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
					to understand underlying factors affecting engagement with physical activity as a child living with diabetes.	knowledge; (3) Support; (4) Coping behaviours; (5) Identity; and (6) Perceptions of control.		
Nigg et al. 2021	Adults	YouTube	2	Moderators were used to post infographics, how-to videos and recipes. Infographics were developed for information about nutrition-related topics. Videos included ideas and strategies for behaviour change such as starting with easy tasks progressing to harder tasks.	YouTube videos were developed based on social cognitive theory to motivate people to change their behaviour, highlight the benefits and set goals. For example, the content in a video encouraged users to "try standing more while working on the computer with an improvised standing desk by placing a chair on a desk/table and putting the computer on the chair."	The outcome was change in physical activity and sedentary behaviour measured with the International Physical Activity Questionnaire (IPAQ).	A non-significant increase of more than 4 minutes per day of moderate to vigorous physical activity sedentary behaviour decreased more than 20 minutes per day whereas the control group performed worse for both outcomes.	Results did not achieve statistical significance and the intervention "could be considered as possibly non-effective" but all of the findings observed were in the same hypothesized positive direction for physical activity and sedentary behaviour and the consistency and direction of the overall non-significant results could also be interpreted as a positive".
Nosek et al. 2019*	Women, mobility impaired	Second Life	16	Virtual world	Informational content based on a diabetes prevention program.	Outcomes included self reported differences in weight, waist circumference, physical activity, diet, self-efficacy for diet and physical activity, nutrition knowledge and social support for weight management as well as determine feasibility and user engagement measures.	There were significant improvements in physical activity, diet and self-efficacy. Most users attended more than half of the 2nd Life weekly sessions.	Reduced body weight and waist circumference Users lost an average 3.31% body weight and 3.58% waist circumference.
Northcott et al. 2021	Secondary data analysis	Facebook and Instagram		Advertisements	Evaluated the effectiveness of an advertising campaign to disseminate a physical activity smartphone app.	Outcomes were reach, click-through, and app downloads.	Advertisements reached 1,373,273 people, achieving 2,989 clicks and 667 downloads. Instagram and Facebook Messenger had higher reach compared to Facebook; Facebook and Facebook Messenger both produced higher click-through and downloads.	Selling-technique differed, with as soft-selling produced greater reach; however, both hard-selling ads (Apple Store and Google Play) had more click-through and downloads.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Oppezzo et al. 2021	Women, heart clinic patients	Twitter	13	Tweet4Wellness Automated daily text prompts suggesting a behavior change strategy and encouraged group sharing.	Content incorporated a blended variety of theories including social cognitive theory, transtheoretical model of behavior change, implicit theories model, and implementation intentions model. Prompts were supportive and promoted engagement with other users.	Effects on physical activity levels (hours per day), total sedentary time and number of active hours that included at least 250 steps measured with a Fitbit Inspire fitness tracker.	Twitter users increased daily physical activity about 12 minutes and increased number of daily steps by 820.	
Park 2022	Content analysis	Twitter		Analysis of approximately1.5 million physical activity-related tweets revealed that a relatively small percentage of tweets used the term motivation.		Type and level of motivation content in physical activity posts.	A small percentage of tweets used the term motivation (2.6%). Three themes present in Twitter posts: "(1) included a number of different types of motivation, (2) promoted individuals or groups, and (3) shared tweets that used the terms "motivation or requesting information".	Physical activity tweets were frequently posted on Mondays or during morning or late morning hours
Parker et al. 2021	Cross sectional survey	Multiple			Examined associations between social media use and self reported adherence to physical activity guidelines among Australian adults and adolescents.	Overall, 39.5% (469/1188) of adults and 26.5% of adolescents reported using social media for physical activity.	Adults and adolescent reported higher guideline adherence among digital platform users relative to nonusers.	
Parris et al. 2022	Interviews, teachers physical education	Multiple				The outcome was the effects of COVID on health-related social media use measured with "What impact, if any, has covid-19 had on your social media use generally and more specifically, in relation to physical activity?" as well as to elaboration, clarification, and examples.	Many teachers reported that screen time, including time spent on social media, dramatically increased from the start of the pandemic.	

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Pilgrim et al. 2019	Content analysis	Instagram	Influencer		100 most frequently used hashtags posts in German.	Identified three types of comments: knowledge transfer), benevolence, aimed at the personal identification of followers.	84% of users were female who communicate about physical activity diet and nutrition. Specific exercise routines and regulated food consumption were promoted to achieve and/or maintain a clearly defined body image.	Messages emphasised an ideal body image that required following influencer advice, that generally pushed the consumption of included consumer goods.
Pope et al. 2019*	University students	Facebook	12	Exercise demonstration videos, text information links to web-based resources, step count competitions, and discussion questions.	Information content was based on social cognitive theory and social determination theory for physical activity and nutrition education.	Outcomes included feasibility, dietary behaviors and physical activity measured with a ActiGraph Link accelerometer. using the National Cancer Institute's Automated Self-Administered 24-h (ASA24) food recall	Experimental group increased 4.2 min/day compared to1.6-min/day for the control group in moderate-to-vigorous physical activity.	
Pope et al. 2018	Breast cancer survivors	Facebook	10	Text	Content was based on social cognitive theory and consisted of physical activity tips.	Physical activity and energy expenditure measured with an ActiGraph GT3X+ accelerometers.	Both groups decreased body weight by nearly the same amount.	
Prout et al. 2018	Youth (14 - 20), severely obese	Facebook	12	Moderated (dieticians, exercise physiologist, physicians, and psychologists from weight management team). Posted videos three times a week, challenges and requests for updates on participants' goal setting.	Exercise, nutrition and behavior change social media communications or "posts" 3 to 4 times/week. Videos featured both youth and "experts". Youth commented and/liked posts from the moderator and each other.	The outcome was BMI, and user acceptability and feasibility of using social media as an adjunct to medical weight management. User engagement was measured with the number of likes and comments.	13 youth completed the study and reported that the group was enjoyable, helpful, reinforced the weight management program, and would recommend using social media to support other youth. Weekly engagement (likes and comments) was greater than once a day.	

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Rayward et al. 2019	Adults	Instagram and Facebook	6 (target campaign)	Challenges, step count/physical activity log. Participation in individual challenges and team tournaments, connecting with friends, user logging of daily steps and likes.	Socal media advertisements promoting a 10 000 steps campaign.	Outcome was new member registrations, daily step counts, user engagement (average number of sessions, average number of pages viewed per session, average number of step entries) and participation in individual challenges and tournaments, connecting with friends, and likes. Additional outcome was social media campaign costs.	Social media marketing was effective in promoting awareness of the 10,000 Steps program.	Facebook reach and new daily registrations were significantly higher compared with six weeks and one year prior. There were no between-group differences in the average usage of most website program features. Non-usage attrition was higher among new users.
Robertson et al. 2020	Focus group	Facebook		Challenge format using Facebook designed to promote playful approach to increase walking behaviors using specific goal oriented activities that increase daily step counts.	Self determination theory concepts such as autonomy, competence, and relatedness and autonomous motivations were used to develop Facebook challenge content to encourage walking behaviors.	Development of content for challenges to increase physical activity.	One challenge asked focus group participants to share a photograph of an object that symbolised their community.	
Saez et al. 2018*	Students, adolescents	Facebook	Academic year	Peer moderators posted Facebook challenges for sharing experiences, peer support, and user-generated challenges for physical activity and nutrition.	A sample physical activity challenge described an activity and goal: "Twice a week, jump up and down 50 times. It's even more fun using a jump-rope!."	Outcome was change in diet and physical activity levels resulting from school-based sessions instruction and and a Facebook group, as well as user evaluations of Facebook from face to face interviews.	Only 8.0% (21/262) adolescents in the study participated in the Facebook group.	
Schlittchen 2020	Cross sectional survey	Multiple		Influencer		Effects of influencers on desire to attain a trained body. Outcome was effects on exercise levels associate with viewing fitness influencer measured by "Have you exercised more or have you started exercising since following a fitness influencer"	86% had an Instagram account About 31% used it for motivation and inspiration About 16% increased physical activity after following an influencer.	68.75 percent followed a fitness influencer There was an association between following fitness influencers on Instagram and the desire among followers to attain a trained body.

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Scott-Andrews et al. 2022	Cross sectional survey	Instagram		Multiple		Outcome was parent interest in social media physical activity program measured by survey item"Are you interested in participating in a family-based physical activity program through social media? and other information about internet/social media use, preferences for content intended for families.	Nearly 86% of respondents were interested in a family-based social media physical activity program. 85% of parents reported that within the past month, they used Facebook, Instagram (38.4%); and Twitter (16.4%).	For social media activity program content, parents top choices were information related to family activities (76.4%), goal setting 61.6%), advice and tips 53.2%), Regarding how often parents would like to receive content, (54.9% preferred email, and 34%) preferred social media.
Shaw et al. 2022	Secondary data analysis	Twitter		Tweets (n=1.7 million)		Examined positive and negative topical sentiments among diet, diabetes, exercise, and obesity tweets.	29% were positive and 17% were negative (see Figure 1); the remaining 54% of tweets were neutral. Pokémon Go is an example of mobile gaming behavior was identified in evaluation.	Increased social media engagement allows health care practitioners to distribute credible information to counteract misinformation.
Shimoga et al. 2019	Cross sectional survey and secondary data analysis	Multiple				Outcome was measured with questions from Monitoring the Future national survey (2014 and 2015) "How often do you exercise vigorously?") and sleeping habits ("How often do you get at least seven hours of sleep?"	At the the extremes, high and low levels, were associated with more frequent social media use physical activity levels at the the extremes, whereas moderate health behaviors show an interesting nonlinear relationship	
Sokolova. et al. 2021	Cross sectional survey, adolescents	YouTube			Explored the motivations of YouTube fitness influencer followers on and how parasocial interaction and intentions to watch fitness videos are related to intentions to exercise.	Watching fitness videos and social interaction motivated followers that are already physically active. Non-physically active users are attracted by entertainment and a parasocial relationship with an influencer that has no impact on their intentions to exercise.		

Study	Data source	Channel	Duration	Format	Content	Outcome	Effects Channel	Effects Format
Tang et al. 2022*	Experimental, Content analysis	Instagram, Facebook, TikTok, Twitter, and Snapchat.	5 (days)	Text and images.	The content was gathered from user content on Instagram, Facebook, TikTok,Twitter, and Snapchat. posts from TikTok included the original video from TikTok.	Outcome was level of inspiration to be physically active, and eating habits and attitudes. Eating behaviour was measured using the Dutch Eating Behaviour Questionnaire. Eating attitudes were measured using the Eating Attitudes Test (EAT-26)		Users who viewed body-focused posts were more inspired to be physically active compared to a control group
Todorovic et al. 2019	Medical students	Facebook	4	Images and texts.	Motivational images, texts, and discussions.	The main outcome was self reported physical activity levels among first- and fifth-year medical students.	Facebook group participants and students who had sufficient physical activity at the baseline (OR: 5.44) had a higher likelihood to be sufficiently active after 1month	
Tricia-Vidal et al. 2022	Cross sectional survey	Instagram		Influencers	Physical activity influencer posts.	Outcome was fitness influencer impact on physical activity measured by a question "Has the information fitness influencers posted ever encouraged you to perform a physical activity?", physical activity levels, and time spent sitting measured with the International Physical Activity Questionnaire		Moderate physical activity levels were significantly higher in the group that felt encouraged to perform physical activities by fitness influencers.
Van Woudenberg et al. 2020	Students, youth	YouTube	1	Vlogs	Based on peer nominations 15% of the participants served as influence agents, and created vlogs about physical activity that were shown as part of the intervention.	Investigated whether social media is more effective to promote physical activity than a mass media campaign. The outcomes were physical activity (the number of steps per day) measured with a Fitbit Flex. Vlog exposure was measured by how many times, and seconds a participant watched the vlogs.	No differences in objectively measured physical activity in the short-term, but there was an increase in the control group over long-term. No differences between the social network intervention and mass media intervention were observed.	

* also examined diet / nutrition / **BOLD** = shown in Appendix C: sample content and strategies

2. Non-intervention study designs

Anti-Smoking Study Design

Study Design	Study
Cross sectional survey/Focus group	Borrelli et al. 2021; Merculieff et al. 2021; Phua 2019; Sinicrope et al. 2022
Experimental	Emery et al. 2018; Lazard 2020; Machado et al. 2019; Wright et al. 2021
Content analysis	Amato et al. 2019; Kerrigan 2019;Lee et al. 2022; Lin et al. 2023; McCausland et al. 2020; McKelvey & Ramo 2018; Merculieff et al. 2021; Miller et al 2022; Pocs et al. 2022; Russell et al. 2022; Sahin and Kaya 2023; Strekalova et al. 2018; Watti et al. 2022
Secondary data analysis	De Santo et al. 2022; Emery et al. 2018; Hefler et al. 2020; Maier et al. 2020; Miller et al 2022; Pócs et al. 2021

Diet / Nutrition Study Design

Study Design	Study
Cross sectional survey/Focus group	Barna et al. 2021; Chan and Allman-Farinelli 2022; Duplaga 2020; Feijoo et al. 2022; Kite et al. 2018; Kreft et al. 2023; Nelson and Fleming 2019; Okpara et al. 2022; Plaisime et al. 2020; Qutteina et al. 2022; Smit et al. 2020 (3 years); Wilksch et al. 2020
Experimental	Jenkins et al. 2020; Pancer et al. 2022; Tang et al. 2022; Von Mettenheim & Wiedmann 2019
Content analysis	Barklamb et al. 2020; Friedman 2022; Hoare et al. 2022; Jebeile et al. 2021; Kabata et al. 2022; Kite et al. 2019; Kreft et al. 2023; Lynn et al. 2020; Mete et al. 2019; Meyerding & Marpert 2023; Minadeo et al. 2022; Nelson and Fleming 2019; Raber et al. 2022; Roccapriore & Pollock 2022; Sabbaghet al. 2020*; Sütcüoğlu et al. 2023; Tang et al. 2022; Te et al. 2019; Turnwald et al. 2022

Secondary data analysis	Barklamb et al. 2020; Gil-Quintana. 2021; Henström et al. 2022; Pilař et al. 2021; Xu and Cavallo 2021

Physical Activity Study Design

Study Design	Study
Cross sectional survey/Focus group	Allman-Farinelli et al. 2021; Barna et al. 2021; Bowles et al. 2021; Burke and Rains 2019; Divine et al. 2019; Duplaga 2020*; Durau et al. 2022; Easton et al. 2018; Goodyear et al. 2019; Goodyear et al. 2021; Kim 2022; Kite et al. 2018; Liu et al. 2019; Parker et al. 2021; Parris et al. 2022; Robertson et al. 2020; Scott-Andrews et al. 2022; Schlittchen 2020; Shimoga et al. 2019; Sokolova. et al. 2021; Tricia-Vidal et al. 2022
Experimental	Gilbert et al. 2021; Tang et al. 2022
Content analysis	Bowles et al. 2021; Gabarron et al. 2021; Kabata et al. 2022; Liu et al. 2021; Marocolo et al. 2021; Morrow et al. 2021; Park 2022; Tang et al. 2022
Secondary data analysis	Leigh et al. 2021; Liu et al. 2019; Northcott et al. 2021; Shimoga et al. 2019

Appendix B: Code sheet

( ) Refers to column number in tables

(2) Article reference number

(5) - Sample Population 1 - Population, sample group

(6) - Sample Population 2 - Population sample group

1 = Full	2 = Students	3 = Teen	4 = Female
5 = Male	6 = Caregiver/parents	7 = Young adult	8 = Seniors
9 = Children	10 = SES	11 = Ethnicity/race/linguistic	
12 = Mobility impaired	13 = Gender ID	14 = Pregnant	
15 = Young cancer survivor	16 = Postpartum	17 = Other	
18 = Diabetes	19 = Obesity	21 = Smoking	

(9) - Social media data = objective user data from particular platform such as number users, likes, shares, or retweets.
1 = Yes

(10) - Survey data = Survey or focus group as primary data source (cross sectional).
1 = Yes

(11) = Validity = content assessment, quality assessment, examination of validity, accuracy, credibility of platform, information providers.
1 = Yes

(12) - Channel 1 = Facebook (13) - Channel 2 = Instagram
(14) - Channel 3 = Twitter (15) - Channel 4 = YouTube
1 = Yes

(16) - Channel 5 Other

1 = Tin Tok	2 = Snapchat	3 = Pinterest	4 = Second Life
5 = V/Blogs	6. = Online forum	7 = What'sApp	8 = Telegram
9 = Reddit			

(17) - Outcome 1 Behaviour change (improve, reduce smoking, increase physical activity, improve diet)
1 = Yes

(18) - Outcome 2
1 = Knowledge Attitudes Beliefs (KAB) 2 = Intention/motivation 3 = Other 4 = Policy

(19) - Data Verified or Self report
1 = Self Report 2 = Validated 3 = Both

(20) - Outcome 3
1 = User generated content

(21) - Outcome 4
1 = Platform engagement - user engagement, that includes likes, shares, comments, brand mentions, mentions and profile visits.

(22) - Outcome 5

1 = Platform evaluation - user evaluation of social media platform, acceptability, would recommend to others.

(23) - Outcome 6
1 = Provider generated content

(24) - Format 1 = Video format (25) - Format 2 = Text based format (26) - Format 3 = Image/phot format
(27) - Format 4 = Hashtag format (28) - Format 5 = Influencer format
1 = Yes

(29) - Format 6 = Other format 1 = Polls 2 = Moderator 3 = Challenge
4 = Information 5 = Cha 6 = Personal stories
7 = Live counselling 8 = Gaming 9 = Ads

(30) - Message Content 1

1 = Support/motivation/encouragement 2 = Attribution 3 = Gain/loss 4 = blank
5 = Financial. 6 = Empowermenrt 7 = Fear 8 = Anger 9 = Stigmatisation
10 = Guilt 11 = Humour 12 = Pleasure 13 = Norms 14 = Social impact
15 = Information 16 = Comparison

(31) - Message Content 2.

1 = Support/motivation/encouragement 2 = Attribution 3 = Gain/loss 4 = blank
5 = Financial. 6 = Empowermenrt 7 = Fear 8 = Anger 9 = Stigmatisation
10 = Guilt 11 = Humour 12 = Pleasure 13 = Norms 14 = Social impact
15 = Information 16 = Comparison

(32) - Location of study

1 = Switzerland 2 = United States 3 = Australia 4 = United Kingdom 5 = Canada
6 = Germany 7 = Spain 8 = Netherlands 9 = Belgium 10 = Croatia
11 = Hungary 12 = Ireland 13 = Italy 14 = Austria 15 = France
16 = Poland 17 = Brazil 18 = Romania 19 = Serbia 20 = South Africa

Appendix C: Sample communication messages and strategies

1- Anti-Smoking

1- Pócs, D., Óvári, T., Watti, J., Hamvai, C., & Kelemen, O. (2022). How to create social media contents based on Motivational Interviewing approach to support tobacco use cessation? A content analysis. *Journal of Substance Use*, *27*(6), Article 6. https://doi.org/10.1080/14659891.2021.1967484

2- McKelvey, K., & Ramo, D. (2018). Conversation Within a Facebook Smoking Cessation Intervention Trial For Young Adults (Tobacco Status Project): Qualitative Analysis. *JMIR Formative Research*, *2*(2), Article 2. https://doi.org/10.2196/11138

3- Ramo DE, Thrul J, Delucchi KL, Hall S, Ling PM, Belohlavek A, Prochaska JJ. (2018). A randomized controlled evaluation of the tobacco status project, a Facebook intervention for young adults. Addiction. 2018 doi: 10.1111/add.14245. and
Ramo, D. E., Meacham, M. C., Kaur, M., Corpuz, E. S., Prochaska, J. J., & Satre, D. D. (2019). Development of a social media-based intervention targeting tobacco use and heavy episodic drinking in young adults. Addiction Science & Clinical Practice, 14(1), Article 1. https://doi.org/10.1186/s13722-019-0141-9

4- Wright, C., Williams, P., Elizarova, O., Dahne, J., Bian, J., Zhao, Y., & Tan, A. S. L. (2021). Effects of brief exposure to misinformation about e-cigarette harms on twitter: A randomised controlled experiment. *BMJ Open*, *11*(9), Article 9. https://doi.org/10.1136/bmjopen-2020-045445

5- Emery, J. L., Coleman, T., Sutton, S., Cooper, S., Leonardi-Bee, J., Jones, M., & Naughton, F. (2018). Uptake of Tailored Text Message Smoking Cessation Support in Pregnancy When Advertised on the Internet (MiQuit): Observational Study. *Journal of Medical Internet Research*, *20*(4), Article 4. https://doi.org/10.2196/jmir.8525

2- Diet / Nutrition

1- Coccia, C., Fernandes, S. M., & Altiti, J. (2020). Tweeting for Nutrition: Feasibility and Efficacy Outcomes of a 6-Week Social Media-Based Nutrition Education Intervention for Student-Athletes. *Journal of Strength and Conditioning Research*, *34*(7), Article 7. https://doi.org/10.1519/JSC.0000000000002500

2- Sharps, M. A., Hetherington, M. M., Blundell-Birtill, P., Rolls, B. J., & Evans, C. E. (2019). The effectiveness of a social media intervention for reducing portion sizes in young adults and adolescents. *DIGITAL HEALTH*, *5*, 205520761987807. https://doi.org/10.1177/2055207619878076

3- Rouf, A., Nour, M., & Allman-Farinelli, M. (2020). Improving Calcium Knowledge and Intake in Young Adults Via Social Media and Text Messages: Randomized Controlled Trial. *JMIR MHealth and UHealth*, *8*(2), Article 2. https://doi.org/10.2196/16499

3- Physical Activity

1- Edney, S., Looyestyn, J., Ryan, J., Kernot, J., & Maher, C. (2018). Posts, pics, or polls? Which post type generates the greatest engagement in a Facebook physical activity intervention? *Translational Behavioral Medicine*, *8*(6), Article 6. https://doi.org/10.1093/tbm/iby006

2- McKeon, G., Steel, Z., Wells, R., Newby, J., Hadzi-Pavlovic, D., Vancampfort, D., & Rosenbaum, S. (2021). A Mental Health–Informed Physical Activity Intervention for First Responders and Their Partners Delivered Using Facebook: Mixed Methods Pilot Study. *JMIR Formative Research*, *5*(4), Article 4. https://doi.org/10.2196/23432

3- Prout Parks, E., Moore, R. H., Li, Z., Bishop-Gilyard, C. T., Garrett, A. R., Hill, D. L., Bruton, Y. P., & Sarwer, D. B. (2018). Assessing the Feasibility of a Social Media to Promote Weight Management Engagement in Adolescents with Severe Obesity: Pilot Study. *JMIR Research Protocols*, *7*(3), Article 3. https://doi.org/10.2196/resprot.8229

4- Rayward, A. T., Vandelanotte, C., Corry, K., Van Itallie, A., & Duncan, M. J. (2019). Impact of a Social Media Campaign on Reach, Uptake, and Engagement with a Free Web- and App-Based Physical Activity Intervention: The 10,000 Steps Australia Program. *International Journal of Environmental Research and Public Health*, *16*(24), Article 24. https://doi.org/10.3390/ijerph16245076

5- Pope, Z., Zeng, N., Zhang, R., Lee, H., & Gao, Z. (2018). Effectiveness of Combined Smartwatch and Social Media Intervention on Breast Cancer Survivor Health Outcomes: A 10-Week Pilot Randomized Trial. *Journal of Clinical Medicine*, *7*(6), Article 6. https://doi.org/10.3390/jcm7060140

4- Diet / Nutrition AND Physical Activity

1- Saez et al. 2018 Saez, L., Langlois, J., Legrand, K., Quinet, M.-H., Lecomte, E., Omorou, A. Y., Briançon, S., & PRALIMAP-INÈS Trial Group. (2018). Reach and Acceptability of a Mobile Reminder Strategy and Facebook Group Intervention for Weight Management in Less Advantaged Adolescents: Insights From the PRALIMAP-INÈS Trial. *JMIR MHealth and UHealth*, *6*(5), Article 5. https://doi.org/10.2196/mhealth.7657

2- Pope, Z., Barr-Anderson, D., Lewis, B., Pereira, M., & Gao, Z. (2019). Use of Wearable Technology and Social Media to Improve Physical Activity and Dietary Behaviors among College Students: A 12-Week Randomized Pilot Study. *International Journal of Environmental Research and Public Health*, *16*(19), Article 19. https://doi.org/10.3390/ijerph16193579

1- Anti-Smoking

1.1 Pócs, D., Óvári, T., Watti, J., Hamvai, C., & Kelemen, O. (2022). How to create social media contents based on Motivational Interviewing approach to support tobacco use cessation? A content analysis. *Journal of Substance Use*, *27*(6), Article 6. https://doi.org/10.1080/14659891.2021.1967484

Definitions of social media content types used in the study (table 2 in the paper)

1) Technical Motivational Interviewing Strategies

- *Cultivating change talk*. Each post shows a marked effort to increase the depth, strength, or momentum of the smokers' language in favor of tobacco use cessation or smoking behavior control. This type of strategies includes: "elaborating", "affirming", "reflecting" (EAR).
    1. *Elaborating change talk*. These posts used asking strategies about tobacco use cessation or smoking behavior control: "evocative questions", "asking for elaboration or examples", "exploring decisional balance", "exploring goals and values", "looking forward".
    2. *Affirming change talk*. These posts emphasized something positive and genuine in tobacco use cessation or smoking behavior control: smokers' efforts and strengths ("affirmation"), ability to make decisions and self-determination ("emphasizing personal control"), ability to succeed ("support self-efficacy").
    3. *Reflecting change talk*. These posts captured and illustrated to smokers something about tobacco use cessation or smoking behavior control: emotions ("simple reflection"), role models for success ("normalizing"), and efficient cessation methods ("planning").

- *Softening sustain talk*. Each post shows a marked effort to decrease the depth, strength, or momentum of the smokers' language in favor of remaining a tobacco user or failing to control smoking behavior. This type of strategies includes: "amplified reflection", "double-sided reflection" and "reframing".

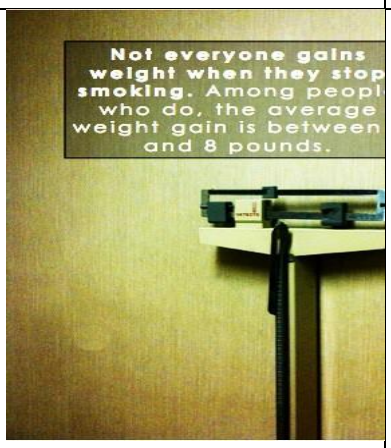
2) Relational Motivational Interviewing Strategies

- *Building partnership*. Each post conveys an understanding that expertise and wisdom about important issues of tobacco use reside mostly within the smoker ("request for opinion"). Themes: social acceptability of smoking, tobacco control policies, tobacco marketing.
- *Expressing empathy*. Each post shows evidence of deep understanding of smokers' point of view, both the smoker's explicit statement and implication ("empathic reflection"). Themes: smokers' stigmatization, nicotine withdrawal, smoking relapse.

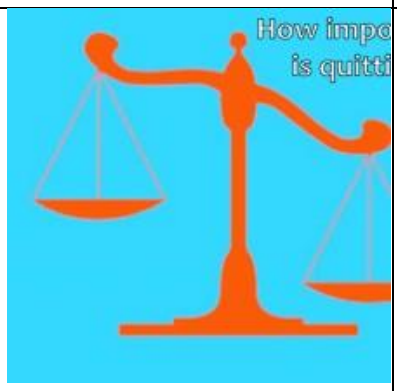
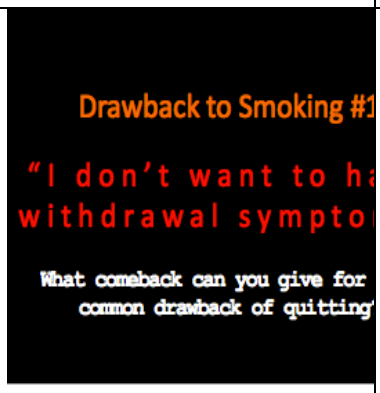
3) Control group

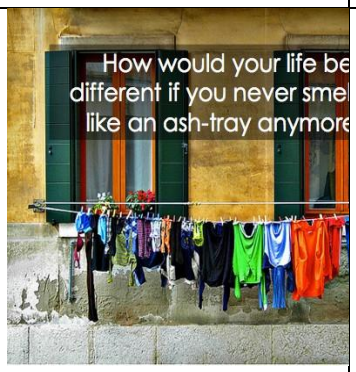
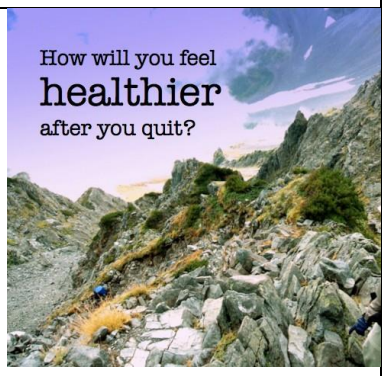
- *Giving information without confrontation*. Each post gives general and neutral information without persuading, advising or warning. Typically, the aim of these posts is informing and not changing behavior or making relationships.
- *Entertaining without confrontation*. Each post provides enjoyable content for the audience without ridiculing, labeling, blaming, moralizing or arguing. Typically, the aim of these posts is entertaining and not changing behavior or making relationships.

1.2 **McKelvey, K., & Ramo, D. (2018).** Conversation Within a Facebook Smoking Cessation Intervention Trial For Young Adults (Tobacco Status Project): Qualitative Analysis. *JMIR Formative Research*, *2*(2), Article 2. https://doi.org/10.2196/11138

	Not Ready	Thinking	Getting Ready
Coping			
	Most people who smoke report dealing with stress as their top reason for smoking. Work, class, family, friends, significant others -- it can be a lot! Can you think of another way to deal with stress that doesn't involve lighting up when things get tough? What could you do instead? *Slapping people or going for a drive* (male, 20)	Weight gain is one of the top concerns for almost every smoker. We've made a list of some tips that can help keep your weight on track while you quit. Pick the one sounds good to you. How could you implement it into your life? *Well I already work out multiple times a day and drink lots of water, my plan when I do quit is to just turn the excess fat into muscle* (male, 21) *I just eat a whole lot of candy and coffee to get me through the first few weeks and then start hitting the gym as an alternative and loose the 5 pounds I gained.* (female, 21)	Post what happened when you told your one (or a few) friends about your plan to quit. *Well I told my dad, shook his hand, and he said he wasn't giving me a single cigarette again.* (male, 19)

	Not Ready	Thinking	Getting Ready
Friends and Family	 Why might your smoking buddies want you to keep smoking? What are their motives? *If I wanted to quit they wouldn't be dicks. They are my friends and they love and support me. If your smoking buddies don't support you... They aren't your friends and forget them for real though.* (male, 20)	 What would be the best-case scenario if you quit smoking? *My daughter won't have to worry about having problems breathing because of her mother. Or being made fun of for smelling like smoke like i was in school. I want to be healthy and be able to care for her in my best health!* (female, 18) *My struggle is that every one of my friends smoke so when I'm alone I don't have the craving. I don't smoke. But when I'm with friends who constantly chain smoke and I smell it, I love the smell of the cigarettes I smoke.* (female, 19)	 When your cravings are getting bad, call someone you trust. Tell them how you're feeling and that you don't want to smoke. Try it out and let us know how it went. *My boyfriend is quitting with me now!!! Extra motivation, Calling him helps a lot <3* (female, 20)

	Not Ready	Thinking	Getting Ready
Motivation			
	On a scale of 1-10, how important is it to you to quit smoking for good? *Yeah, i quit whenever I was pregnant. But I started again when she was born mainly because of ppd* [post partum depression]. *When I have another child, I might just quit for good.* (female, 22)	Research shows that emphasizing the benefits of quitting over the drawbacks helps smokers quit their habit for good. Try your hand at making a negative a positive. What's your comeback for this drawback? *Seeing friends quit heroine* [*sic*] *make quitting cigarettes look like a cake walk. I think I can handle being agitated for a little while* (male, 22)	Practice makes perfect! Today, everytime you feel the urge to light up, wait at least 10 minutes and practice using a smoking substition. What did you choose to do, and how helpful was it to curb your craving? *I'm never smoking again. Ef tobacco, its useless, pointless. I can literally feel the damage its doing to my body. Its gives me panic attacks. I don't need this. My body shakes when I smoke. I hate it.* (male, 19)

	Not Ready	Thinking	Getting Ready
Benefits of Quitting			
	How do you think your life would change if you always smelled fresh and never like a cigarette? *I wouldn't be so worried about how I smell at work and I wouldnt have to constantly change my shirt to smoke and wash my hands after to hold my son. Oh and I wouldn't have to deal with my fiancee saying how much she hates the smell lol* (male, 23) *My friends' parents wouldn't think I'm some street ruffian.* (male, 18)	What would be the best-case scenario if you quit smoking? *Saving my hard earned money to put toward other things. Along with a better quality of life plus better health overall.* (female, 19) *Best case senario* [sic]*, better health, no taking time away from work or hanging out to go smoke, more money, less debt, freedom* (female, 23)	The following post was made by a successful quitter: "I focused every day on another way that I felt better. One day, I'd notice how much easier it was to breathe, and another day I would realize how I could walk up the stairs without getting winded. Reminding myself each day about what I was getting out of quitting made it seem worthwhile." How do you think you'll notice your body getting healthier when you quit? *I think it will most benefit my mental health when I am finding better coping mechanisms for my anxiety.* (female, 22) *Not hacking my lungs up after running.* (female, 20)

1.3 **Ramo DE, Thrul J, Delucchi KL, Hall S, Ling PM, Belohlavek A, Prochaska JJ. (2018).** A randomized controlled evaluation of the tobacco status project, a Facebook intervention for young adults. Addiction. 2018 doi: 10.1111/add.14245.
and
Ramo, D. E., Meacham, M. C., Kaur, M., Corpuz, E. S., Prochaska, J. J., & Satre, D. D. (2019). Development of a social media-based intervention targeting tobacco use and heavy episodic drinking in young adults. Addiction Science & Clinical Practice, 14(1), Article 1. https://doi.org/10.1186/s13722-019-0141-9

"Sample Tobacco Status Project posts tailored to readiness to quit smoking according to Transtheoretical Model processes of change and posts for all levels of readiness based on motivational interviewing and electronic cigarette content." (from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6761032/bin/NIHMS1050059-supplement-Supplement.docx)

Content area	Definition	Example
Precontemplation		
Consciousness Raising	new facts about smoking and quitting	
Social Liberation	reflecting on recent policy changes supporting quitting	

Environmental Re-evaluation	evaluating the effects of smoking on loved ones, pets	
Contemplation		
Environmental Reevaluation	realizing the negative impact of one's behavior and the positive impact of change on others	
Consciousness Raising	learning new facts, ideas and tips that support the behavior change	

Dramatic relief	images of harms of smoking, benefits of quitting	
Self-reevaluation	questioning the "smoker" identity	
Self-liberation	making a small commitment to change	

Preparation		
Helping relationships	Seeking and using social support to make and sustain change	
self-liberation	making a commitment to quit	
Stimulus Control	removing smoking paraphernalia from the home	

Counter Conditioning	engaging in alternative behaviors	
Self re-evaluation	realizing that the behavior change is an important part of one's identity	
Reinforcement management	Increasing rewards for healthy behavior change and decreasing the rewards for old behaviors	

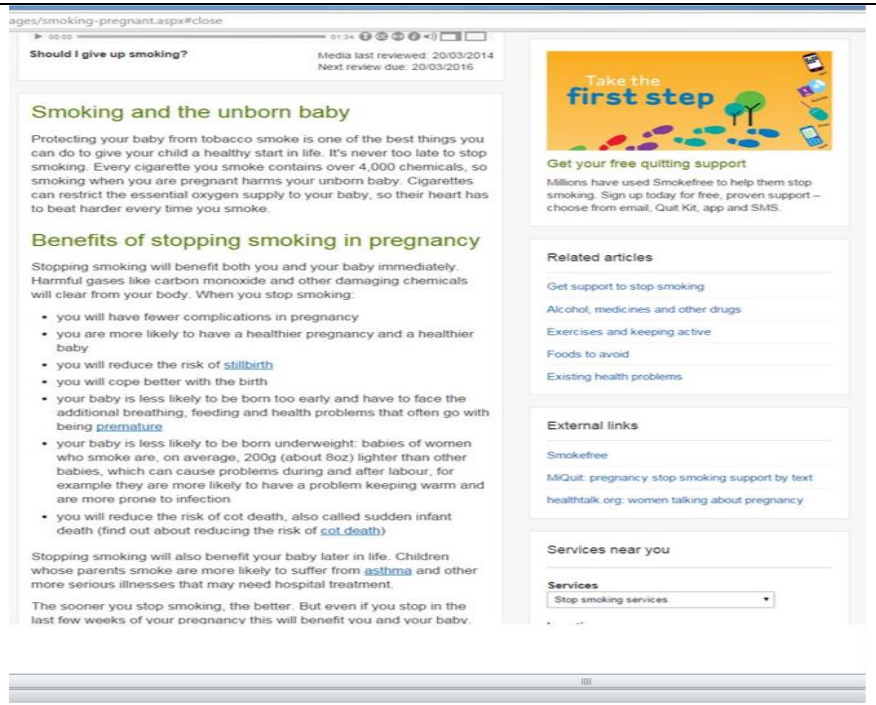
Additional content areas used in all groups		
Electronic-cigarette posts	Raise awareness about nicotine and marketing strategies in e-cig industry	
Motivational Interviewing	Evaluating one's confidence in quitting	

1.4 **Wright, C., Williams, P., Elizarova, O., Dahne, J., Bian, J., Zhao, Y., & Tan, A. S. L. (2021).** Effects of brief exposure to misinformation about e-cigarette harms on twitter: A randomised controlled experiment. *BMJ Open*, *11*(9), Article 9. https://doi.org/10.1136/bmjopen-2020-045445

Figure 1 Condition 1: e-cigarettes are as or more harmful.

1.5 **Emery, J. L., Coleman, T., Sutton, S., Cooper, S., Leonardi-Bee, J., Jones, M., & Naughton, F. (2018).** Uptake of Tailored Text Message Smoking Cessation Support in Pregnancy When Advertised on the Internet (MiQuit): Observational Study. *Journal of Medical Internet Research*, *20*(4), Article 4. https://doi.org/10.2196/jmir.8525

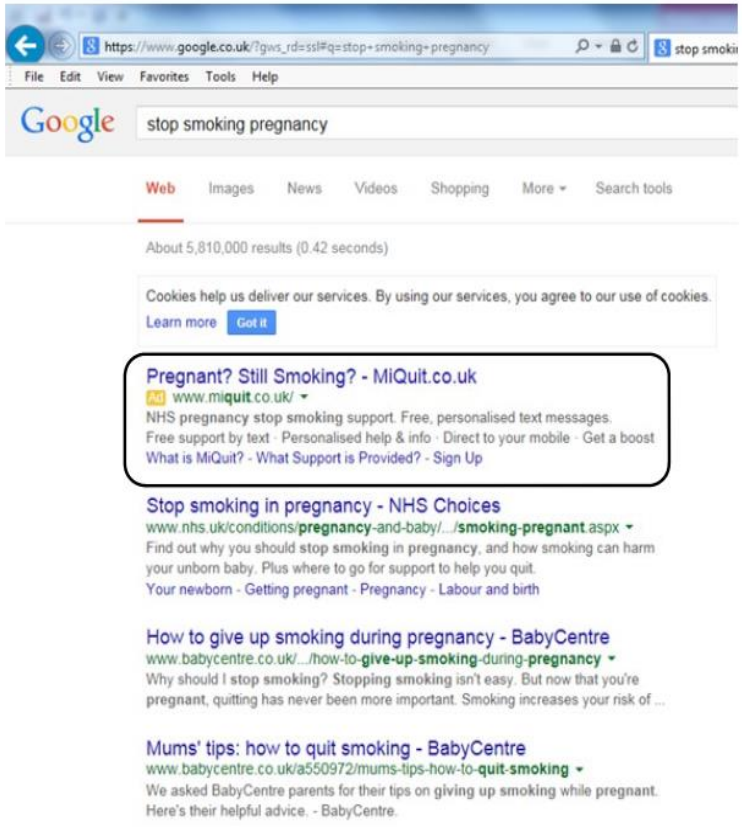
For the Facebook advert, we added an image of a pregnant smoker used previously to promote MiQuit.[23] The header used for our Google advert (Pregnant? Still Smoking?) was rejected by Facebook for referring to personal characteristics of those targeted, and was therefore amended to Help for Pregnant Smokers . Advert appearance varied depending on the device used, with additional text (shown below the image) appearing on mobile devices. The advert appeared as below on mobile devices (black border added).



National Childbirth Trust (Smoking During Pregnancy" Web page)

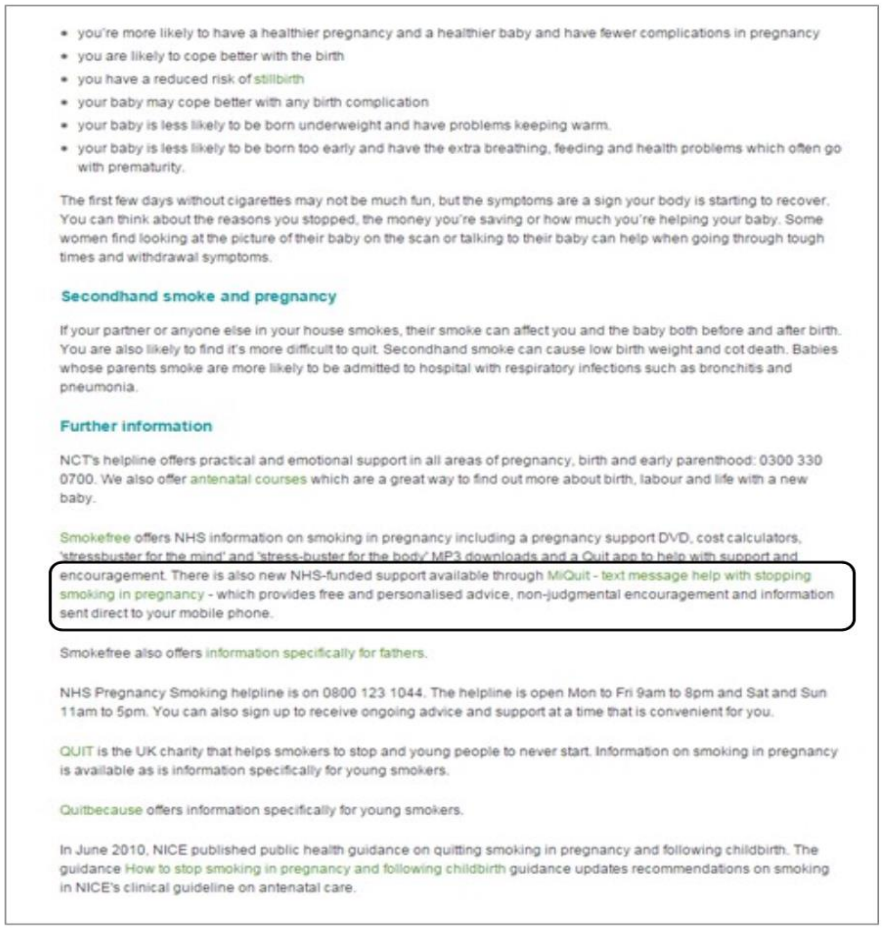
Google AdWords

We created the following text-only advert to fit within the strict character limits of Google AdWords (limits apply to each line of text). The advert appeared as below, with slight variations depending on screen position (black border added). Mean screen position was 1.2 for desktops and 1.0 for mobile devices.



National Childbirth Trust ("Smoking During Pregnancy" Web page)

NCT placed the following text-only link to the MiQuit website under a "Further information" header situated towards the bottom of their "Smoking During Pregnancy" Web page. The link appeared as below (black border added).



- you're more likely to have a healthier pregnancy and a healthier baby and have fewer complications in pregnancy
- you are likely to cope better with the birth
- you have a reduced risk of stillbirth
- your baby may cope better with any birth complication
- your baby is less likely to be born underweight and have problems keeping warm.
- your baby is less likely to be born too early and have the extra breathing, feeding and health problems which often go with prematurity.

The first few days without cigarettes may not be much fun, but the symptoms are a sign your body is starting to recover. You can think about the reasons you stopped, the money you're saving or how much you're helping your baby. Some women find looking at the picture of their baby on the scan or talking to their baby can help when going through tough times and withdrawal symptoms.

Secondhand smoke and pregnancy

If your partner or anyone else in your house smokes, their smoke can affect you and the baby both before and after birth. You are also likely to find it's more difficult to quit. Secondhand smoke can cause low birth weight and cot death. Babies whose parents smoke are more likely to be admitted to hospital with respiratory infections such as bronchitis and pneumonia.

Further information

NCT's helpline offers practical and emotional support in all areas of pregnancy, birth and early parenthood: 0300 330 0700. We also offer antenatal courses which are a great way to find out more about birth, labour and life with a new baby.

Smokefree offers NHS information on smoking in pregnancy including a pregnancy support DVD, cost calculators, 'stressbuster for the mind' and 'stress-buster for the body' MP3 downloads and a Quit app to help with support and encouragement. There is also new NHS-funded support available through MiQuit - text message help with stopping smoking in pregnancy - which provides free and personalised advice, non-judgmental encouragement and information sent direct to your mobile phone.

Smokefree also offers information specifically for fathers.

NHS Pregnancy Smoking helpline is on 0800 123 1044. The helpline is open Mon to Fri 9am to 8pm and Sat and Sun 11am to 5pm. You can also sign up to receive ongoing advice and support at a time that is convenient for you.

QUIT is the UK charity that helps smokers to stop and young people to never start. Information on smoking in pregnancy is available as is information specifically for young smokers.

Quitbecause offers information specifically for young smokers.

In June 2010, NICE published public health guidance on quitting smoking in pregnancy and following childbirth. The guidance How to stop smoking in pregnancy and following childbirth guidance updates recommendations on smoking in NICE's clinical guideline on antenatal care.

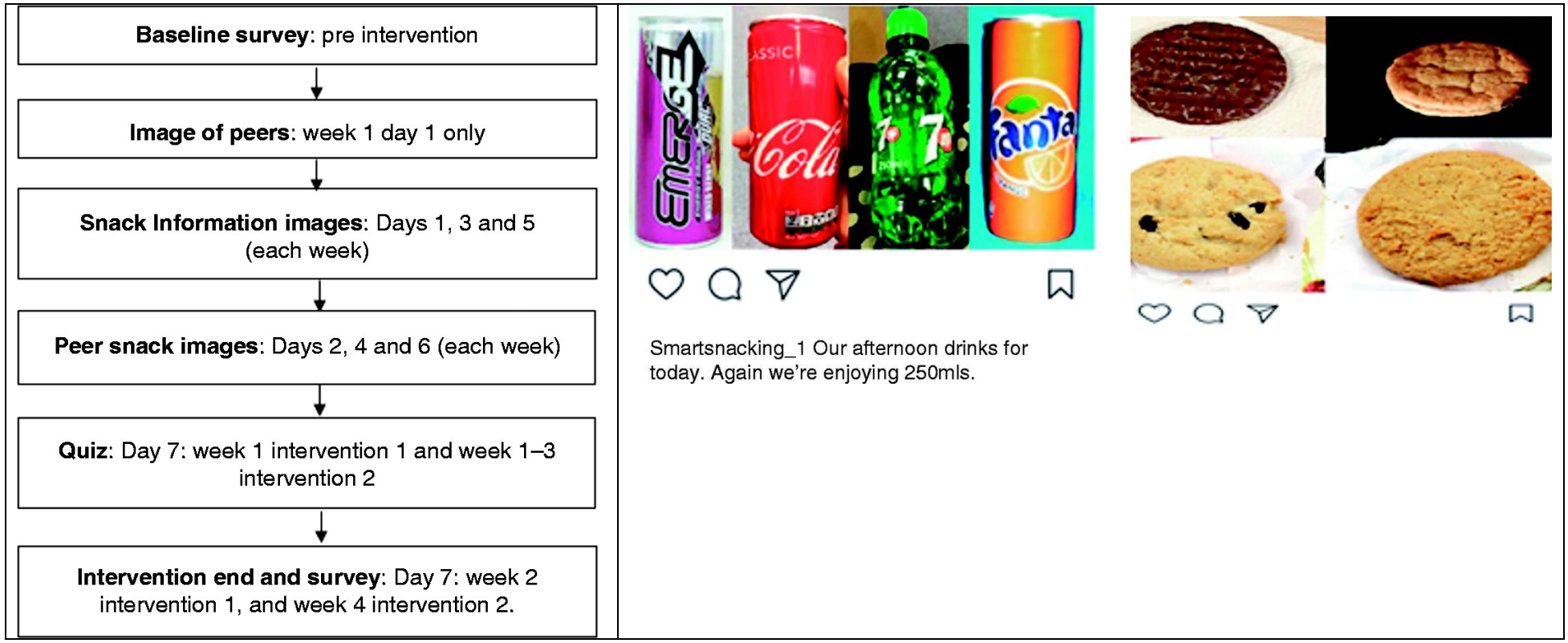
2- Diet / Nutrition

2.1 Coccia, C., Fernandes, S. M., & Altiti, J. (2020). Tweeting for Nutrition: Feasibility and Efficacy Outcomes of a 6-Week Social Media-Based Nutrition Education Intervention for Student-Athletes. *Journal of Strength and Conditioning Research*, *34*(7), Article 7. https://doi.org/10.1519/JSC.0000000000002500

TABLE 1. Example Twitter prompts for whole grains based on Health Belief Model constructs.

	Master tweet (@nutritweetion)	Super tweet (@supernutritweet)
Nutrition knowledge	What are some foods that are high in whole grains? #TwitterNutritionProject	Make half your grains whole grains. My favorite whole grain food is popcorn! #TwitterNutritionProject
Barriers	Sometimes knowing if a product is a whole grain can be difficult. What is a way to find out if it is a whole grain? #TwitterNutritionProject	Reading the ingredients on food labels can tell you if it is a 100% whole grain product. #TwitterNutritionProject
Cues to action	Share a picture of how you can substitute processed grain products with a whole grain product. #TwitterNutritionProject	Pictures of meals with a whole grain product. #TwitterNutritionProject

2.2 **Sharps, M. A., Hetherington, M. M., Blundell-Birtill, P., Rolls, B. J., & Evans, C. E. (2019).** The effectiveness of a social media intervention for reducing portion sizes in young adults and adolescents. *DIGITAL HEALTH*, *5*, 205520761987807. https://doi.org/10.1177/2055207619878076



2.3 **Rouf, A., Nour, M., & Allman-Farinelli, M. (2020).** Improving Calcium Knowledge and Intake in Young Adults Via Social Media and Text Messages: Randomized Controlled Trial. *JMIR MHealth and UHealth*, *8*(2), Article 2. https://doi.org/10.2196/16499

Table 1. Details of behavior change techniques with an example.

Intervention function	BCT[a,b] code	Name of BCT	An example of a Facebook post	An example of a text message
Enablement	1.1	Goal setting (behavior)	Males and females aged between 18 to 30 years should aim to consume about 1000 mg or 2.5 serves of dairy and/or alternatives per day. How much are you having? Check out this infographic which shows examples of what counts as a serve and set yourself a goal to have one more serve per day.	Hi [insert name], it's Anika from the CAN-DO[c] program. It's time to set your goals and start tracking! Have you downloaded your app and set a goal? Please reply to this message by typing YES or NO.
Enablement	2.3	Self-monitoring of behavior	Calcium intake is low in the Australian population; 44% of males and 71% of females aged 18 to 30 years don't get enough. Monitoring your progress can be useful when trying to establish new habits. You can use the app "Productive" (for iPhones) and "Loop Habit Tracker" (for Android) to track your intake.	Hi [insert name], are you still using the app to track your goals? Please reply to this message by typing YES or NO.
Enablement	3.1	Social support (unspecified)	Have you tried tofu? It is a great alternative to eggs and can be scrambled together with leftover veggies for breakfast. PS: Do you have any breakfast ideas you'd like us to share? Let us know what recipes you have tried in the comments below:)	Hi [insert name], it's Anika from the CAN-DO program. Did you check out the Facebook post yesterday? Give us a thumbs up if you like it.
Training	4.1	Instruction on how to perform a behavior	Not only is fish great for heart health, but some varieties are a good source of calcium. You can opt for canned options such as salmon or sardines that will save you time and money. Check out this salmon cannelloni recipe for a delicious way to cook with canned fish.	Hi [insert name], Have you tried any of the recipes from the cooking videos we've shared so far? Please reply to this message by typing YES or NO.
Education	5.1	Information about health consequences	It is important to get your calcium everyday as it can lower your risk of chronic diseases. Here's a photo of a veggie platter I created recently. I used the Tzatziki recipe shared on Monday as a side dip to boost the flavor. Make sure you give this a go and share your veggie platter with us :)	Hi [insert name], Did you know that calcium is important for your bone strength? To up the calcium, why not try anchovies and vegetables on your pizza.
Enablement	8.2	Behavior substitution	Is takeaway your go-to for work lunch? Try cooking larger amounts at dinner and taking the leftovers the next day for a	Hi [insert name], Do you get afternoon munchies? Why not swap those chips with

			healthier alternative. These delicious stuffed capsicums contain ricotta and parmesan and taste even better the next day. You can even use canned salmon to bump up the calcium content.	some wholegrain crackers and cheese? Cheese is a great source of calcium and protein, and will help you beat the 3 pm slump.
Training	8.3	Habit formation	Research has shown that eating breakfast improves your cognitive function and memory. If you are not a breakfast eater, it's time to change and look after yourself! Here's an overnight chia pudding recipe for you to try.	Hi [insert name], How much calcium are you having now? Even if you've only increased a little, WELL DONE! You're on your way to healthier habits.
Persuasion	9.1	Credible source	Did you know that low fat dairy products have just as much as calcium as regular varieties? The Australian Dietary Guidelines advise that more than 50% of intake from dairy foods should be reduced-fat varieties. Check out this infographic!	Hi [insert name], Research shows that having calcium at breakfast increases your chance of meeting your requirement. Did you have your breakfast today? Reply YES or NO.
Environmental restructuring	12.1	Restructuring the physical environment	Need some meal prep inspiration? Here is a Mac and Cheese recipe you could try at home. Having pre-prepared meals in your fridge will help you avoid the temptation of take-away and keep you on track with healthy eating. TIP: to save time, you can use multiple containers to store so it is ready to grab and go for the next day!	Hi [insert name], Some canned varieties of fish with bones like salmon and sardines are a great source of calcium. Stock your pantry with canned fish for a quick calcium-rich sandwich filler.

[a]BCT: behavior change technique.

[b]BCTs were derived from Behavior Change Technique Taxonomy (version 1).

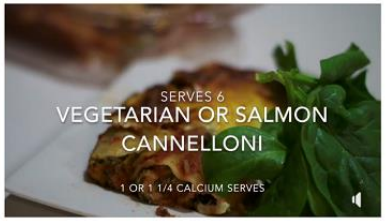
[c]CAN-DO: CAlcium Nutrition-Dietary Opportunities.

Anika
26 March

It is important to get your calcium everyday as it can lower your risk of chronic diseases.
Here's a photo of a veggie platter I created recently. I used the Tzatziki recipe shared on last Wednesday as a side dip to boost the flavour. Make sure you give this a go and share your veggie platter with us 😀

Anika
31 January

Not only is fish great for heart health, but some varieties are a good source of calcium. You can opt for canned options such as salmon or sardines that will save you time and money. Check out this salmon cannelloni recipe for a delicious way to cook with canned fish 😀



Anika
4 March

Research has shown that eating breakfast improves your cognitive function and memory. If you are not a breakfast eater, it's time to change and look after yourself! Here's an overnight chia pudding recipe for you to try 😀

Anika
8 February

Have you ever tried tzatziki? It's a yoghurt based dip. There are so many ways you can enjoy it like
1) Sauce for meat/ fish / falafel
2) On burgers/ pita wraps
3) On sandwiches (a healthier alternative to mayo)
4) With baked potatoes (a healthier alternative to sour cream)
5) As a veggie dip, salad dressing

Check out this easy recipe and let me know in the comments below how you used your Tzatziki 😀

TIP: to save $$$, buy yoghurt in bulk and then share with a friend because sharing is caring!

Anika
1 April

Did you know that low-fat dairy products have just as much as calcium as regular varieties?
The Australian Dietary Guidelines advise that more than 50% of intake from dairy foods should be reduced-fat varieties. Check out this infographic!

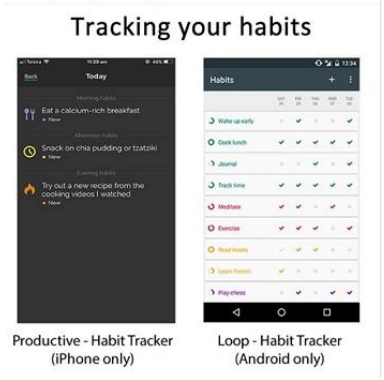
	Full cream milk	Reduced fat milk	Skim milk
Energy	665 kJ	590 kJ	368 kJ
Protein	8.5 g	8.8 g	8.8 g
Calcium	288 mg	305 mg	330 mg
Natural sugars	12.0 g	12.3 g	12.3 g
Saturated fat	6.3 g	3.3 g	0.2 g

Anika
24 February

If you live out of home and find your dairy products expire before you make your way through them, try purchasing a smaller size (i.e. smaller milk cartons) or look for new ways to use them in your cooking. Here are some ideas of what to do with leftover ricotta cheese 😀

Anika
28 March

Calcium intake is low in the Australian population. 44% of males and 71% of females aged 18-30 years don't get enough. Monitoring your progress can be useful when trying to establish new habits. You can use the app 'Productive- Habit tracker' (for iPhones) and 'Loop Habit Tracker' (for Android) to track your intake 😀



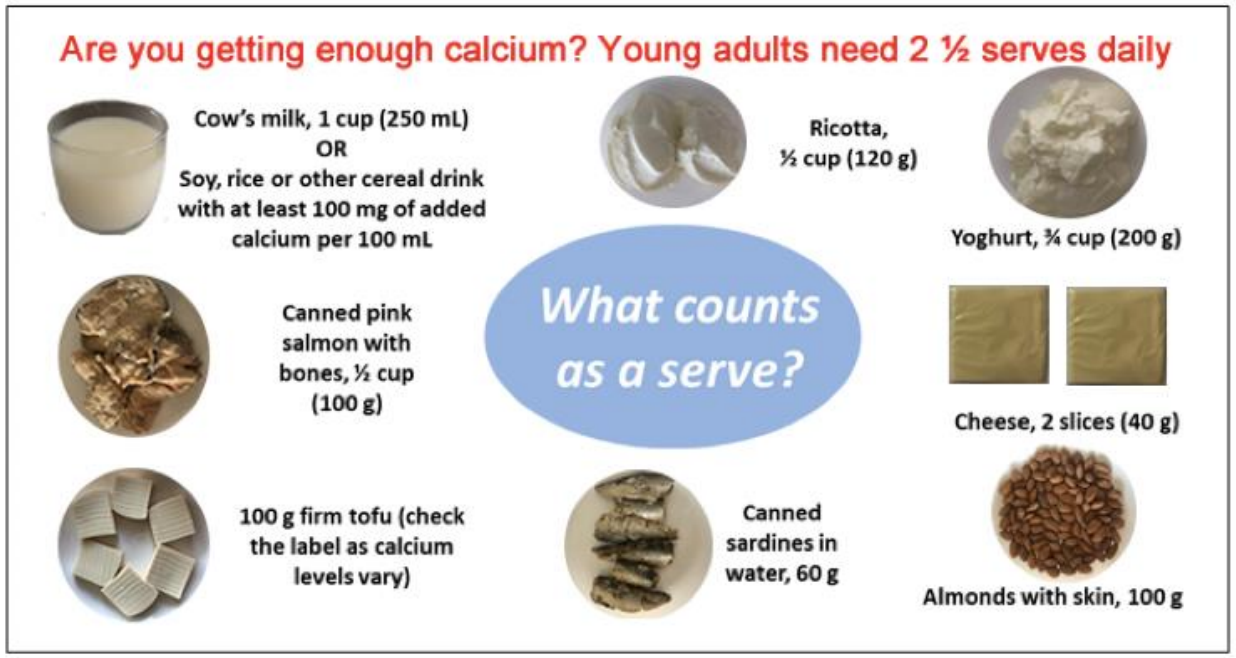
Anika
20 February

Need some meal prep inspiration? Here is a Mac and Cheese recipe you could try at home. Having pre-prepared meals in your fridge will help you avoid the temptation of take-away and keep you on track with healthy eating.

TIP: to save time, you can use multiple containers to store so it is ready to grab and go for the next day!

Anika
6 February

Tofu is a great plant based source of calcium. In this recipe, we've combined it with kale, which also contains some calcium. Yoghurt can be used to bump up the calcium, but it is optional. Watch the video, have a go and share your picture with us in the comments 😀



Multimedia Appendix 7: Quotations illustrating feedback from participants provided through text message replies and qualitative process evaluation (n=106)

replies and qualitative process evaluation (n=106)

Themes	Supporting quotes
Goal setting	• Goal is two weeks without missing a day, so far on track! [Female, Facebook plus text] • Yes I achieved my goals today. [Female, Facebook plus text] • Yes, I have achieved my personal goals of having Greek yoghurt/ some sort of milk or calcium added to my breakfast and lunch everyday. [Female, Facebook plus text]
Demonstrates improvement in intake	• Life has been so busy for me at the moment but I have been remembering to eat yoghurt and that's nice. [Female, Facebook plus text] • ...more mindful of my calcium intake and having a little more each day. [Female, Facebook plus text]. • I remembered to buy strawberry Yoplait yoghurt and started drinking milk today so that was nice. [Female, Facebook plus text] • Yes I have achieved my personal goal of the having Greek yoghurt/ some sort of milk or calcium added into my breakfast and lunch everyday. [Female, Facebook plus text] • Already picked up plenty of yoghurt and some cheese this week. [Female, Facebook plus text]

	• I have been consuming approximately 2-3 serves of calcium per day since beginning of this study. It has really opened my eyes to foods which are calcium rich that I was unaware of, such as tofu and some fish. [Female, Facebook plus text]
Ease of use	• The survey was very easy to use. [Female, Facebook] • It didn't feel very interactive. [Female, Facebook] • More instructions could have made the study clearer. [Female, Facebook plus text] • The program was easy to follow, but I noticed people were confused as to what they were doing, as the amount of participation was variable. [Male, Facebook plus text]
Raised awareness	• For myself, I feel much more knowledgeable in this area than before, as before I wouldn't even know the recommended intake or which foods are high in calcium. [Female, Facebook plus text]
Feedback on recipes	• Showing recipes made it so much easier and more fun than just reading listed foods. [Female, Facebook] • The recipes were pointless. The picture with the serve info was the only information I cared about. [Male, Facebook plus text] • I wasn't trying the recipes but I thought they were great, planning to try some in the future. [Female, Facebook plus text] • The breakfast smoothie idea is now a staple! [Female, Facebook plus text] • I loved the recipes and shared them with my family. [Female, Facebook plus text]
Reason for reading text messages	• The text messages were a good way to be reminded to check my calcium intake. [Male, Facebook plus text] • They were relevant and interesting. [Female, Facebook plus text] • It was good to have an instant reminder to check my habits or provide ideas. [Female, Facebook plus text]
Reason for not sharing content	• I don't like to share on Facebook. [Female, Facebook] • I'm reluctant to share information online. [Female, Facebook] • I'm more of a passive participant, I did watch some videos but didn't feel like posting anything. [Female, Facebook] • I would have if it was anonymous. [Female, Facebook plus text] • I didn't feel comfortable including my own ideas. I did appreciate when someone else posted though. [Female, Facebook plus text]
Overall feedback and suggestions for improvement	• I think if it was on another site [ie, not Facebook], I would go on it more often [I rarely use Facebook]. Also, if there was an active chat with all the members talking and posting pictures it would be more fun and interesting. [Female, Facebook] • The constant texts and notifications are kind of annoying. Perhaps there could be a less intrusive way of providing the information. [Female, Facebook plus text] • Lots of the meals worked and were delicious! I will definitely keep using the app and still follow the page if possible. [Female, Facebook plus text] • Thanks for the study, it really helps me realise how much calcium I was lacking and keep me in track with my calcium consumption. [Female, Facebook plus text] • Loved all the recipes and all the tips, definitely will increase the calcium in my diet after this! [Female, Facebook plus text] • The study has really opened my eyes to calcium rich foods that I didn't expect to be calcium rich, such as tofu and sardines. The recipes were delicious and easy to make, and a great initiative to encourage myself to increase my calcium. [Female, Facebook plus text]

3- Physical Activity

3.1 Edney, S., Looyestyn, J., Ryan, J., Kernot, J., & Maher, C. (2018). Posts, pics, or polls? Which post type generates the greatest engagement in a Facebook physical activity intervention? *Translational Behavioral Medicine*, *8*(6), Article 6. https://doi.org/10.1093/tbm/iby006

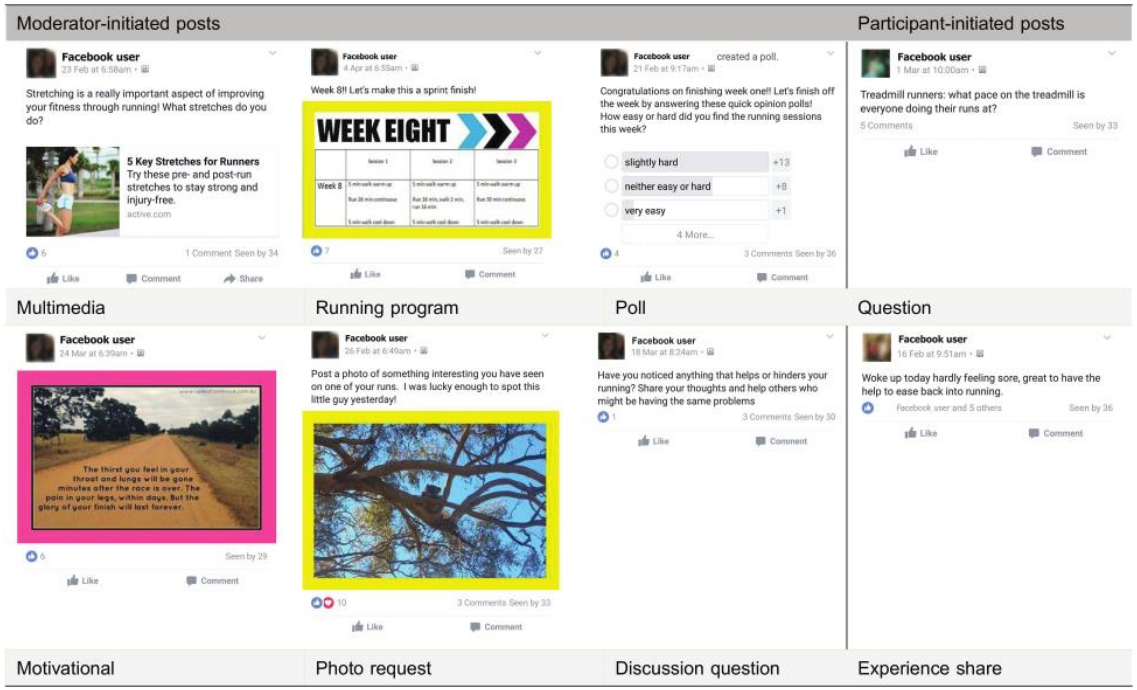


Fig 1 | Examples of each of the eight Facebook post types.

3.2 McKeon, G., Steel, Z., Wells, R., Newby, J., Hadzi-Pavlovic, D., Vancampfort, D., & Rosenbaum, S. (2021). A Mental Health–Informed Physical Activity Intervention for First Responders and Their Partners Delivered Using Facebook: Mixed Methods Pilot Study. *JMIR Formative Research*, *5*(4), Article 4. https://doi.org/10.2196/23432

Table 1. Facebook group facilitator content.

Week	Topic	Content
1	Welcome	• Participants were asked to introduce themselves (eg, occupation) and mention why they joined the group • Instructions were provided on Fitbit activity trackers
2	Goal setting	• How to write a SMART[a] goal. For example, participants were encouraged to increase their step count from the last week by 5%-10% • Participants were asked to write goals (short term, long term, and one with the support person) and post them on the Facebook group • Benefits of self-monitoring and ways to do it (eg, Fitbit and training diaries)
3	Benefits of physical activity	• Link between physical and mental health explained • Physical and mental health benefits (eg, improved mood, sleep, and decreased anxiety and stress) • Video links and factsheets provided
4	Barriers	• Participants were asked to vote on their biggest barriers to getting active (eg, lack of time, low motivation, and low mood) • Discuss strategies to overcome barriers and ask participants to share their suggestions and ideas
5	Support	• Information provided on how to be a helpful support person (practical support, effective communication, and exercising together) • Information provided on social support for increasing motivation
6	Sedentary behavior	• Risks associated with sedentary behavior (eg, increased mortality risk) • How to increase incidental activity, including ways to incorporate physical activity into everyday life • Minimize time spent sitting and encourage breaking up long periods of sitting
7	Aerobic exercise	• Australian guidelines (150 min of moderate-to-vigorous physical activity) • Finding an exercise you enjoy
8	Resistance exercise	• Australian guidelines (strength training at least two times per week) • Exercise safety (eg, the importance of a warm-up) • Videos of simple workouts (eg, squats and push-ups against a wall) • The importance of progression and ways to do it (eg, using the FITT[b] principle)
9	Healthy eating	• The healthy eating pyramid • Creating a healthy food environment (eg, shopping and cooking together and eating meals without distractions)
10	Review	• How to maintain an exercise program • Community programs discussed (eg, gyms and community runs) • Review of goals • Celebration of progress

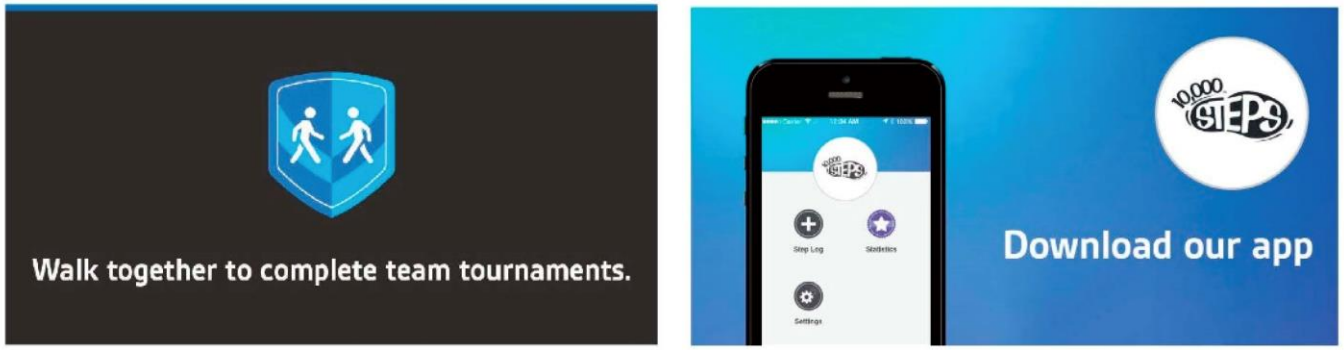
[a]SMART: specific, measurable, achievable, realistic, and timely.

[b]FITT: frequency, intensity, time, and type.

3.3 Prout Parks, E., Moore, R. H., Li, Z., Bishop-Gilyard, C. T., Garrett, A. R., Hill, D. L., Bruton, Y. P., & Sarwer, D. B. (2018). Assessing the Feasibility of a Social Media to Promote Weight Management Engagement in Adolescents with Severe Obesity: Pilot Study. *JMIR Research Protocols*, *7*(3), Article 3. https://doi.org/10.2196/resprot.8229

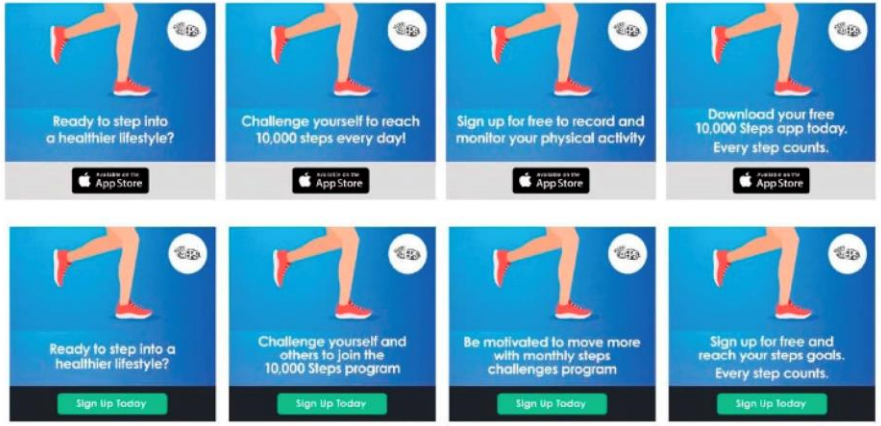
3.4 Rayward, A. T., Vandelanotte, C., Corry, K., Van Itallie, A., & Duncan, M. J. (2019). Impact of a Social Media Campaign on Reach, Uptake, and Engagement with a Free Web- and App-Based Physical Activity Intervention: The 10,000 Steps Australia Program. *International Journal of Environmental Research and Public Health*, *16*(24), Article 24. https://doi.org/10.3390/ijerph16245076

a.



b.

c.



3.5 Pope, Z., Zeng, N., Zhang, R., Lee, H., & Gao, Z. (2018). Effectiveness of Combined Smartwatch and Social Media Intervention on Breast Cancer Survivor Health Outcomes: A 10-Week Pilot Randomized Trial. *Journal of Clinical Medicine*, *7*(6), Article 6. https://doi.org/10.3390/jcm7060140

Supplementary Materials 1.

Twice-weekly tips.The following tips were provided twice a week (once on Monday and once on Thursday) for 10 weeks to all study participants. Psychosocial constructs targeted with each posting are listed in bold italics following each tip.

Week 1

Monday: Did you know the American College of Sports Medicine states that the recommended 30 minutes a day of physical activity can be accumulated in 3 ten-minute bouts?! If you have an extra ten minutes, try going for a brisk walk or bike ride. Social-cognitive belief(s) targeted: Promoting Self- Efficacy, Decreasing Barriers

Thursday: Taking the stairs instead of the elevator is a great way to interject more physical activity into your day! Trying doing so today! Social-cognitive belief(s) targeted: Promoting Self-Efficacy

Week 2

Monday: Did you know that burning an extra 100 calories per day or reducing calorie intake by 100 calories a day can result in weight loss of over 10 pounds in one year?! This can be as simple as a one mile walk after dinner or foregoing a can of soda in exchange for water during the day. Baby steps! Social- cognitive belief(s) targeted: Promoting Self-Efficacy, Improving Outcome Expectancy, Decreasing Barriers

Thursday: Travelling and not confident about your ability to work out? Try one of two things. First, ask the hotel if they have a fitness room or exclusive access to a nearby gym. Note the hours of operation for either and build at least 30 minutes into each day of your vacation to get a short workout in. Second, if you find the hotel does not have a fitness center or access to a nearby gym, explore nearby walking trails or maybe even walk laps around the hotel for the hotel for 30 minutes. Still want to lift? Use your luggage as weights for resistance training. Social-cognitive belief(s) targeted: Promoting Self-Efficacy, Decreasing Barriers

Week 3

Monday: Social support is crucial to continued physical activity engagement. Thus, try to find a good friend willing to go "sweat it out" with you two or three times per week. Although your friend may not be able to join you for every workout, s/he may be able to provide company on the days where you are lacking the motivation to get to the gym. Social-cognitive belief(s) targeted: Enhancing Social Support

Thursday: School work or your job stressing you out? Lucky for you, physical activity releases stress- reducing hormones such as endorphins into the bloodstream even during short 10-minute bouts of exercise. All the more reason to set aside a little time each day to be physically active! Social-cognitive belief(s) targeted: Improving Outcome Expectancy

Week 4

Monday: We schedule dentist appointments, haircuts, and meals. Why not schedule physical activity into your day? Make exercise a part of your daily schedule at a time where physical activity can help you get ready for the day (for morning exercisers) or unwind from the day (for evening exercisers). Treat this scheduled exercise as important and much needed "you" time--allowing you to be better for those around you. Further, you can be confident that you are going to get your workout in when viewing it in this manner. Social-cognitive belief(s) targeted: Promoting Self-Efficacy

Thursday: Worried about your motivation to exercise in the morning or that you will forget your exercise clothes as you head out the door? Place your workout clothes/shoes in front of the door you exit each morning. In this manner, you will have to move the clothes prior to opening the door, acting as a reminder to be a little more physically active during the day or to not skip the gym in the evening. Social- cognitive belief(s) targeted: Promoting Self-Efficacy, Decreasing Barriers

Week 5

Monday: Setting realistic, yet challenging goals can be a great way to sustain motivation to remain physically active. For example, set the goal of increasing the distance you walk by one-quarter mile each week until you reach three miles. At three miles, consider a walk-run pattern wherein you walk for one minute and then jog for one minute. You can repeat this pattern for a designated amount of time (e.g., 30 minutes) or for a certain distance (e.g., 3 miles). As it gets easier, gradually introduce more jogging and less walking. Social-cognitive belief(s) targeted: Promoting Self-Efficacy

Thursday: Blisters and chaffing caused by the wrong workout clothes/shoes can be a serious threat to continued participation in physical activity. Thus, consider an investment in proper (and good-looking) athletic clothes and shoes. Doing so may just help increase your motivation to be physically active while also decreasing the likelihood of experiencing painful skin irritation! Social-cognitive belief(s) targeted: Decreasing Barriers, Improving Outcome Expectancy

Week 6

Monday: Again, social support is important to physical activity participation. If you are engaging in a new physical activity program, perhaps tell your family and close friends about your new program. Stating your plans out loud not only increases the likelihood that you will continue this physical activity program, but your family and friends will surely ask about it at some point in the future meaning you may be held accountable for sticking to this program! Social-cognitive belief(s) targeted: Enhancing Social Support

Thursday: Water is vital. Although recommendations put forth my numerous health organizations such as the Centers for Disease Control and Prevention and the American College of Sports Medicine state 6-8 cups a day is needed, this does not always hold true for all individuals. Therefore, if you are not confident in your ability to drink enough water, buy a good water bottle that can be used at the gym and during the day and drink each time you feel thirsty. Further, drinking consistently throughout the day can help decrease your appetite and improve digestion, helping you lose weight. Social-cognitive belief(s) targeted: Promoting Self-Efficacy, Improving Outcome Expectancy

Week 7

Monday: One of the best ways to ensure you continue to participate in a physical activity program is finding an activity you enjoy. If you are an individual who prefers to workout alone, perhaps swimming, running, or biking suits you the best. For individuals who prefer to workout with others, consider group exercise classes such as yoga or step aerobics such as Zumba or dancing. Additionally, do not be afraid to mix and match different types of exercise! If you are going to sweat you might as well be doing something that interests you! Social-cognitive belief(s) targeted: Increasing Enjoyment, Enhancing Social Support

Thursday: Face it, you have put in the time in the gym and, perhaps, even lost a little weight in the process. Consider a monthly reward. This reward can be anything from the purchase of that one shirt that you have been dying to add to your wardrobe to a night out with your significant other. Yet, whatever the reward is, make sure that it does not derail your quest for better health and participation in physical activity. Social-cognitive belief(s) targeted: Improving Outcome Expectancy

Week 8

Monday: Did you know that physical activity has been linked to greater feelings of well-being? Well, it has! Physical activity, even in bouts as short as ten minutes can increase "good" hormones within the body such as endorphins. Indeed, release of these hormones on a regular basis as a result of continued physical activity participation has been found to lower likelihood of diseases such as depression and increase self-esteem. Social-cognitive belief(s) targeted: Improving Outcome Expectancy

Thursday: Sitting at a desk all day is not healthy. Consider setting your watch or phone to beep every thirty minutes during the day at which point you HAVE to get up and go for a five minute walk or engage in some light stretching. Not only will this give your body a much needed boost, it might also give your mind the break in concentration it needs and allow you to be more productive while doing homework or completing work for your job. Social-cognitive belief(s) targeted: Improving Outcome Expectancy

Week 9

Monday: Ensure you do not pull a muscle during your workout. Start each exercise session with some light exercise such as jumping jacks, brisk walking, or light biking/weight lifting. This will allow you to heat your core temperature up to a point wherein physical activity engagement does not pose much risk to your body. Social-cognitive belief(s) targeted: Decreasing Barriers

Thursday: Static stretching prior to exercise may actually decrease workout performance and, due to the fact the muscles are not warm, is not increasing flexibility. However, engaging in static stretching after engaging in physical activity is one of the best ways to increase flexibility and may even help with delayed-onset muscle soreness. Ensure your stretching routine is sufficient to stretch all major muscles of the upper and lower body. Further, only stretch to the point of slight discomfort, not pain, and hold the stretch for 20 seconds. Social-cognitive belief(s) targeted: Promoting Self-Efficacy, Improving Outcome Expectancy

Week 10

Monday: Sleep may not seem important to physical activity, but it is. Not getting enough sleep is a sure- fire way to experience decreases in motivation for engaging in physical activity. Therefore, aim for 6 to 8 hours of sleep each night. Moreover, try to cut out all screen time in the 10 to 15 minutes prior to going to sleep as watching TV or using your computer/smartphone to cruise social media or read the news decreases the body's ability to produce melatonin, a key sleep hormone. Finally, consider removing any TV from the bedroom and/or not playing music while you sleep as this background noise can actually decrease sleep quality. Making these small changes can go a long

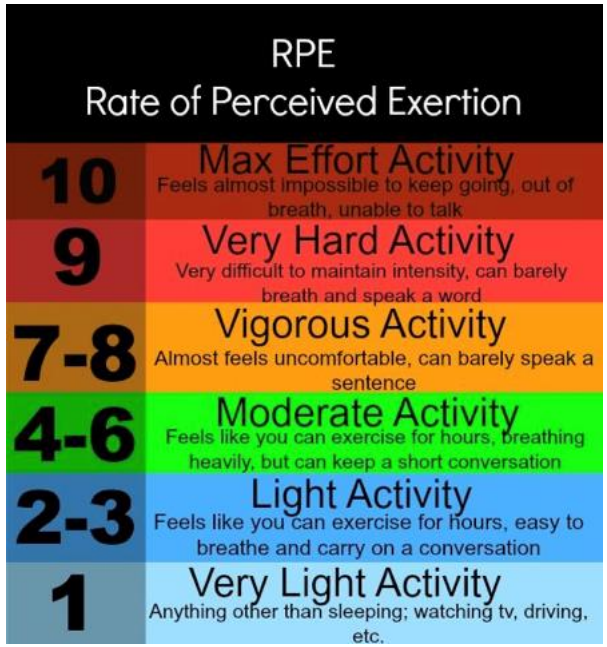
way in helping you feel more rested and ready to engage in physical activity (and life) the next day! Social-cognitive belief(s) targeted: Promoting Self-Efficacy, Decreasing Barriers

Thursday: Crank those tunes! If music is something you know will get you motivated to engage in your workout, consider investing in some athletic-oriented headphones that are sweat resistant and capable of staying in the ear during exercise. Keeping an up-to-date playlist of your favorite songs will allow you to have a better workout. This is especially true of exercisers preferring to exercise indoors. However, if exercising outdoors, consider leaving the headphones at home and enjoying the scenery as use of headphones while exercising outdoors can put you in danger. Social-cognitive belief(s) targeted: Increasing Enjoyment

Supplementary Materials 2. Exercise made easy: beginners programming.

Below is a 10-week outline (40 workouts) of exercise programming for individuals with little experience in the gym or those just coming back from a long time away from the gym. As such, this workout program is programmed for exercise 4 times a week for roughly an hour, with simple exercises placed within. Notably, under each of the main exercises for each day are suggested alternative exercises which may better appeal to breast cancer survivors recovering from treatment.

Finally, for each cardio workout listed below, you will use the Rating of Perceived Exertion (RPE) scale to gauge your intensity level. This scale is listed below, allowing for comprehension of the intensity level each cardio workout should be completed at.



Month 1: Endurance Phase

For each strength exercise, the endurance phase of this program will include higher numbers of repetitions (10-12 repetitions for each set) for each exercise with lower weight. You should rest for 60 seconds to 1.5 minutes between each strength exercise. A Diagrammatic explanation for each exercise is available starting on Page 20 of this workout program. For each cardio workout, feel free to select your favorite cardio exercise. Some cardio exercise options include, but are not limited to: walking, jogging, running, biking, swimming, stairclimbing, rowing, elliptical exercise, etc.

<u>Examples from days 1-2</u>

Week 1 Day 1:

- Strength Workout
  - Dumbbell Lunges (count every other leg): 3 sets x 10-12 repetitions
    - ALTERNATIVE: Walking Lunges without Dumbbells (still count every other leg)

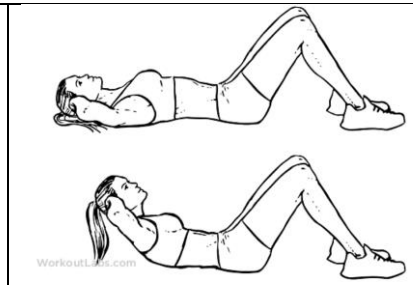
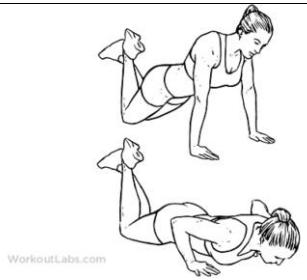
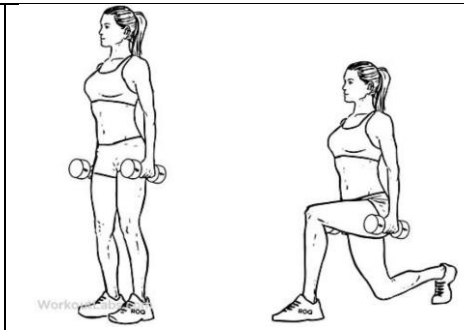
- Hamstring Curls: 3 sets x 10-12 repetitions
  - ALTERNATIVE: Glute Kickbacks
- Calf Raises: 3 sets x 50 repetitions
  - ALTERNATIVE: Seated Heel Lifts
- Bicycle Crunches: 2 sets x 50 revolutions
  - ALTERNATIVE: Standard Crunches
- Cardio Workout
  - 30 minutes selected cardio exercise at moderate pace: RPE Scale: 4-6

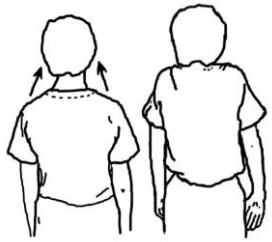
Day 2:

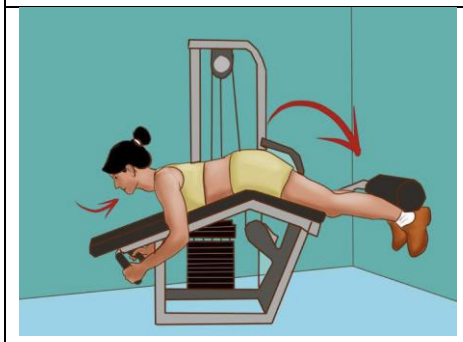
- Strength Workout
  - Dumbbell Bench Press: 3 sets x 10-12 repetitions
    - ALTERNATIVE: Push-Ups on Knees (only go down as far as your mobility will allow)
  - Tricep Kickbacks: 3 sets x 10-12 repetitions
    - ALTERNATIVE: Tricep Dips on Chair (only go down as far as your mobility will allow
  - o Dumbbell Chest Flies (go light and pretend to "hug a tree"): 3 sets x 10-12 repetitions
    - ALTERNATIVE: Wide-Grip Wall Push-Ups
  - Bicycle Crunches: 2 sets x 50 revolutions
    - ALTERNATIVE: Standard Crunches
- Cardio Workout
  - 30 minutes selected cardio exercise high-intensity intervals: These intervals will be comprised of 1 minute EASY (RPE Scale: 2-3) and 1 minute HARD (RPE Scale: 7-8) and repeated until time is up.

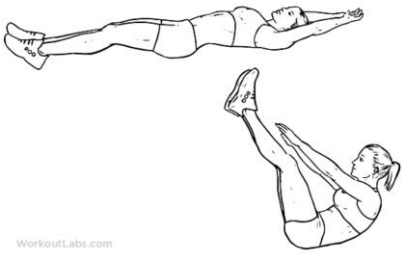
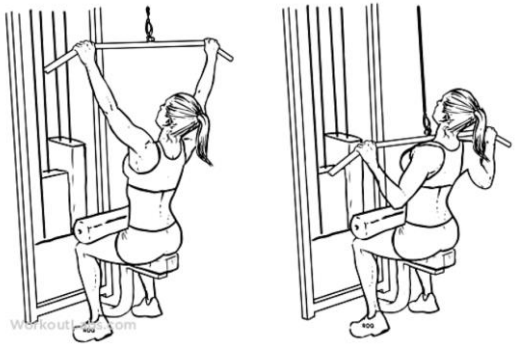
To show the exercises, in some cases images of real people were used, in other cases drawings were used (these are a small sample of the images shown to users:





4- Physical activity *and* nutrition

4.1 Saez, L., Langlois, J., Legrand, K., Quinet, M.-H., Lecomte, E., Omorou, A. Y., Briançon, S., & PRALIMAP-INÈS Trial Group. (2018). Reach and Acceptability of a Mobile Reminder Strategy and Facebook Group Intervention for Weight Management in Less Advantaged Adolescents: Insights From the PRALIMAP-INÈS Trial. *JMIR MHealth and UHealth*, *6*(5), Article 5. https://doi.org/10.2196/mhealth.7657

Multimedia Appendix 1 : Screenshot of one of the Facebook challenges	

4.2 Pope, Z., Barr-Anderson, D., Lewis, B., Pereira, M., & Gao, Z. (2019). Use of Wearable Technology and Social Media to Improve Physical Activity and Dietary Behaviors among College Students: A 12-Week Randomized Pilot Study. *International Journal of Environmental Research and Public Health*, *16*(19), Article 19. https://doi.org/10.3390/ijerph16193579

Twice-Weekly Health Education Tips

The following tips will be provided twice a week on Monday and Thursday for 12 weeks to all study participants. Specifically, the intervention group and the comparison group will have their own Facebook groups through which these health tips will be provided. Notably, each week includes one physical activity-related posting (Monday) and one nutrition-related posting (Thursday), with Social Cognitive Theory- and Self-Determination Theory-Related health determinants targeted denoted after each tip.

Week One

Physical Activity Tip	**Nutrition Tip**
Did you know the American College of Sports Medicine states that the recommended 30 min a day of physical activity can be accumulated in 3 ten-minute bouts?! If you have an extra ten minutes, try going for a brisk walk or bike ride. Indeed, a quick physical activity break following a meal or at points of the day where you begin to feel tired can really go a long way!	Water is vital. Although recommendations put forth by numerous health organizations such as the Centers for Disease Control and Prevention and the American College of Sports Medicine state 6–8 cups a day is needed, this does not always hold true for all individuals. Therefore, if you are not confident in your ability to drink enough water, buy a good water bottle that can be used at the gym and during the day and drink each time you feel thirsty. Why is this important? Well, drinking water consistently throughout the day can help decrease your appetite and improve digestion while also replacing unnecessary excess kcalories from beverages such as soda and fruit juices that often contain added sugars. Given the preceding benefits, drinking more water may aid in improving health and even help you lose weight!
Social cognitive belief(s) targeted:	**Social cognitive belief(s) targeted:**
Promoting Self-Efficacy, Decreasing Barriers	Promoting Self-Efficacy, Improving Outcome Expectancy
Self-determination theory constructs potentially influenced:	**Self-determination theory constructs potentially influenced:**
Self-Determination/Autonomy, Competence	Competence

Week Two

Physical Activity Tip	Nutrition Tip
Social support is crucial to continued physical activity engagement. Thus, try to find a good friend willing to go "sweat it out" with you two or three times per week. Although your friend may not be able to join you for every workout, s/he may be able to provide company on the days where you are lacking the motivation to get to the gym.	Small changes in what you eat and drink daily will enhance the likelihood of sticking to your nutritional goals as opposed to wide, sweeping changes all at once. Indeed, you need to explore small dietary changes which best conform to your taste preferences and daily schedule while also promoting improved health. For instance, if you are busy with school or work and find you tend to purchase an unhealthy snack from a vending machine, perhaps consider a healthy snack replacement strategy where you pack a small plastic bag of carrots, cucumbers, and whole grain crackers. Not only will this alternative likely be lower in kcalories, but the foods will also contain more of the nutrients your body needs for good health.
Social cognitive belief(s) targeted:	**Social cognitive belief(s) targeted:**
Enhancing Social Support	Promoting Self-Efficacy, Decreasing Barriers
Self-determination theory constructs potentially influenced:	**Self-determination theory constructs potentially influenced:.**
Relatedness/Social Interaction	Self-Determination/Autonomy, Competence

Week Three

Physical Activity Tip	Nutrition Tip
School work or your job stressing you out? Lucky for you, physical activity releases stress-reducing hormones such as endorphins into the bloodstream even during short 10-min bouts of exercise. All the more reason to set aside a little time each day to be physically active!	Desire to introduce more fruits and vegetables into your diet but worried about these fruits and vegetables going bad before you have had a chance to eat them? Consider a trip down the freezer isle at your local grocery store. Specifically, look at the frozen fruit and vegetable options available to you! Indeed, most fruits and vegetables are available as frozen options and are every bit as nutritious as their non-frozen counterparts—and sometimes cheaper as well. Just remember to look for frozen fruit and vegetable options which do not have added sauces (e.g., gravy) or extra butter/cream and salt.
Social-cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Improving Outcome Expectancy	Promoting Self-Efficacy, Decreasing Barriers
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Competence	Self-Determination/Autonomy, Competence

Week Four

Physical Activity Tip	Nutrition Tip
Worried about your motivation to exercise in the morning or that you will forget your exercise clothes as you head out the door? Place your workout clothes/shoes in front of the door you exit each morning. In this manner, you will have to move the clothes prior to opening the door, acting as a reminder to be a little more physically active during the day or to not skip the gym in the evening	Protein is important for numerous processes in the body. Not only is protein important for growth/repair of bodily tissues, but is instrumental in the proper functioning of hormones and enzymes as well. Foods like chicken, seafood, beans, eggs, and soy products are great lean sources of protein which can be introduced into the diet as part of a main dish (e.g., making a tuna salad or bean chili). Notably, consumption of protein-rich foods decreases appetite given the fact it takes longer for the body to break down the protein in these foods meaning protein might aid in controlling intake of excess kcalories.
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Promoting Self-Efficacy, Decreasing Barriers	Promoting Self-Efficacy, Improving Outcome Expectancy
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Self-Determination/Autonomy	Competence

Week Five

Physical Activity Tip	Nutrition Tip
Again, social support is important to physical activity participation. If you are engaging in a new physical activity program, perhaps tell your family and close friends about your new program and related goals. Stating your plans/goals out loud not only increases the likelihood that you will continue this physical activity program, but your family and friends will surely ask about it at some point in the future meaning you may be held accountable for sticking to this program and achieving your health goals!	Foods like sour cream, cream, and regular cheese can be high in saturated and total fat. However, superb substitutes for the aforementioned foods are available in the form of low-fat yogurt, milk, and cheese, as well as soy alternatives—foods also often higher in protein content than their less healthy counterparts. Consider low-fat yogurt, milk, cheese, and soy alternatives to decrease saturated and total fat intake while also ensuring adequate intake of protein.
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Enhancing Social Support	Promoting Self-Efficacy, Improving Outcome Expectancy
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Relatedness/Social Interactions	Competence

Week Six

Physical Activity Tip	Nutrition Tip
One of the best ways to ensure you continue to participate in a physical activity program is finding an activity you enjoy. If you are an individual who prefers to work out alone, perhaps swimming, running, or biking suits you the best. For individuals who prefer to workout with others, consider group exercise classes such as yoga or step aerobics such as Zumba or dancing. Additionally, do not be afraid to mix and match different types of exercise! If you are going to sweat, you might as well be doing something that interests you!	Worried about a potluck or party derailing your goal of healthier eating? Keep in mind the following three tips. First, walk around the food table to see what options are available and decide upon what available foods are conducive to your nutritional goals and which are not. Second, ensure you create for yourself a colorful plate approximately half full of fruits and/or vegetables, with smaller portions of each food you choose. Eating foods of different colors will increase the variety of health-enhancing nutrients consumed while eating smaller portions of food will ensure you do not eat too much. Finally, consider water or unsweetened iced tea as drink options while at a potluck or party instead of sugar-sweetened and/or high-calorie options such as soda, juices, punch, or alcohol. In this way, you can still have fun with friends without worrying about derailing your health goals!
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Increasing Enjoyment, Enhancing Social Support	Promoting Self-Efficacy, Improving Outcome Expectancy, Decreasing Barriers
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Self-Determination/Autonomy	Competence

Week Seven

Physical Activity Tip	Nutrition Tip
Crank those tunes! If music is something you know will get you motivated to engage in your workout, consider investing in some athletic-oriented headphones that are sweat resistant and capable of staying in your ears during exercise. Keeping an up-to-date playlist of your favorite songs will allow you to have a better workout. This is especially true of exercisers preferring to exercise indoors. However, if exercising outdoors, consider leaving the headphones at home and enjoying the sounds and scenery as use of headphones while exercising outdoors can put you in danger.	Coffee is a daily beverage for many. Yet, how an individual prepares their coffee can have a direct effect on their nutritional goals. Therefore, think about the following when getting your daily coffee. First, consider downsizing to a smaller drink, nixing whipped cream and caramel, and reducing or eliminating the addition of syrups to your drink. Second, if you like to add dairy to your coffee, look at adding low- or non-fat milk instead of whole fat milk. Not only will this substitution decrease caloric intake, but this substitution will also reduce saturated and total fat intake.

	Finally, when purchasing a muffin or pastry, perhaps consider splitting it with a friend as these foods can be higher in kcalories.
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Increasing Enjoyment	Promoting Self-Efficacy
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Competence	Competence

Week Eight

Physical Activity Tip	**Nutrition Tip**
Journaling is a great way to increase the likelihood of engagement in physical activity! Writing down not only your workouts, but the feelings associated with those workouts forces you to reflect upon different aspects of your exercise session. This reflection can have a profound impact on your motivation to continue your physical activity program and your desire to continue to experience the mental and physical benefits coming about as a result of participating in a regular physical activity routine. Try journaling today!	Limit eating out to once a week. When eating out, however, consider how you might improve the health of your order. For instance, you could look for entrees featuring vegetables such as a chicken or vegetable stir-fry. Further, you might consider ordering steamed options as steamed foods are often lower in saturated and total fat than fried foods. Finally, asking for additional oils or sauces on the side is a request many restaurants gladly accommodate of which will allow you more control of the caloric, salt, and fat content of your food.
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Improving Outcome Expectancy	Promoting Self-Efficacy, Decreasing Barriers
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Competence	Self-Determination/Autonomy, Competence

Week Nine

Physical Activity Tip	**Nutrition Tip**
Did you know that literature states that around 60 days is needed to make a new behavior a habit? Think about physical activity in the same manner. If you can engage in physical activity on a regular basis—say four times a week—over the course of two months, you will likely end up craving the good feeling physical activity provides when you miss a workout. Therefore, think about setting a start date and a follow-up date two months out. Then, plan to exercise a specified number of times per week over the next two months. At the follow-up date, reflect	Fiber is a nutrient which aids in decreasing levels of low-density lipoprotein cholesterol (i.e., the "bad" cholesterol) and promoting increased high-density lipoprotein cholesterol (i.e., the "good" cholesterol) while also promoting better digestive functioning. One way to ensure adequate intake of fiber is to increase consumption of foods high in whole grains. Foods such as bread, rice, oats, and granola can be great sources of whole grains; however, not all of these foods are created equal. To ensure the food you are considering purchasing is high in whole

upon what your physical activity program means in the context of your daily routine. You will likely find that physical activity is something that you now crave and cannot do without!	grains, look for terms such as “100% whole grain” or “100% whole wheat” on the ingredient label. Not only will these foods provide higher fiber per serving, but they will also possess greater amounts of nutrients per serving compared to more refined grains.
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Promoting Self-Efficacy, Decreasing Barriers, Improving Outcome Expectancy	Promoting Self-Efficacy
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Self-Determination/Autonomy, Competence	Competence

Week Ten

Physical Activity Tip	**Nutrition Tip**
Individuals new to a physical activity program often believe that they need to exercise every day to receive the benefits of exercise. However, this could not be further from the truth! Rest and recovery is a good thing. Consider exercising a maximum of 4 days a week if you are just beginning a physical activity program. Further, consider splitting these 4 days up over the course of the week to allow for your body to recover. For example, you could work out on Monday and Tuesday, rest on Wednesday, workout on Thursday and Friday, and take the weekend off. This rest will allow your body to experience the maximum amount of adaptations from your workouts!	Got a “sweet tooth”?! If so, you are not the only one! The good news is, your sweet tooth does not have to adversely affect your pursuit of healthier eating behaviors. Indeed, consider making a fruit salad or yogurt parfait for a cold dessert or, for a delicious hot dessert option, baked apples with cinnamon as a topping is a great choice. What a great way to blend the enjoyment of satisfying a sweet tooth with engaging in more nutritious eating!
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Promoting Self-Efficacy, Decreasing Barriers, Improving Outcome Expectancy	Promoting Self-Efficacy, Increasing Enjoyment, Decreasing Barriers
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Self-Determination/Autonomy, Competence	Competence

Week Eleven

Physical Activity Tip	**Nutrition Tip**
Sleep may not seem important to physical activity, but it is. Not getting enough sleep is a sure-fire way to experience decreases in motivation for engaging in physical activity. Therefore, aim for 6 to 8 h of sleep each night. Moreover, try to cut out all screen time in the 10 to 15 min prior to going to sleep as watching TV or	Look at your plate. What do you see? Ideally, you should see half your plate as including fruit and/or vegetables. Fruits and vegetables include nutrients vital to good health. Further, and more specifically, fruit can be a great natural substitute for candy or other dessert foods while many vegetables provide fiber important to

using your computer/smartphone to cruise social media or read the news decreases the body's ability to produce melatonin, a key sleep hormone. Finally, consider removing any TV from the bedroom and/or not playing music while you sleep as this background noise can actually decrease sleep quality. Making these small changes can go a long way in helping you feel more rested and ready to engage in physical activity (and life) the next day!	the promotion of proper blood lipid levels (e.g., cholesterol). Notably, when eaten in proper amounts, fruits and vegetables are often lower in kcalories than other sides included with a meal.
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Promoting Self-Efficacy, Decreasing Barriers	Promoting Self-Efficacy
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Competence	Competence

Week Twelve

Physical Activity Tip	**Nutrition Tip**
Face it, you have put in the time in the gym and, perhaps, even lost a little weight in the process. Consider a monthly or bi-monthly reward. This reward can be anything from the purchase of that one shirt that you have been dying to add to your wardrobe to a night out with your significant other. Yet, whatever the reward is, make sure that it does not derail your quest for better health and participation in physical activity.	Healthy eating is always more fun with friends! Consider a "Healthy Cooking Night" with friends where each individual is asked to search for a healthy entrée, side, dessert or beverage to cook/bake. Once each individual has found a recipe for their aspect of the meal, spend the night together cooking and baking! Not only will this increase the likelihood of engagement in healthy eating behaviors, but it is promoting support between each individual for participation in healthier lifestyle behaviors!
Social cognitive belief(s) targeted	**Social cognitive belief(s) targeted**
Improving Outcome Expectancy	Promoting Self-Efficacy, Increasing Enjoyment, Promoting Social Support
Self-determination theory constructs potentially influenced	**Self-determination theory constructs potentially influenced**
Self-Determination/Autonomy	Relatedness/Social Interactions

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