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Web-based and mHealth interventions for intimate partner violence prevention: a systematic review protocol

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Web-based and mHealth interventions for intimate partner violence prevention: a systematic review protocol

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Keywords:

Intimate partner violence; mHealth; violence prevention

Author's contributions: EJA, DOG, and MPK were responsible for the conceptualization of the research question, approach, and rationale. EJA and JM developed the methods to be used for this review. CMK and KK provided initial research into existing literature and developed the introduction to this manuscript. EJA prepared the first draft of this manuscript, which was reviewed and revised by MPK and DOG. All authors read and approved the final manuscript.

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Patient and Public Involvement: Patient and public involvement are not appropriate for this work. The research question answered in this work will explore patient preference for prevention approaches and the acceptability of web-based interventions in a hard-to-reach population. The results of this study will be publically disseminated in an open access, peer-reviewed journal that can be accessed by community based organizations or individuals interested in intimate partner violence prevention.

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Abstract

Introduction: Victims of intimate partner violence (IPV), or those individuals susceptible to IPV victimization or perpetration, may benefit from participation in primary or secondary interventions to address or mitigate exposure to violence. However, participation in such programs is limited by poor access, sociocultural barriers, and program cost given mixed evidence of IPV intervention effectiveness. However, increasingly near-universal access to the Internet, web-based technologies, and low-cost smartphones has created new avenues to provide preventive health services using mobile health (mHealth) tools, platforms, and services. The objective of this systematic review is to assess current web-based and mHealth interventions that employ one or more web- or mobile-based (mHealth) delivery methods for IPV prevention.

Methods and analysis: This systematic review will incorporate articles relevant to any prevention intervention targeting IPV victims or perpetrators of any gender where one or more intervention components are web- or mobile-based. All forms of IPV will be considered, including sexual assault and coercion, physical violence, and emotional control or abuse. Articles will be retrieved from the following academic databases: MEDLINE/PubMed, Embase, CINAHL, PsycInfo, and Open Grey, as well Google Scholar. Results will be limited to articles published since 1998 in English, Spanish, Portuguese, or French. Data extraction procedures will follow PRISMA guidelines. The Mixed Methods Appraisal Tool (MMAT) will be used to assess the quality and risk of bias among studies selected for inclusion. A narrative account will be used to answer the objectives of this review through synthesis and qualitative assessment of included articles.

Ethics and dissemination: Results from this review will be published in an open access format for the benefit of both academic and non-academic audiences, including community organizations and individuals interested in employing mHealth strategies to reduce and prevent IPV.

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Strengths and limitations of this study:

- This article will systematically report on existing mHealth interventions to reduce intimate partner violence across the globe and summarize methods and platforms that have been attempted in various contexts but may not be universally successful
- The quality of identified primary and secondary interventions will be assessed using a validated tool for both observational studies and randomized control trials
- A possible limitation may be that review will be limited to languages read and understood by investigators, which may result in exclusions of studies published in other widely-used languages

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Introduction:

Intimate partner violence (IPV) is defined as any violent or aggressive behavior that occurs in a close relationship between current or former intimate partners, including sexual, physical, or psychological harm that can vary in severity and frequency (1-3). IPV can occur with or without sexual intimacy (4), and may include sexual coercion, sexual touching, refusal to practice safe sex, rape, or other non-consensual sex acts with or without physical contact (2, 3). IPV can also occur in the form of controlling and isolating behaviors such as limiting the victim's contact with friends and family (2, 5). Individuals of any gender may be perpetrators or victims of IPV, though most victims are women and most perpetrators are men (6).

An estimated thirty percent of women around the world have experienced physical and/or sexual IPV during their lifetime (5, 7, 8). The prevalence of IPV is difficult to measure due to incompatible data collection techniques and tools, non-representative sampling techniques, and sociocultural barriers to identifying and reporting IPV (5). Risk of IPV victimization is elevated in low income and younger populations and those with a history of childhood abuse (9, 10) and immigrant status (11). Most current reports of IPV are limited to female victims of IPV given that women are more likely to experience IPV and are in some instances more likely to have culturally appropriate avenues for reporting IPV victimization, though IPV is likely widely underreported for all groups (5, 7, 8, 11).

IPV is costly to personal and public health in all global contexts. In addition to the direct short-term health consequences of IPV (e.g. physical injury), long-term impacts can include post-traumatic stress disorder (PTSD), anxiety disorders, and depression (3, 5, 12) as well as chronic physiological conditions in the cardiovascular, gastrointestinal, reproductive, musculoskeletal, and nervous systems (3, 12). Survivors of IPV may also have increased propensity for health risk behaviors such as smoking, binge drinking, recreational drug use, and additional HIV risk factors (12-15). At the community level, IPV puts considerable financial strain on medical and social services including care for IPV-related injuries, mental health services, lost workforce productivity, and increased demand for criminal justice and child welfare services (3). Substantial population and clinic-based evidence shows that overall healthcare consumption is significantly higher among IPV victims, particularly women (1, 16).

Various primary and secondary prevention programs have been developed to prevent IPV exposure and mitigate health and social consequences after exposure. Primary prevention reduces the incidence of a health threat before it occurs (17). Conventional primary prevention programs addressing IPV often consist of school- or community-based healthy relationship programs targeting adolescents and families before victimization or perpetration occur (12, 17, 18). Secondary prevention focuses on early detection after exposure and subsequent treatment in order to mitigate any resulting negative health consequences or recurrent exposure. Secondary prevention programs addressing IPV include universal IPV assessments and screening in healthcare settings, relocation and/or safe-haven shelters for survivors, access to counselling, medical treatment, and legal action to prevent future victimization, as well as diversion programs that promote anger management and de-escalation tactics for perpetrators to prevent future violence.

Interest in mobile health (mHealth) as a means of delivering public health interventions across mobile devices has increased across disciplines. mHealth tools are usually but not exclusively web-based and often target audiences that are otherwise reticent to participate in interventions due to the nature of the health issue or barriers to participation(19). Among primary and secondary interventions to reduce IPV, barriers to participation include fear of retribution, embarrassment, non-acknowledgement of abuse or violence, or perceived cultural taboos about addressing violence (20), while social support and perceived normalization of efforts to reduce IPV are protective factors (21). These risk and protective factors may be addressed through web-based efforts that do not rely on conventional in-person interventions.

Web-based and mHealth interventions for intimate partner violence prevention: a systematic review protocol

Existing mHealth and web-based interventions to reduce IPV include novel approaches and methods adapted from evidence-based interventions for online delivery. These approaches include an app-based intervention for college students at risk for dating violence (22), educational information to prevent both primary and secondary victimization of women adapted from an in-person intervention (23). mHealth interventions addressing IPV have been evaluated in observational studies, mixed qualitative and quantitative analyses, and randomized control trials (24, 25). Ownership of internet capable devices is highest in high income countries, where IPV prevention efforts are most likely to be funded or evaluated, though mHealth approaches have been successfully implemented across discipline in low- and middle-income settings (26).

To our knowledge, no systematic review has been performed regarding existing mHealth interventions to reduce or mitigate IPV. The purpose of our systematic review is to summarize existing efforts to address IPV using mobile or other web-based programs and to qualitatively assess their influence at each level of the social ecological model: individual, relationship, community, and societal. This review will provide insight into which populations are benefitting from mHealth interventions to prevent IPV, what, if any, benefits exist for participants, and identify gaps in the literature related to the use of mHealth to address IPV.

Methods and analysis

Inclusion criteria:

Participants

This review will include studies of adults as defined by the study authors (typically 18 years or older) who receive any form of intervention related to IPV primary or secondary prevention with a web-, mobile-, or other technology-based delivery component.

Phenomena of interest

This review will include studies with any sort of intervention regarding primary, secondary, or tertiary prevention of IPV victimization or perpetration and any outcome related to its reduction including barriers and facilitators. We are interested in the following aspects of web-based IPV prevention programs: characteristics that distinguish web-based primary and secondary IPV prevention programs; characteristics of target audiences of prevention programs of interest; aspects of web-based primary and secondary prevention programs result in highest completion and program acceptance. The primary outcome is any result of participation in a primary or secondary IPV prevention program with one or more web-based delivery components. Secondary outcomes of interest are acceptability of different aspects of web-based primary or secondary IPV prevention programs, evaluation of causes of dropout, and evaluation of studies stratified by racial/ethnic/gender group.

Context

This review will consider studies that have one or more elements that take place via a web-, mobile-, or other technology-based platform. No geographic limiters will be considered.

Type of studies

This review will include any sort of study including randomized control trials, quasi-randomized control trials, pre/post assessments, observational studies including participant satisfaction data or other outcomes data, or other experimental design. We will also include relevant cross-sectional surveys if they relate to participation in a qualifying mHealth program or intervention. Both qualitative and quantitative data will be considered. Comparators will be “no intervention”, any “pre” data collected before the intervention, and/or routine care.

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Search strategy

Initial searches were performed in MEDLINE/PubMed and Embase databases using keywords "intimate partner violence", "intervention", and "mHealth" were used to harvest keywords, Mesh and Emtree terms, and publication types from resulting titles and abstracts. The search strategy was iteratively refined to ensure that relevant articles were identified. Both published and unpublished studies will be considered. Only studies published in English, Spanish, Portuguese, or French will be included given capabilities and limitations of the study team.

The following databases will be included in the search: MEDLINE/PubMed, Embase, PsycInfo, CINAHL, and the Cochrane Central Register of Controlled Trials (CENTRAL). Articles published between 1998 and 2019 will be screened. 1998 was selected as the lower date limit because it is unlikely that any web-based health interventions were performed or assessed before that time (27). The first 100 search results from a Google Scholar search performed on the same day as the database search will be included. The search strategy for MEDLINE/PubMed is published in the Appendix. Adaptations to the MEDLINE/PubMed search strategy will be made for each included database in collaboration with the research librarian (JM). Unpublished studies including theses, dissertations, and grey literature will be searched for via the OpenGrey and ProQuest Dissertations and Theses databases. Additionally, the first 100 results from Google Scholar [scholar.google.com] using the specified search terms will be included in review.

Study selection

Following the search, all identified article information will be collated and uploaded into EndNote X8.2 (Clarivate Analytics, PA, USA) and de-duplicated. Where multiple citations report on the same data, only the most recent or complete citation will be included. Titles and abstracts will be independently screened by two researchers (EJA, CMK, or KK) with the third researcher arbitrating any discordant decisions. Studies marked for potential inclusion will be flagged for full text review. Studies without an abstract will be flagged for full text review. Two researchers will independently screen each of the selected citations for inclusion (EJA, CMK, or KK). Any full-text article that does not meet the inclusion criteria will be recorded along with the reason for exclusion, in accordance with PRISMA guidelines. Any disagreements between the two independent reviewers assigned to any given article will be resolved through discussion and or arbitration with the third reviewer or else other members of the research team (MPK). The results of the search will be reported in full in the final systematic review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram (28).

Assessment of methodological quality and risk of bias

In order to assess the quality of individual studies, risk of bias assessment will be performed by two independent researchers with any discrepancies settled by discussion with a third researcher (EJA, CMK, or KK). The Mixed Methods Appraisal Tool (MMAT) will be used given the likely inclusion of both observational studies and randomized control trials. Grey literature, such as conference abstracts and presentations, will be assessed with the AACODS checklist (29) which evaluates authority, accuracy, coverage, objectivity, date, and significance All studies, regardless of the results of their methodological quality, will undergo data extraction and synthesis (where possible). An analysis of meta-biases such as publication bias will be informed by AMSTAR 2 (Assessing the Methodological Quality of Systematic Reviews) guidelines(30). Data will be presented in tables including scores received on the appropriate above-mentioned assessment tools.

Data extraction

Included studies will be assessed by two independent reviewers (EJA, CMK, or KK) using a data extraction table created in Excel. The data extracted will include specific details about the populations, context, culture, geographical location, study methods and the phenomena of interest relevant to the review objective, in addition to details of the study design, target population characteristics and sample

size, data analysis methods, context, web- or mobile-based intervention delivery methods, primary and secondary outcomes of interest, and effect size, where reported. Findings, and their illustrations, will be extracted and assigned a level of credibility. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer (MPK). Authors of papers will be contacted to request missing or additional data, where required.

Data synthesis

Study findings and extracted data will be synthesized using meta-aggregation to categorize findings based on similarities and differences of meaning. Where possible, assembled findings will be stratified into meaningful categories such as global setting, type of target population, and level of scientific evidence provided (e.g., randomized control trial versus observational study). Findings will be synthesized to produce one comprehensive summary. Tables will be used where possible, followed by qualitative, narrative descriptions of findings. The summary of findings will include the publication title and year, outcome of interest, study type, and context. Given the likely heterogeneity of study design and populations, no quantitative analysis (e.g., meta-analysis) is planned.

Ethics and dissemination

The findings of this review may be useful to academic researchers, community-based organizations, and lay activists seeking to reduce or mitigate IPV using novel mHealth platforms, tools, and methods. Our findings may additionally highlight gaps in knowledge about the effectiveness, efficacy, or global applicability of mHealth in IPV prevention.

The systematic review process will follow PRISMA as well as the data extraction processes outlined by the Cochrane Collaboration (31). This review protocol follows the PRISMA protocol (PRISMA-P) guidelines (32). However, given current evidence about the types and locations of conventional IPV prevention interventions, it is unlikely that we will be able to make meaningful inferences about many global populations, including ethnic, racial, gender, or sexual minorities, those from low- or middle-income countries. The inclusion of research librarian (JM) minimizes the possibility of missing any relevant publications, yet language limitations of the study team prevent screening studies published in most languages if no English translation is available.

After completion of this review, we will present our findings at academic meetings and, if relevant, to community-based organizations or partners interested in using mHealth tools to provide IPV prevention services. We will publish the results of our review in an open-access peer-reviewed journal in order to maximize availability of our research.

In conclusion, this review is the first to assess existing efforts to prevent IPV using one or more mobile elements. The resultant information will be helpful for the future development or adaptation of IPV prevention services given an increasing global emphasis on web-based public health prevention efforts.

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Appendix: MEDLINE/PubMed Search Strategy

Concept:	**IPV**	**Prevention programs**	**Internet**
MeSH (PubMed/Medline) :	"domestic violence"[MeSH] OR “spouse abuse”[Mesh] OR "Gender-Based Violence"[Mesh] OR "Exposure to Violence"[Mesh] OR "Intimate Partner Violence"[Mesh] OR "Physical Abuse"[Mesh] OR "Battered Women"[Mesh] OR “Conflict (Psychology)”[Mesh] OR “Courtship/psychology”[Mesh] OR “Sexual Partners”[Mesh] OR “Rape”[Mesh] OR “Power”[Mesh]	"Rape/prevention and control"[Mesh] OR "Primary Prevention"[Mesh] OR "Secondary Prevention"[Mesh] OR "Early Intervention (Education)"[Mesh] OR “Crisis intervention”[Mesh] OR "Tertiary Prevention"[Mesh] OR "Risk Reduction Behavior"[Mesh] OR "Behavior Therapy"[Mesh] OR “Counseling/methods”[Mesh] OR “Motivational interviewing”[Mesh] OR “Cognitive Behavioral Therapy”[Mesh] OR "Randomized Controlled Trials as Topic"[Mesh] OR "Randomized Controlled Trial" [Publication Type] OR "Clinical Trials as Topic"[Mesh] OR “Couples therapy”[Mesh] OR “Marital therapy”[Mesh]	"Online Systems"[Mesh] "Online Social Networking"[Mesh] "Mobile Applications"[Mesh] "Smartphone"[Mesh] "Internet"[Mesh] “Telemedicine”[Mesh] “Telecommunications”[Mesh] “computing methodologies”[Mesh] "Social Media"[Mesh]

Text words:	“intimate partner violence” OR “domestic violence” OR “IPV” OR “dating violence” OR “domestic abuse” OR Abuse* OR “wife abuse” OR “spouse abuse” OR “partner abuse” OR “family violence” OR “violence, family” OR “Gender Based Violence” OR “Violence Exposure” OR “Coercive behavior” OR “Physical Maltreatment” OR “Sexual coercion” OR “Battered women” OR “Battered woman” OR	“Primary prevention*” OR “Secondary prevention*” OR “Secondary Preventions” OR “Relapse Prevention*” OR “Early Therapy” OR “Early Therapies” OR “Crisis Intervention*” OR “Critical Incident Stress Debriefing” OR “Risk Reduction Behavior*” OR “Lifestyle Risk Reduction” OR “Risk Reduction” OR “couples therapy” OR “marriage therapy” OR “Marital therapy” OR Diversion OR “Batterer intervention”	Ehealth “Web-based trial*” blue-tooth bluetooth camera cell phone computer computerized digital E-health e-learning elearning “electronic mail” email e-mail Facebook “global positioning” handheld hand-held informatics internet “information system” mhealth m-health mms mobile “mobile health” “mobile phone” NFC Online “Remote care” “Remote consultation” “Remote data” “Remote monitoring” “Short message service” “Sim card*”

	Batter* OR “Abused women” OR “Abused woman” OR Rape OR “sexual violence” OR “sexual assault” OR “sexual aggression” OR "violence against women" OR perpetration		Smartphone Smart-phone Sms Software “Social media” Tablet Telecare Telecommunication Teleconferenc* Teleconsultation Tele-education Tele-learning Telemed* Telemanagement Telematics Telephone Texting Text-messaging Text-message Video Videoconferenc* video-conferenc* virtual reality virtual Web “Web service” web-based Whatsapp wireless
Results	267589 – Feb 4, 2019	1788818– Feb 4, 2019	2090707 — Feb 4, 2019
Results from all: 2581			

("domestic violence"[MeSH] OR “spouse abuse”[Mesh] OR "Gender-Based Violence"[Mesh] OR "Exposure to Violence"[Mesh] OR "Intimate Partner Violence"[Mesh] OR "Physical Abuse"[Mesh] OR "Battered Women"[Mesh] OR “Conflict (Psychology)”[Mesh] OR “Courtship/psychology”[Mesh] OR “Sexual Partners”[Mesh] OR “Rape”[Mesh] OR "Power"[Mesh] OR “intimate partner violence” OR “domestic violence” OR “IPV” OR “dating violence” OR “domestic abuse” OR Abuse* OR “wife abuse” OR “spouse abuse” OR “partner abuse” OR “family violence” OR “violence, family” OR “Gender Based Violence” OR “Violence Exposure” OR “Coercive behavior” OR “Physical Maltreatment” OR “Sexual coercion” OR “Battered women” OR “Battered woman” OR Batter* OR “Abused women” OR “Abused woman” OR Rape OR “sexual violence” OR “sexual assault” OR “sexual aggression” OR "violence against women" OR "perpetration") AND (Technology[Mesh] OR "Online Systems"[Mesh] OR "Online Social Networking"[Mesh] OR "Mobile Applications"[Mesh] OR "Smartphone"[Mesh] OR "Internet"[Mesh] OR “Telemedicine”[Mesh] OR “Telecommunications”[Mesh] OR “computing methodologies”[Mesh] OR "Social Media"[Mesh] OR Ehealth OR “Web-based trial*” OR bluetooth OR bluetooth OR camera OR "cell phone" OR computer OR computerized OR digital OR E-health OR e-learning OR eleaning OR “electronic-mail” OR email OR e-mail OR Facebook OR “global positioning” OR handheld OR hand-held OR informatics OR Internet OR “information system” OR mhealth OR m-health OR mms OR mobile OR “mobile health” OR “mobile phone” OR NFC OR Online OR “Remote care” OR “Remote consultation” OR “Remote data” OR “Remote monitoring” OR “Short message service” OR “Sim card*” OR Smartphone OR Smart-phone OR Sms OR Software OR “Social media” OR Tablet OR Telecare OR Telecommunication OR Teleconferenc* OR Teleconsultation OR Tele-education OR Tele-learning OR Telemed* OR Telemanagement OR Telematics OR Telephone OR Texting OR Text-messaging OR Text-message OR Video OR videoconference OR video-conference OR videoconferencing OR video-conferencing OR "virtual reality" OR virtual OR Web OR “Web service” OR web-based OR Whatsapp OR wireless) AND ("Rape/prevention and control"[Mesh] OR "Primary Prevention"[Mesh] OR "Secondary Prevention"[Mesh] OR "Early Intervention (Education)"[Mesh] OR “Crisis intervention”[Mesh] OR "Tertiary Prevention"[Mesh] OR "Risk Reduction Behavior"[Mesh] OR "Behavior Therapy"[Mesh] OR “Counseling/methods”[Mesh] OR “Motivational interviewing”[Mesh] OR “Cognitive Behavioral Therapy”[Mesh] OR "Randomized Controlled Trials as Topic"[Mesh] OR "Randomized Controlled Trial" [Publication Type] OR "Clinical Trials as Topic"[Mesh] OR “Couples therapy”[Mesh] OR “Marital therapy”[Mesh] OR “Primary prevention*” OR “Secondary prevention*” OR “Relapse Prevention*” OR “Early Therapy” OR “Early Therapies” OR “Crisis Intervention*” OR “Critical Incident Stress Debriefing” OR “Risk Reduction Behaviors” OR “Lifestyle Risk Reduction*” OR “Risk Reduction*” OR “couples therapy” OR “marriage therapy” OR “Marital therapy” OR Diversion OR “Batterer intervention”

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Web-based and mHealth interventions for intimate partner violence prevention: a systematic review protocol

Abstract

Introduction: Victims of intimate partner violence (IPV), or those individuals susceptible to IPV victimization or perpetration, may benefit from participation in primary, secondary, or tertiary interventions to address or mitigate exposure to violence. However, participation in such programs is limited by poor access, sociocultural barriers, and program cost given mixed evidence of IPV intervention effectiveness. However, increasingly near-universal access to the Internet, web-based technologies, and low-cost smartphones has created new avenues to provide preventive health services using mobile health (mHealth) tools, platforms, and services. The objective of this systematic review is to assess current web-based and mHealth interventions that employ one or more web- or mobile-based (mHealth) delivery methods for IPV prevention.

Methods and analysis: This systematic review will incorporate articles relevant to any empirical prevention intervention targeting IPV victims or perpetrators of any gender where one or more intervention components are web- or mobile-based. All forms of IPV will be considered, including sexual assault and coercion, physical violence, and emotional control or abuse. Articles will be retrieved from the following academic databases: MEDLINE/PubMed, Embase, CINAHL, PsycInfo, and Open Grey, as well Google Scholar. Results will be limited to articles reporting primary data, published since 1998, and in English, Spanish, Portuguese, or French. Data extraction procedures will follow PRISMA guidelines. The Mixed Methods Appraisal Tool (MMAT) will be used to assess the quality and risk of bias among studies selected for inclusion. A narrative account will be used to answer the objectives of this review through synthesis and qualitative assessment of included articles.

Ethics and dissemination: Results from this review will be published in an open access format for the benefit of both academic and non-academic audiences, including community organizations and individuals interested in employing mHealth strategies to reduce and prevent IPV.

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Author's contributions: EJA, DOG, and MPK were responsible for the conceptualization of the research question, approach, and rationale. EJA and JM developed the methods to be used for this review. CMK and KK provided initial research into existing literature and developed the introduction to this manuscript. EJA prepared the first draft of this manuscript, which was reviewed and revised by MPK and DOG. All authors read and approved the final manuscript.

Strengths and limitations of this study:

- This article will systematically report on existing mHealth interventions to reduce intimate partner violence across the globe, including those where IPV prevention was not the primary intervention goal, and provide insight on what types of platforms are most successful in populations where they have been attempted, which will inform future interventions
- The quality of identified primary, secondary, and tertiary interventions will be assessed using a validated tool for both observational studies and randomized control trials
- A possible limitation may be that review will be limited to languages read and understood by investigators, which may result in exclusions of studies published in other widely-used languages

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Introduction:

Intimate partner violence (IPV) is defined as any violent or aggressive behavior that occurs in a close relationship between current or former intimate partners, including sexual, physical, or psychological harm that can vary in severity and frequency (1-3). IPV can occur with or without sexual intimacy (4), and may include sexual coercion, sexual touching, refusal to practice safe sex, rape, or other non-consensual sex acts with or without physical contact (2, 3). IPV can also occur in the form of controlling and isolating behaviors such as limiting the victim's contact with friends and family (2, 5). Individuals of any gender may be perpetrators or victims of IPV, though most victims are women and most perpetrators are men (6). Men are more likely to report being victimized by low-impact forms of IPV (e.g., pushing, shoving, verbal abuse) than women but are much more likely to perpetrate severe forms of IPV such as battery (7). However, men's experiences of victimization are not well studied, particularly among sexual minorities (8).

An estimated thirty percent of women around the world have experienced physical and/or sexual IPV during their lifetime (5, 9, 10). The prevalence of IPV is difficult to measure due to incompatible data collection techniques and tools, non-representative sampling techniques, and sociocultural barriers to identifying and reporting IPV (5). Risk of IPV victimization is elevated in low income and younger populations and those with a history of childhood abuse (11, 12) and immigrant status (13). Most current reports of IPV are limited to female victims of IPV given that women are more likely to experience IPV and are in some instances more likely to have culturally appropriate avenues for reporting IPV victimization, although IPV is likely widely underreported for all groups (5, 8, 9, 13, 14).

IPV is costly to personal and public health in all global contexts. In addition to the direct short-term health consequences of IPV (e.g. physical injury), long-term impacts can include post-traumatic stress disorder (PTSD), anxiety disorders, and depression (3, 5, 15) as well as chronic physiological conditions in the cardiovascular, gastrointestinal, reproductive, musculoskeletal, and nervous systems (3, 12). Survivors of IPV may also have increased propensity for health risk behaviors such as smoking, binge drinking, recreational drug use, and additional HIV risk factors (15-20). At the community level, IPV puts considerable financial strain on medical and social services including care for IPV-related injuries, mental health services, lost workforce productivity, and increased demand for criminal justice and child welfare services (3). Substantial population and clinic-based evidence shows that overall healthcare consumption is significantly higher among IPV victims, particularly women (1, 21).

Various primary, secondary, and tertiary prevention programs have been developed to prevent IPV exposure and mitigate health and social consequences after exposure. Primary prevention reduces the incidence of a health threat before it occurs (22). Conventional primary prevention programs addressing IPV often consist of school- or community-based healthy relationship programs targeting adolescents and families before victimization or perpetration occur (12, 22, 23). Secondary prevention focuses on early detection after exposure and subsequent treatment in order to triage any resulting negative health consequences or recurrent exposure. Secondary prevention programs addressing IPV include universal IPV assessments and screening in healthcare settings, relocation and/or safe-haven shelters for survivors, access to counselling, medical treatment, and legal action to prevent future victimization, as well as diversion programs that promote anger management and de-escalation tactics for perpetrators to prevent future violence. Tertiary prevention includes efforts to mitigate the impacts of previous or current experiences of IPV such as counseling for post-traumatic stress disorder or recidivism reduction programs.

Interest in mobile health (mHealth) as a means of delivering public health interventions across mobile devices has increased across disciplines (24). mHealth tools are usually but not exclusively web-based and often target audiences that are otherwise reticent to participate in interventions due to the nature of the health issue or barriers to participation (20). Among interventions to reduce IPV, barriers to participation include fear of retribution, embarrassment, non-acknowledgement of abuse or violence, or perceived cultural taboos about addressing violence (25) while social support and perceived

normalization of efforts to reduce IPV are protective factors (26). These risk and protective factors may be addressed through web-based efforts that do not rely on conventional in-person interventions.

Existing mHealth and web-based interventions to reduce IPV include novel approaches and methods adapted from evidence-based interventions for online delivery. These approaches include an app-based intervention for college students at risk for dating violence (27), educational information to prevent primary, secondary and tertiary victimization of women adapted from an in-person intervention (28). mHealth interventions addressing IPV have been evaluated in observational studies, mixed qualitative and quantitative analyses, and randomized control trials (29, 30). Ownership of internet capable devices is highest in high income countries, where IPV prevention efforts are most likely to be funded or evaluated, though mHealth approaches have been successfully implemented across discipline in low- and middle-income settings (31).

Purpose

To our knowledge, no systematic review has been performed regarding existing mHealth interventions to reduce or mitigate IPV. The purpose of our systematic review is to summarize existing efforts to address IPV using mobile or other web-based programs and to qualitatively assess their influence at each level of the social ecological model: individual, relationship, community, and societal. This review will provide insight into: which populations are being served by mHealth interventions to prevent IPV; what, if any, benefits exist for participants; and identify gaps in the literature related to the use of mHealth to address IPV.

Methods and analysis

This protocol follows the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols) 2015 statement (32); the systematic review will follow both the PRISMA statement and the best practices outlined by the Cochrane Collaboration (33).

Inclusion criteria:

Participants

This review will include studies of adults as defined by the study authors (typically 18 years or older) who receive any form of intervention related to IPV primary, secondary, or tertiary prevention with a web-, mobile-, or other technology-based delivery component.

Phenomena of interest

This review will include studies with any sort of intervention regarding primary, secondary, or tertiary prevention of IPV victimization or perpetration and any outcome related to its reduction including barriers and facilitators. We are interested in the following aspects of web-based IPV prevention programs: characteristics that distinguish web-based IPV prevention programs; characteristics of target audiences of prevention programs of interest; aspects of web-based prevention programs result in highest completion and program acceptance. The primary outcome is any result of participation in a primary, secondary, or tertiary IPV prevention program (where IPV prevention is either a direct or indirect goal of the intervention) with one or more web-based delivery components. Secondary outcomes of interest are acceptability of different aspects of web-based primary, secondary, or tertiary IPV prevention programs, evaluation of causes of dropout, and evaluation of studies stratified by racial/ethnic/gender group. Interventions that focus on other domains of health behavior (e.g., HIV risk reduction) or relationship health (e.g., couple therapy) that include IPV prevention as a secondary goal or outcome will also be included.

Context

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This review will consider studies that have one or more elements that take place via a web-, mobile-, or other technology-based platform (i.e., one where the outcome of the intervention depended on the use of a platform such as a computer, cell phone, or tablet). No geographic limiters will be considered.

Type of studies

This review will include any sort of study including randomized control trials, quasi-randomized control trials, pre/post assessments, observational studies including participant satisfaction data or other outcomes data, or other experimental design. We will also include relevant cross-sectional surveys if they relate to participation in a qualifying mHealth program or intervention. Both qualitative and quantitative data will be considered. Comparators will be “no intervention”, any “pre” data collected before the intervention, and/or routine care.

Exclusion criteria:

Studies will be excluded if they describe the following: family or interpersonal violence not targeting an adult romantic partner; only report qualitative feasibility or acceptability data with no quantifiable measure of feasibility (e.g., retention rate); use a computer-based delivery method that has no bearing on the outcome of interest (e.g., web-based recruitment for a face-to-face intervention); not available in a language read by study authors.

Search strategy

Initial searches were performed in MEDLINE/PubMed and Embase databases using keywords “intimate partner violence”, “intervention”, and “mHealth” were used to harvest keywords, Mesh and Emtree terms, and publication types from resulting titles and abstracts. The search strategy was iteratively refined to ensure that relevant articles were identified. Both published and unpublished studies will be considered. Only studies published in English, Spanish, Portuguese, or French will be included given capabilities and limitations of the study team.

The following databases will be included in the search: MEDLINE/PubMed, Embase, PsycInfo, CINAHL, and the Cochrane Central Register of Controlled Trials (CENTRAL). Articles published between 1998 and 2019 will be screened. 1998 was selected as the lower date limit because it is unlikely that any web-based health interventions were performed or assessed before that time (34). The first 100 search results from a Google Scholar search performed on the same day as the database search will be included. The search strategy for MEDLINE/PubMed is published in the Appendix. Adaptations to the MEDLINE/PubMed search strategy will be made for each included database in collaboration with the research librarian (JM). Unpublished studies including theses, dissertations, and grey literature will be searched for via the OpenGrey and ProQuest Dissertations and Theses databases. Additionally, the first 100 results from Google Scholar [scholar.google.com] using the specified search terms will be included in review.

Study selection

Following the search, all identified article information will be collated and uploaded into EndNote X8.2 (Clarivate Analytics, PA, USA) and de-duplicated. Where multiple citations report on the same data, only the most recent or complete citation will be included. Titles and abstracts will be independently screened by two researchers (EJA, CMK, or KK) with the third researcher arbitrating any discordant decisions. Studies marked for potential inclusion will be flagged for full text review. Studies without an abstract will be flagged for full text review. Two researchers will independently screen each of the selected citations for inclusion (EJA, CMK, or KK). Any full-text article that does not meet the inclusion criteria will be recorded along with the reason for exclusion, in accordance with PRISMA guidelines. Any disagreements between the two independent reviewers assigned to any given article will be resolved

through discussion and or arbitration with the third reviewer or else other members of the research team (MPK). The results of the search will be reported in full in the final systematic review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram (32).

Assessment of methodological quality and risk of bias

In order to assess the quality of individual studies, risk of bias assessment will be performed by two independent researchers with any discrepancies settled by discussion with a third researcher (EJA, CMK, or KK). The Mixed Methods Appraisal Tool (MMAT) will be used given the likely inclusion of both observational studies and randomized control trials. All studies, regardless of the results of their methodological quality, will undergo data extraction and synthesis (where possible). Individual studies will be given a score using the appropriate tool, with scores presented in a table. An analysis of meta-biases such as publication bias will be informed by AMSTAR 2 (Assessing the Methodological Quality of Systematic Reviews) guidelines (35). Data will be presented in tables including scores received on the appropriate above-mentioned assessment tools.

Data extraction

Included studies will be assessed by two independent reviewers (EJA, CMK, or KK) using a data extraction table created in Excel. The data extracted will include specific details about the populations, context, culture, geographical location, study methods and the phenomena of interest relevant to the review objective, in addition to details of the study design, target population characteristics and sample size, data analysis methods, context (e.g., community-based vs academic), web- or mobile-based intervention delivery methods, measure (i.e., instrument) of IPV used, type/severity of IPV, primary and secondary outcomes of interest, and effect size, where reported. Primary outcomes reported by included trials are likely to include reduction in IPV experiences or rate of entry into care, as well as intervention feasibility among pilot studies. Secondary outcomes reported by included trials may include attitudes towards violence or changes in mental wellness scores (e.g., depression). Findings, and their illustrations, will be extracted and assigned a level of credibility. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer (MPK). Authors of papers will be contacted to request missing or additional data, where required.

Data synthesis

Study results and extracted data will be synthesized using meta-aggregation to categorize findings based on similarities and differences of meaning. Where possible, assembled findings will be stratified into meaningful categories such as global setting, type of target population, and level of scientific evidence provided (e.g., randomized control trial versus observational study). Findings will be synthesized to produce one comprehensive summary. Tables will be used where possible, followed by qualitative, narrative descriptions of findings. The summary of findings will include the publication title and year, outcome of interest, study type, and context. Comparisons will be made relative to the differences in IPV reporting rates based on population type, measure of IPV prevalence used, and variety in severity/type of IPV experienced by participants (e.g., assessment of the impact of intervention types given the severity of IPV). Due to the likely heterogeneity of study design and populations, no quantitative analysis (e.g., meta-analysis) is planned. However, where trials use the same primary (e.g., IPV experiences) or secondary (e.g., depression or anxiety) outcome measures and instruments, these results will be meta-aggregated and stratified by population type, method of intervention delivery, and/or severity of IPV.

Ethics and dissemination

The findings of this review may be useful to academic researchers, community-based organizations, and lay activists seeking to reduce or mitigate IPV using novel mHealth platforms, tools, and methods. Our findings may additionally highlight gaps in knowledge about the effectiveness, efficacy, or global applicability of mHealth in IPV prevention.

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The systematic review process will follow PRISMA as well as the data extraction processes outlined by the Cochrane Collaboration (32). This review protocol follows the PRISMA protocol (PRISMA-P) guidelines (33). However, given current evidence about the types and locations of conventional IPV prevention interventions, it is unlikely that we will be able to make meaningful inferences about many global populations, including ethnic, racial, gender, or sexual minorities, those from low- or middle-income countries. The inclusion of research librarian (JM) minimizes the possibility of missing any relevant publications, yet language limitations of the study team prevent screening studies published in most languages if no English translation is available.

After completion of this review, we will present our findings at academic meetings and, if relevant, to community-based organizations or partners interested in using mHealth tools to provide IPV prevention services. We will publish the results of our review in an open-access peer-reviewed journal in order to maximize availability of our research.

In conclusion, this review is the first to assess existing efforts to prevent IPV using one or more mobile elements. The resultant information will be helpful for the future development or adaptation of IPV prevention services given an increasing global emphasis on web-based public health prevention efforts.

Patient and Public Involvement: Patient and public involvement are not appropriate for this work. The research question answered in this work will explore patient preference for prevention approaches and the acceptability of web-based interventions in a hard-to-reach population. No patients were recruited for this study; there was no public involvement. The results of this study will be publically disseminated in an open access, peer-reviewed journal that can be accessed by community based organizations or individuals interested in intimate partner violence prevention.

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Appendix: MEDLINE/PubMed Search Strategy

Concept:	**IPV**	**Prevention programs**	**Internet**
MeSH (PubMed/Medline) :	"domestic violence"[MeSH] OR “spouse abuse”[Mesh] OR "Gender-Based Violence"[Mesh] OR "Exposure to Violence"[Mesh] OR "Intimate Partner Violence"[Mesh] OR "Physical Abuse"[Mesh] OR "Battered Women"[Mesh] OR “Conflict (Psychology)”[Mesh] OR “Courtship/psychology”[Mesh] OR “Sexual Partners”[Mesh] OR “Rape”[Mesh] OR “Power”[Mesh]	"Rape/prevention and control"[Mesh] OR "Primary Prevention"[Mesh] OR "Secondary Prevention"[Mesh] OR "Early Intervention (Education)"[Mesh] OR “Crisis intervention”[Mesh] OR "Tertiary Prevention"[Mesh] OR "Risk Reduction Behavior"[Mesh] OR "Behavior Therapy"[Mesh] OR “Counseling/methods”[Mesh] OR “Motivational interviewing”[Mesh] OR “Cognitive Behavioral Therapy”[Mesh] OR "Randomized Controlled Trials as Topic"[Mesh] OR "Randomized Controlled Trial" [Publication Type] OR "Clinical Trials as Topic"[Mesh] OR “Couples therapy”[Mesh] OR “Marital therapy”[Mesh]	"Online Systems"[Mesh] "Online Social Networking"[Mesh] "Mobile Applications"[Mesh] "Smartphone"[Mesh] "Internet"[Mesh] “Telemedicine”[Mesh] “Telecommunications”[Mesh] “computing methodologies”[Mesh] "Social Media"[Mesh]

Text words:	“intimate partner violence” OR “domestic violence” OR “IPV” OR “dating violence” OR “domestic abuse” OR Abuse* OR “wife abuse” OR “spouse abuse” OR “partner abuse” OR “family violence” OR “violence, family” OR “Gender Based Violence” OR “Violence Exposure” OR “Coercive behavior” OR “Physical Maltreatment” OR “Sexual coercion” OR “Battered women” OR “Battered woman” OR	“Primary prevention*” OR “Secondary prevention*” OR “Secondary Preventions” OR “Relapse Prevention*” OR “Early Therapy” OR “Early Therapies” OR “Crisis Intervention*” OR “Critical Incident Stress Debriefing” OR “Risk Reduction Behavior*” OR “Lifestyle Risk Reduction” OR “Risk Reduction” OR “couples therapy” OR “marriage therapy” OR “Marital therapy” OR Diversion OR “Batterer intervention”	Ehealth “Web-based trial*” blue-tooth bluetooth camera cell phone computer computerized digital E-health e-learning elearning “electronic mail” email e-mail Facebook “global positioning” handheld hand-held informatics internet “information system” mhealth m-health mms mobile “mobile health” “mobile phone” NFC Online “Remote care” “Remote consultation” “Remote data” “Remote monitoring” “Short message service” “Sim card*”

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	Batter* OR “Abused women” OR “Abused woman” OR Rape OR “sexual violence” OR “sexual assault” OR “sexual aggression” OR "violence against women" OR perpetration		Smartphone Smart-phone Sms Software “Social media” Tablet Telecare Telecommunication Telecomunic* Teleconsultation Tele-education Tele-learning Telemed Telemanagement Telematics Telephone Texting Text-messaging Text-message Video Videoconferenc* video-conferenc* virtual reality virtual Web “Web service” web-based Whatsapp wireless
Results	267589 – Feb 4, 2019	1788818– Feb 4, 2019	2090703 – Feb 4, 2019
Results from all: 2581			

("domestic violence"[MeSH] OR “spouse abuse”[Mesh] OR "Gender-Based Violence"[Mesh] OR "Exposure to Violence"[Mesh] OR "Intimate Partner Violence"[Mesh] OR "Physical Abuse"[Mesh] OR "Battered Women"[Mesh] OR “Conflict (Psychology)”[Mesh] OR “Courtship/psychology”[Mesh] OR “Sexual Partners”[Mesh] OR “Rape”[Mesh] OR "Power"[Mesh] OR “intimate partner violence” OR “domestic violence” OR “IPV” OR “dating violence” OR “domestic abuse” OR Abuse* OR “wife abuse” OR “spouse abuse” OR “partner abuse” OR “family violence” OR “violence, family” OR “Gender Based Violence” OR “Violence Exposure” OR “Coercive behavior” OR “Physical Maltreatment” OR “Sexual coercion” OR “Battered women” OR “Battered woman” OR Batter* OR “Abused women” OR “Abused woman” OR Rape OR “sexual violence” OR “sexual assault” OR “sexual aggression” OR "violence against women" OR "perpetration") AND (Technology[Mesh] OR "Online Systems"[Mesh] OR "Online Social Networking"[Mesh] OR "Mobile Applications"[Mesh] OR "Smartphone"[Mesh] OR "Internet"[Mesh] OR “Telemedicine”[Mesh] OR “Telecommunications”[Mesh] OR “computing methodologies”[Mesh] OR "Social Media"[Mesh] OR Ehealth OR “Web-based trial*” OR bluetooth OR bluetooth OR camera OR "cell phone" OR computer OR computerized OR digital OR E-health OR e-learning OR eleaning OR “electronic-mail” OR email OR e-mail OR Facebook OR “global positioning” OR handheld OR hand-held OR informatics OR Internet OR “information system” OR mhealth OR m-health OR mms OR mobile OR “mobile health” OR “mobile phone” OR NFC OR Online OR “Remote care” OR “Remote consultation” OR “Remote data” OR “Remote monitoring” OR “Short message service” OR “Sim card*” OR Smartphone OR Smart-phone OR Sms OR Software OR “Social media” OR Tablet OR Telecare OR Telecommunication OR Teleconferenc* OR Teleconsultation OR Tele-education OR Tele-learning OR Telemed* OR Telemanagement OR Telematics OR Telephone OR Texting OR Text-messaging OR Text-message OR Video OR videoconference OR video-conference OR videoconferencing OR video-conferencing OR "virtual reality" OR virtual OR Web OR “Web service” OR web-based OR Whatsapp OR wireless) AND ("Rape/prevention and control"[Mesh] OR "Primary Prevention"[Mesh] OR "Secondary Prevention"[Mesh] OR "Early Intervention (Education)"[Mesh] OR “Crisis intervention”[Mesh] OR "Tertiary Prevention"[Mesh] OR "Risk Reduction Behavior"[Mesh] OR "Behavior Therapy"[Mesh] OR “Counseling/methods”[Mesh] OR “Motivational interviewing”[Mesh] OR “Cognitive Behavioral Therapy”[Mesh] OR "Randomized Controlled Trials as Topic"[Mesh] OR "Randomized Controlled Trial" [Publication Type] OR "Clinical Trials as Topic"[Mesh] OR “Couples therapy”[Mesh] OR “Marital therapy”[Mesh] OR “Primary prevention*” OR “Secondary prevention*” OR “Relapse Prevention*” OR “Early Therapy” OR “Early Therapies” OR “Crisis Intervention*” OR “Critical Incident Stress Debriefing” OR “Risk Reduction Behaviors” OR “Lifestyle Risk Reduction*” OR “Risk Reduction*” OR “couples therapy” OR “marriage therapy” OR “Marital therapy” OR Diversion OR “Batterer intervention”

BMJ Open

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Intimate partner violence; mHealth; violence prevention

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Abstract

Introduction: Victims of intimate partner violence (IPV), or those individuals susceptible to IPV victimization or perpetration, may benefit from participation in primary, secondary, or tertiary interventions to address or mitigate exposure to violence despite mixed evidence of IPV intervention effectiveness. However, participation in such programs is limited by poor access, sociocultural barriers, and program cost. As the world fast approaches universal access to the Internet, web-based technologies, and low-cost smartphones, new avenues to provide preventive health services including mobile health (mHealth) tools, platforms, and services have emerged. The objective of this systematic review is to assess current web-based and mHealth interventions, which include web- or mobile-based delivery methods for IPV prevention. Interpersonal violence is defined as perpetration or victimization of a physical, psychological, or sexual nature among adults. Interventions may be at the primary, secondary, or tertiary level of the public health model.

Methods and analysis: This systematic review will incorporate studies focused on any empirical prevention intervention intended for IPV victims or perpetrators of any gender where one or more components is web- or mobile-based. Articles will be retrieved from the following academic databases: MEDLINE/PubMed, Embase, CINAHL, PsycInfo, and Open Grey, as well Google Scholar. Results will be limited to articles reporting primary data, published since 1998, and in English, Spanish, Portuguese, or French. Data extraction procedures will follow PRISMA reporting guidelines. The Mixed Methods Appraisal Tool (MMAT), a critical appraisal tool, will be used to record ratings of quality and risk of bias among studies selected for inclusion. Content analysis and between-study comparisons will be used to answer the objectives of this review.

Ethics and dissemination: Results from this review will be published in an open access format for the benefit of both academic and non-academic audiences, including community organizations and individuals seeking mHealth strategies to reduce and prevent IPV.

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Disclosure: The authors declare no conflicts of interest or competing interests. This research received no funding from agencies in the public, commercial or not-for-profit sectors. EJA is the guarantor of this review.

Author's contributions: EJA, DOG, and MPK were responsible for the conceptualization of the research question, approach, and rationale. EJA and JM developed the methods to be used for this review. CMK and KK provided initial research into existing literature and developed the introduction to this manuscript. EJA prepared the first draft of this manuscript, which was reviewed and revised by MPK and DOG. All authors read and approved the final manuscript.

1. **Strengths and limitations of this study:**

- This article will systematically report on existing mHealth interventions to reduce intimate partner violence across the globe, including those where IPV prevention was not the primary intervention goal.
- The findings will identify the platforms that are most successful in populations studied to date.
- The quality of identified primary, secondary, and tertiary interventions will be assessed using a validated rating approach applicable to both observational studies and randomized control trials
- The review will be limited to languages read and understood by investigators, which may result in exclusions of studies published in other widely-used languages.

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Introduction:

Intimate partner violence (IPV) is defined as any violent or aggressive behavior that occurs in a close relationship between current or former intimate partners, including sexual, physical, or psychological harm that can vary in severity and frequency (1-3). IPV can occur with or without sexual intimacy (4), and may include sexual coercion, sexual touching, refusal to practice safe sex, rape, or other non-consensual sex acts with or without physical contact (2, 3). IPV can also occur in the form of controlling and isolating behaviors such as limiting the victim's contact with friends and family (2, 5). Individuals of any gender may be perpetrators or victims of IPV, though most victims are women and most perpetrators are men (6). Men are more likely to report being victimized by low-impact forms of IPV (e.g., pushing, shoving, verbal abuse) than women but are much more likely to perpetrate severe forms of IPV such as battery (7). Men are much more likely to be studied as perpetrators rather than victims including among sexual minorities (8).

An estimated thirty percent of women around the world have experienced physical and/or sexual IPV during their lifetime (5, 9, 10). However, the prevalence of IPV is difficult to estimate due to incompatible data collection techniques and tools, non-representative sampling techniques, and sociocultural barriers to identifying and disclosing IPV (5). Risk of IPV victimization is elevated in low income and younger populations, those with a history of childhood abuse (11, 12), and among immigrants (13). Most current reports of IPV are limited to female victims of IPV given that women are more likely to experience severe IPV and are in some instances more likely to have culturally appropriate avenues for reporting IPV victimization, although IPV is likely widely underreported across gender (5, 8, 9, 13, 14).

IPV is costly to personal and public health in all global contexts. In addition to the direct short-term health consequences of IPV (e.g. physical injury), long-term impacts can include post-traumatic stress disorder (PTSD), anxiety disorders, and depression (3, 5, 15) as well as chronic physiological conditions in the cardiovascular, gastrointestinal, reproductive, musculoskeletal, and nervous systems (3, 12). Survivors of IPV may also have increased propensity for health risk behaviors such as smoking, binge drinking, recreational drug use, and additional HIV risk factors (15-20). At the community level, IPV puts considerable financial strain on medical and social services including care for IPV-related injuries, mental health services, lost workforce productivity, and increased demand for criminal justice and child welfare services (3). Substantial population and clinic-based evidence shows that overall healthcare consumption is significantly higher among IPV victims, particularly women (1, 21).

Various primary, secondary, and tertiary prevention programs have been developed to prevent IPV exposure and mitigate health and social consequences after exposure. Primary prevention reduces the incidence of a health threat before it occurs (22). Conventional primary prevention programs addressing IPV often consist of school- or community-based healthy relationship programs targeting adolescents and families before victimization or perpetration occur (12, 22, 23). Secondary prevention focuses on early detection after exposure and subsequent treatment in order to triage any resulting negative health consequences or recurrent exposure. Secondary prevention programs addressing IPV include universal IPV screening in healthcare settings, relocation and/or safe-haven shelters for survivors, access to counselling, medical treatment, and legal action to prevent future victimization. Interventions aimed at reducing perpetration include diversion programs that promote anger management and de-escalation tactics for perpetrators. Tertiary prevention includes efforts to mitigate the impacts of previous or current experiences of IPV such as counseling for post-traumatic stress disorder or recidivism reduction and community reintegration programs.

Interest in mobile health (mHealth) to deliver public health interventions across mobile devices has increased across disciplines (24). mHealth tools are usually but not exclusively web-based and often intend to reach audiences that are otherwise reticent to participate in interventions due to the nature of the health issue or barriers to participation (20). Barriers to participation include fear of retribution, embarrassment, non-acknowledgement of abuse or violence, or perceived cultural taboos about addressing violence (25). Protective factors that reduce risk include social support and acceptability of

efforts to reduce IPV (26). These risk and protective factors may be addressed through web-based efforts that do not rely on conventional in-person interventions.

Existing mHealth and web-based interventions to reduce IPV include novel approaches and methods adapted from evidence-based interventions for online delivery. These approaches include an app-based intervention for college students at risk for dating violence (27), educational information to prevent primary, secondary and tertiary victimization of women adapted from an in-person intervention (28). mHealth interventions addressing IPV have been evaluated in observational studies, mixed qualitative and quantitative analyses, and randomized control trials (29, 30). Ownership of internet capable devices is highest in high income countries, where IPV prevention efforts are most likely to be funded or evaluated, though mHealth approaches have been successfully implemented across discipline in low- and middle-income settings (31).

Purpose

To our knowledge, no systematic review has been performed regarding existing mHealth interventions to reduce or mitigate IPV. The purpose of our systematic review is to summarize existing efforts to address IPV using mobile or other web-based programs and to qualitatively assess their influence at each level of the social ecological model: individual, relationship, community, and societal. Our primary objective is to describe how mHealth approaches are being used in IPV prevention using any research approach—quantitative, qualitative, or mixed methods—that provides an empirically interpretable estimate of the contextual impact of mHealth. This review will provide insight into: which populations are being served by mHealth interventions to prevent IPV; what, if any, benefits exist for participants; and locate gaps in the literature related to the use of mHealth to address IPV.

Methods and analysis

This protocol follows the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols) 2015 statement (32); the systematic review will follow both the PRISMA statement and the best practices outlined by the Cochrane Collaboration (33) to ensure transparent reporting.

Inclusion criteria:

Participants

This review will include studies of adults as defined by the study authors (typically 18 years or older) who receive any form of intervention related to IPV primary, secondary, or tertiary prevention with a web-, mobile-, or other technology-based delivery component. Interventions intended for either or both victims and perpetrators are included.

Phenomena of interest

This review will include studies with any sort of intervention regarding primary, secondary, or tertiary prevention of IPV victimization or perpetration and any outcome related to its reduction including barriers and facilitators. The review aims to elucidate characteristics that distinguish web-based IPV prevention programs; make-up of intended audiences, and characteristics of web-based prevention programs result in highest completion and program acceptance. The primary outcome focuses on results of participation in programming where IPV prevention is either a direct or indirect goal of the intervention and contains one or more web-based delivery component. Secondary outcomes of interest are acceptability of different aspects of web-based primary, secondary, or tertiary IPV prevention programs, evaluation of causes of dropout, and evaluation of studies stratified by racial/ethnic/gender group. Interventions that focus on other domains of health behavior (e.g., HIV risk reduction) or relationship health (e.g., couple therapy) that include IPV prevention as a secondary goal or outcome will also be included.

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Context

This review will consider studies that have one or more elements that take place via a web-, mobile-, or other technology-based platform (i.e., one where the outcome of the intervention depended on the use of a platform such as a computer, cell phone, or tablet). No geographic limiters will be considered.

Type of studies

This review will include any sort of study including randomized control trials, quasi-randomized control trials, pre/post assessments, or observational studies that include participant satisfaction data or other outcome data. We will also include relevant cross-sectional surveys if they relate to participation in a qualifying mHealth program or intervention. Both qualitative and quantitative data will be considered. Comparators will be "no intervention", any "pre" data collected before the intervention, and/or routine care. Qualitative studies will be included only if they examined and interpreted a measure such as acceptability.

Exclusion criteria:

Both experimental (RCT) and pre- or quasi-experimental studies will be excluded if their focus includes the following: family or interpersonal violence outside of intimate relationship contexts; use a computer-based delivery method that has no bearing on the outcome of interest (e.g., web-based recruitment for a face-to-face intervention or computer-assisting survey interviewing; and/or are not available in a language read by study authors.

Search strategy

Initial searches were performed in MEDLINE/PubMed and Embase databases using keywords "intimate partner violence", "intervention", and "mHealth" were used to harvest keywords, Mesh and Emtree terms, and publication types from resulting titles and abstracts. The search strategy was iteratively refined to ensure that relevant articles were identified. Both published and unpublished studies will be considered. Only studies published in English, Spanish, Portuguese, or French will be included given capabilities and limitations of the study team.

The following databases will be included in the search: MEDLINE/PubMed, Embase, PsycInfo, CINAHL, and the Cochrane Central Register of Controlled Trials (CENTRAL). Articles published between 1998 and 2019 will be screened. 1998 was selected as the lower date limit because it is unlikely that any web-based health interventions were performed or assessed before that time (34). The first 100 search results from a Google Scholar search performed on the same day as the database search will be included. The search strategy for MEDLINE/PubMed is published in the Appendix. Adaptations to the MEDLINE/PubMed search strategy will be made for each included database in collaboration with the research librarian (JM). Unpublished studies including theses, dissertations, and grey literature will be searched for via the OpenGrey and ProQuest Dissertations and Theses databases. Additionally, the first 100 results from Google Scholar [scholar.google.com] using the specified search terms will be included in review given the high precision and coverage of Google Scholar relative to bibliographic databases (35).

Study selection

Following the search, all identified article information will be collated and uploaded into EndNote X8.2 (Clarivate Analytics, PA, USA) and de-duplicated. Where multiple citations report on the same data, only the most recent or complete citation will be included. Titles and abstracts will be independently screened by two researchers (EJA, CMK, or KK) with the third researcher arbitrating any discordant decisions. Studies marked for potential inclusion will be flagged for full text review. Studies without an abstract will be flagged for full text review. Two researchers will independently screen each of the selected citations for inclusion (EJA, CMK, or KK). Any full-text article that does not meet the inclusion criteria will be recorded along with the reason for exclusion, in accordance with PRISMA guidelines. Any

disagreements between the two independent reviewers assigned to any given article will be resolved through discussion and or arbitration with the third reviewer or else other members of the research team (MPK). The results of the search will be reported in full in the final systematic review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram (32).

Assessment of methodological quality and risk of bias

All studies, regardless of the results of their methodological quality, will undergo data extraction and synthesis (where possible). Individual studies will be scored following AMSTAR 2 guidelines (Assessing the Methodological Quality of Systematic Reviews) (36). The Mixed Methods Appraisal Tool (MMAT) will be used given the likely inclusion of observational studies, qualitative studies, and randomized control trials. The MMAT contains five distinct, validated subscales to evaluate a wide range of empirical studies (i.e., qualitative, quantitative randomized controlled trials, quantitative non-randomized trials, quantitative descriptive, and mixed methods) where each subscale evaluates the methodological quality of the study in question (37).

Data extraction

Included studies will be assessed by two independent reviewers (EJA, CMK, or KK) using a data extraction table created in Excel. The data extracted will include specific details about the populations, context, culture, geographical location, study methods and the phenomena of interest relevant to the review objective, in addition to details of the study design, target population characteristics and sample size, data analysis methods, context (e.g., community-based vs academic), web- or mobile-based intervention delivery methods, measure (i.e., instrument) of IPV used, type/severity of IPV, primary and secondary outcomes of interest, and effect size, where reported. Primary outcomes reported by included experimental studies are likely to include reduction in IPV experiences or rate of entry into care, as well as intervention feasibility in pre- or quasi-experimental studies including pilot studies. Secondary outcomes reported by included trials may include attitudes towards violence or changes in mental wellness scores (e.g., depression). Findings, and their illustrations, will be extracted and assigned a level of credibility. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer (MPK). Authors of papers will be contacted to request missing or additional data, where required.

Data synthesis

Study results and extracted data will be synthesized by categorizing findings based on similarities and differences of meaning and using meta-aggregation (cross-study generalizations). Where possible, assembled findings will be stratified into meaningful categories such as global setting, type of target population, and level of scientific evidence provided (e.g., randomized control trial versus observational study). Findings will be synthesized to produce one comprehensive summary. Tables will be used where possible, followed by qualitative, narrative descriptions of findings. The summary of findings will include the publication title and year, outcome of interest, study type, and context. Comparisons will be made relative to the differences in IPV reporting rates based on population type, measure of IPV prevalence used, and variety in severity/type of IPV experienced by participants (e.g., assessment of the impact of intervention types given the severity of IPV). Due to the likely heterogeneity of study design and populations, no quantitative analysis (e.g., meta-analysis) is planned. However, where experimental studies use the same primary (e.g., IPV experiences) or secondary (e.g., depression or anxiety) outcome measures and instruments, these results will be meta-aggregated and stratified by population type, method of intervention delivery, and/or severity of IPV. Pre- or quasi-experimental studies or studies using qualitative methods will be meta-aggregated where possible based on comparable factors including method of intervention delivery, dropout rate, and intervention characteristics such as participant demographics and length of intervention. Meta-aggregation will be used as the foundation of our data synthesis plan because it estimates the influence of individual studies in terms of their applied significance in the cumulative evidence.

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Ethics and dissemination

The findings of this review may be useful to academic researchers, community-based organizations, and lay activists seeking to reduce or mitigate IPV using novel mHealth platforms, tools, and methods. Our findings may additionally highlight gaps in knowledge about the effectiveness, efficacy, or global applicability of mHealth in IPV prevention.

The systematic review process will follow PRISMA as well as the data extraction processes outlined by the Cochrane Collaboration (32). This review protocol follows the PRISMA protocol (PRISMA-P) guidelines (33). However, given current evidence about the types and locations of conventional IPV prevention interventions, it is unlikely that we will be able to make meaningful inferences about many global populations, including ethnic, racial, gender, or sexual minorities, those from low- or middle-income countries. The inclusion of research librarian (JM) minimizes the possibility of missing any relevant publications, yet language limitations of the study team prevent screening studies published in most languages if no English translation is available.

After completion of this review, we will present our findings at academic meetings and, if relevant, to community-based organizations or partners interested in using mHealth tools to provide IPV prevention services.

In conclusion, this review is the first to assess existing efforts to prevent IPV using one or more mobile elements. The results and discussion will descriptions including integration across studies, abstract conclusions about the state of collected data, advances needed to fill gaps, and recommendations for a future research agenda including the most important deficits that need to be addressed. The resultant information will be helpful for the future development or adaptation of IPV prevention services given an increasing global emphasis on web-based public health prevention efforts.

Patient and Public Involvement: Patient and public involvement are not appropriate for this work. The research question answered in this work will explore patient preference for prevention approaches and the acceptability of web-based interventions in a hard-to-reach population. No patients were recruited for this study; there was no public involvement. The results of this study will be publically disseminated in an open access, peer-reviewed journal that can be accessed by community based organizations or individuals interested in intimate partner violence prevention.

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Appendix: MEDLINE/PubMed Search Strategy

Concept:	**IPV**	**Prevention programs**	**Internet**
MeSH (PubMed/Medline) :	"domestic violence"[MeSH] OR “spouse abuse”[Mesh] OR "Gender-Based Violence"[Mesh] OR "Exposure to Violence"[Mesh] OR "Intimate Partner Violence"[Mesh] OR "Physical Abuse"[Mesh] OR "Battered Women"[Mesh] OR “Conflict (Psychology)”[Mesh] OR “Courtship/psychology”[Mesh] OR “Sexual Partners”[Mesh] OR “Rape”[Mesh] OR “Power”[Mesh]	"Rape/prevention and control"[Mesh] OR "Primary Prevention"[Mesh] OR "Secondary Prevention"[Mesh] OR "Early Intervention (Education)"[Mesh] OR “Crisis intervention”[Mesh] OR "Tertiary Prevention"[Mesh] OR "Risk Reduction Behavior"[Mesh] OR "Behavior Therapy"[Mesh] OR “Counseling/methods”[Mesh] OR “Motivational interviewing”[Mesh] OR “Cognitive Behavioral Therapy”[Mesh] OR "Randomized Controlled Trials as Topic"[Mesh] OR "Randomized Controlled Trial" [Publication Type] OR "Clinical Trials as Topic"[Mesh] OR “Couples therapy”[Mesh] OR “Marital therapy”[Mesh]	"Online Systems"[Mesh] "Online Social Networking"[Mesh] "Mobile Applications"[Mesh] "Smartphone"[Mesh] "Internet"[Mesh] “Telemedicine”[Mesh] “Telecommunications”[Mesh] “computing methodologies”[Mesh] "Social Media"[Mesh]

Text words:	“intimate partner violence” OR “domestic violence” OR “IPV” OR “dating violence” OR “domestic abuse” OR Abuse* OR “wife abuse” OR “spouse abuse” OR “partner abuse” OR “family violence” OR “violence, family” OR “Gender Based Violence” OR “Violence Exposure” OR “Coercive behavior” OR “Physical Maltreatment” OR “Sexual coercion” OR “Battered women” OR “Battered woman” OR	“Primary prevention*” OR “Secondary prevention*” OR “Secondary Preventions” OR “Relapse Prevention*” OR “Early Therapy” OR “Early Therapies” OR “Crisis Intervention*” OR “Critical Incident Stress Debriefing” OR “Risk Reduction Behavior*” OR “Lifestyle Risk Reduction” OR “Risk Reduction” OR “couples therapy” OR “marriage therapy” OR “Marital therapy” OR Diversion OR “Batterer intervention”	Ehealth “Web-based trial*” blue-tooth bluetooth camera cell phone computer computerized digital E-health e-learning elearning “electronic mail” email e-mail Facebook “global positioning” handheld hand-held informatics internet “information system” mhealth m-health mms mobile “mobile health” “mobile phone” NFC Online “Remote care” “Remote consultation” “Remote data” “Remote monitoring” “Short message service” “Sim card*”

10.1136/bmjopen-2019-029880 on 10 August 2019. Downloaded from

	Batter* OR “Abused women” OR “Abused woman” OR Rape OR “sexual violence” OR “sexual assault” OR “sexual aggression” OR "violence against women" OR perpetration		Smartphone Smart-phone Sms Software “Social media” Tablet Telecare Telecommunication Telecomunic* Telecons?ltation Tele-education Tele-learning Telemed* Telemanagement Telematics Telephone Texting Text-messaging Text-message Video Videoconferenc* video-conferenc* virtual reality virtual Web “Web service” web-based Whatsapp wireless
Results	267589 – Feb 4, 2019	1788818– Feb 4, 2019	2090705 — Feb 4, 2019
Results from all: 2581			

("domestic violence"[MeSH] OR “spouse abuse”[Mesh] OR "Gender-Based Violence"[Mesh] OR "Exposure to Violence"[Mesh] OR "Intimate Partner Violence"[Mesh] OR "Physical Abuse"[Mesh] OR "Battered Women"[Mesh] OR “Conflict (Psychology)”[Mesh] OR “Courtship/psychology”[Mesh] OR “Sexual Partners”[Mesh] OR “Rape”[Mesh] OR "Power"[Mesh] OR “intimate partner violence” OR “domestic violence” OR “IPV” OR “dating violence” OR “domestic abuse” OR Abuse* OR “wife abuse” OR “spouse abuse” OR “partner abuse” OR “family violence” OR “violence, family” OR “Gender Based Violence” OR “Violence Exposure” OR “Coercive behavior” OR “Physical Maltreatment” OR “Sexual coercion” OR “Battered women” OR “Battered woman” OR Batter* OR “Abused women” OR “Abused woman” OR Rape OR “sexual violence” OR “sexual assault” OR “sexual aggression” OR "violence against women" OR "perpetration") AND (Technology[Mesh] OR "Online Systems"[Mesh] OR "Online Social Networking"[Mesh] OR "Mobile Applications"[Mesh] OR "Smartphone"[Mesh] OR "Internet"[Mesh] OR “Telemedicine”[Mesh] OR “Telecommunications”[Mesh] OR “computing methodologies”[Mesh] OR "Social Media"[Mesh] OR Ehealth OR “Web-based trial*” OR bluetooth OR bluetooth OR camera OR "cell phone" OR computer OR computerized OR digital OR E-health OR e-learning OR eleaning OR “electronic-mail” OR email OR e-mail OR Facebook OR “global positioning” OR handheld OR hand-held OR informatics OR Internet OR “information system” OR mhealth OR m-health OR mms OR mobile OR “mobile health” OR “mobile phone” OR NFC OR Online OR “Remote care” OR “Remote consultation” OR “Remote data” OR “Remote monitoring” OR “Short message service” OR “Sim card*” OR Smartphone OR Smart-phone OR Sms OR Software OR “Social media” OR Tablet OR Telecare OR Telecommunication OR Teleconferenc* OR Teleconsultation OR Tele-education OR Tele-learning OR Telemed* OR Telemanagement OR Telematics OR Telephone OR Texting OR Text-messaging OR Text-message OR Video OR videoconference OR video-conference OR videoconferencing OR video-conferencing OR "virtual reality" OR virtual OR Web OR “Web service” OR web-based OR Whatsapp OR wireless) AND ("Rape/prevention and control"[Mesh] OR "Primary Prevention"[Mesh] OR "Secondary Prevention"[Mesh] OR "Early Intervention (Education)"[Mesh] OR “Crisis intervention”[Mesh] OR "Tertiary Prevention"[Mesh] OR "Risk Reduction Behavior"[Mesh] OR "Behavior Therapy"[Mesh] OR “Counseling/methods”[Mesh] OR “Motivational interviewing”[Mesh] OR “Cognitive Behavioral Therapy”[Mesh] OR "Randomized Controlled Trials as Topic"[Mesh] OR "Randomized Controlled Trial" [Publication Type] OR "Clinical Trials as Topic"[Mesh] OR “Couples therapy”[Mesh] OR “Marital therapy”[Mesh] OR “Primary prevention*” OR “Secondary prevention*” OR “Relapse Prevention*” OR “Early Therapy” OR “Early Therapies” OR “Crisis Intervention*” OR “Critical Incident Stress Debriefing” OR “Risk Reduction Behaviors” OR “Lifestyle Risk Reduction*” OR “Risk Reduction*” OR “couples therapy” OR “marriage therapy” OR “Marital therapy” OR Diversion OR “Batterer intervention”

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	n/a
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	2
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	1
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	n/a
Support:			
Sources	5a	Indicate sources of financial or other support for the review	2
Sponsor	5b	Provide name for the review funder and/or sponsor	2
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	n/a
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	4
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	4,5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	5

Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	Appendix
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	6
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	6
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	6
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	6
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	6
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	6
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	6
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	n/a
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	n/a
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	6
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	6
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	6

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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