FHI
Folkehelseinstituttet

RAPPORT

2022

FORSKNINGSKARTLEGGING

Et forskningskart over randomiserte studier og systematiske oversikter for selvhjelpsapper

Utgitt av	Folkehelseinstituttet Område for helsetjenester
Tittel	Et forskningskart over randomiserte studier og systematiske oversikter for selvhjelpsapper
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Ansvarlig	Camilla Stoltenberg, direktør
Forfattere	Heather Ames, prosjektleder Henriette Tyse Nygård Maria Bjerk
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Innhold

Hovedbudskap

I tråd med FNs bærekraftsmål skal tidlig død på grunn av ikke-smittsomme sykdommer reduseres med 30 % innen 2030. Hensikten med dette forskningskartet er å kartlegge omfanget av forskning om effekt av apper som blir brukt som selvhjelpsverktøy innen helse, samt å avdekke eventuelle kunnskapshull.

Et forskningskart oppsummerer, sorterer og synliggjør den tilgjengelige forskningen om en bred problemstilling, men sier ingenting om effekten av tiltakene som studeres.

Vi identifiserte totalt 12886 referanser, hvorav vi inkluderte og kodet 802.

- Det finnes et bredt utvalg av randomiserte studier og systematiske oversikter om effekt av apper som selvhjelpsverktøy innen helse (n=802).
- En stor andel av studiene var små, med mindre enn 99 deltakere.
- 50 % av studiene var publisert de siste to årene.
- Det er flest studier som undersøker effekten på fysisk helse.
- Utfallet som var med i flest studier var endringer i symptomer/tilstand.

Apper som selvhjelpsverktøy er et felt i rask endring og vekst. Det er sannsynlig at dette forskningskartet vil være utdatert i løpet av relativt kort tid.

Lenker til interaktive forskningskart:
EPPI Mapper: www.nornesk.no/forskningskart-selvhjepsapper/forskningskart-selvhjelpsapper.html
EPPI-Vis: https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=153

Tittel:
Et forskningskart over randomiserte studier og systematiske oversikter for selvhjelpsapper

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Hvem står bak denne publikasjonen?
Folkehelseinstituttet, på oppdrag fra Helsedirektoratet

Når ble litteratursøket avsluttet?
Desember, 2021

Fagfellevurdering:
Signe Flottorp, FHI

Karianne Fredenfeldt Lind, Forskningsbibliotekar, Nasjonalt Senter for e-helseforskning

Celia Nilssen, Seniorrådgiver, Nasjonalt Senter for e-helseforskning

Key messages

One of the UNs Sustainable Development Goals is to reduce early death due to non-communicable disease by 30% by 2030. The aim of this evidence and gap map is to provide an overview of research about the effect of health-related self-help apps that are used as tools to improve health and identify any eventual evidence gaps.

An evidence and gap map (EGM) is a systematic evidence synthesis product that categorises and displays the available evidence relevant to a broad research question. It cannot say anything about the effectiveness of the apps themselves. We identified a total of 12 886 references. 802 met our inclusion criteria, were coded, and included in this map.

- There is a wide variety of randomized trials and systematic reviews on the effect of health-related apps as self-help tools (n=802).
- A large portion of these studies were small with less than 99 participants.
- 50% of the studies were published in the last two years.
- Most of the studies look at physical health.
- The outcome that was present in the most studies was related to changes insymptoms/ state.

Health related self-help apps are a field in rapid development and change. It is very likely that this evidence and gap map will become outdated in a short period of time.

Links to the interactive evidence and gap maps:
EPPI Mapper: www.nornesk.no/forskningskart-selvhjepsapper/forskningskart-selvhjelpsapper.html
EPPI-Vis: https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=153

Title:
An evidence and gap map of randomized trials and systematic reviews for self-help apps

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Publisher:
The Norwegian Institute of Public Health conducted the evidence and gap map based on a commission from the Norwegian Directorate of Health

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Updated:
Last search for studies: December, 2021

Peer review:
Signe Flottorp, NIPH

Karianne Fredenfeldt Lind, Research librarian, Norwegian Centre for E-health Research

Celia Nilssen, Senior advisor, Norwegian Centre for E-health Research

Forord

Område for helsetjenester, Folkehelseinstituttet (FHI), fikk i oktober 2021 i oppdrag av Helsedirektoratet å utarbeide et forskningskart over forskning om apper som selvhjelpsverktøy for å forbedre helse. Helsedirektoratet, Direktoratet for eHelse og Norsk helsenett SF (NHN) skal utrede en nasjonal godkjenningsordning for denne typen apper. Det er viktig å kartlegge hva som finnes av forskning om effekt av selvhjelpsapper og hva appene blir brukt til.

Område for helsetjenester, FHI, følger en felles framgangsmåte i arbeidet med forskningskart, dokumentert i håndboka «Slik oppsummerer vi forskning». Det innebærer blant annet at vi kan bruke standardformuleringer når vi beskriver metode, resultater og i diskusjon av funnene.

Bidragsytere
Prosjektleder: Heather Ames
Interne prosjektmedarbeidere ved FHI:
Henriette Tyse Nygård
Maria Bjerk
Elisabet Hafstad

Takk til eksterne fagfeller Karianne Fredenfeldt Lind og Celia Nilssen, Nasjonalt Senter for e-helseforskning og intern fagfelle Signe Flottorp som har gjennomgått og gitt innspill til kunnskapsoppsummeringen. Takk til Ashley Muller og maskinlæringslaget for hjelp med maskinlæringsfunksjoner.

Oppgitte interessekonflikter
Alle forfattere og fagfeller har fylt ut et skjema som kartlegger mulige interessekonflikter. Ingen oppgir interessekonflikter.

Folkehelseinstituttet tar det fulle ansvaret for innholdet i rapporten.

Kåre Birger Hagen	Hege Kornør	Heather Ames
fagdirektør	*avdelingsdirektør*	*prosjektleder*

Innledning

I tråd med FNs bærekraftsmål skal tidlig død på grunn av ikke-smittsomme sykdommer reduseres med 30 % innen 2030. For å nå målet kreves det strategier for helsefremmende og forebyggende tiltak for somatisk og psykisk sykdom. Det er bred tverrpolitisk enighet om tre overordnede nasjonale mål for folkehelsearbeidet:

1. Norge skal være blant de tre landene i verden som har høyest levealder.
2. Befolkningen skal oppleve flere leveår med god helse og trivsel og reduserte sosiale helseforskjeller.
3. Vi skal skape et samfunn som fremmer helse i hele befolkningen (1).

Folkehelse er definert som befolkningens helsetilstand og hvordan helsen fordeler seg i befolkningen. Folkehelsearbeid er samfunnets innsats for å påvirke faktorer som direkte eller indirekte fremmer befolkningens somatiske og psykiske helse. Dette gjøres gjennom tiltak for forebygging, habilitering og rehabilitering (2;3).

Nasjonal e-helsestrategi 2017-2022 slår fast at Norge ønsker innovative helsetjenester som setter innbyggeren i sentrum. Mennesker er ressurser og det skal tilrettelegges for at innbyggerne kan bidra i egen behandling (4).

Den forventede levealderen i Norge er blant verdens høyeste. Helsetilstanden er i hovedsak god, men det er rom for bedring. I løpet av et år vil én av fem voksne oppleve psykisk lidelse. Angst og depresjon er de mest utbredte. For mange debuterer det i ung alder og kan ha et langvarig forløp. Hvert år begår mellom 550 og 600 mennesker selvmord, ca. halvparten av disse er under 50 år (1). Psykisk og fysisk helse må sees under ett. Personer med psykiske lidelser er mer utsatt for dårligere fysisk helse. En del personer med dårlig fysisk helse utvikler depresjon og angst som kan gjøre livsstilsendringer som for eksempel vektreduksjon vanskeligere (4). Kreft og hjerte- og karsykdom er de to hyppigste dødsårsakene i Norge. Dette kan i mange tilfeller sees i sammenheng med livstil. Det er cirka 10 % av befolkningen som røyker fast. Mange er lite fysisk aktive og har høyt inntak av sukker. Andelen som har fedme, øker i befolkingen. Det samme gjør andelen som lever med diabetes (1).

Hvorfor er det viktig å utføre dette forskningskartet?

Det foregår mye innovasjon og utprøving av selvhjelpsapper. I dag finnes apper som skal hjelpe folk å hjelpe seg selv med en rekke utfordringer. For at Helsedirektoratet, Direktoratet for e-helse og Norsk helsenett SF (NHN) skal kunne fortsette sitt arbeid med en nasjonal godkjenningsordning for denne typen apper er det viktig å kartlegge hva som finnes av forsking om effekt av denne type verktøy og hva de er brukt til.

Mål og problemstilling

Med bakgrunn i dette ønsket Helsedirektoratet å kartlegge omfanget av forskning på effekter av ulike selvhjelpsapper som brukes for mestring av kronisk sykdom, endring av livstil (som for eksempel ved røykeslutt) og forebygging av sykdom.

Hensikten med dette forskningskartet, var å få en oversikt over eksisterende forskning om effekt av selvhjelpsapper, definert som selvhjelpsverktøy for å leve med kronisk sykdom, fremme helse, gjøre livsstilsendringer og forebygge sykdom. Det var også et mål å avdekke mulige kunnskapshull.

Det var *ikke* et mål å undersøke effekter av selhjelpsappene.

Metode

Et forskningskart er et systematisk kunnskapsoppsummeringsprodukt som synliggjør den tilgjengelige forskningen som gjelder et spesifikt, bredere forskningsspørsmål. Denne typen forskningskartlegging egner seg særlig godt til å identifisere kunnskapshull, da den forutsetter et forhåndsbestemt konseptuelt rammeverk for hvilket forskningstema og hvilke typer forskningsdesign som skal kartlegges. Metoden innebærer i dette forskningskartet systematiske litteratursøk, utvelgelse av studier basert på vurdering av sammendrag opp mot forhåndsbestemte inklusjonskriterier og koding av inkluderte studier innenfor et forhåndsbestemt rammeverk.

I utarbeidelsen av dette forskningskartet brukte vi de metodene som framgår av den publiserte prosjektplanen (5), basert på FHIs metodebok (6) og Campbell Collaborations retningslinje for forskningskart (7;8).

Prosjektplan

Vi avklarte prosjektplanen med oppdragsgiver før vi utførte oppsummeringen. Prosjektplanen er tilgjengelig fra: https://www.fhi.no/cristin-prosjekter/aktiv/et-forskningskart-over-kontrollerte-studier-og-systematiske-oversikter-av-k/

På grunn av begrenset tidsramme for prosjektet og et stort antall studier som oppfylte inklusjonskriteriene var vi nødt til å gjøre noen avvik fra prosjektplanen. Det ene var at vi valgte ikke å gjennomgå de inkluderte studiene i de systematiske oversiktene (n=120). Det andre var at vi i samråd med oppdragsgiver endret noen av kodene i kodeboken slik at de i større grad beskrev dataene i de inkluderte studiene.

Inklusjonskriterier

Vi brukte følgende inklusjonskriterier:

Studiedesign	Randomiserte studier (RCTer) Systematiske oversikter over RCTer
Populasjon	Voksne, 18 år og eldre
Intervensjoner/ eksponering	Selvhjelpsapper* som gir støtte, veiledning, læring eller øvelser til mestring, egenomsorg og/eller livsstilsendring for:

	· Røykeslutt · Alkoholforbruk · Kostregulering · Vektnedgang · Fysisk aktivitet · Mestring av kronisk sykdom · Mestring av psykisk lidelse · Forebygging av kroniske sykdommer · Forebygging av psykiske lidelser
Sammenlikninger	• Standard behandling/ oppfølging som for eksempel oppmøtebaserte kurs eller veiledning, i eller utenfor helsetjenesten • Ingen behandling/tiltak • En annen app
Utfall	Etterlevelse av medikamentbruken (i hvilken grad pasienten bruker legemidlene slik det er avtalt) Etterlevelse anbefalinger livsstil, for eksempel: · Røykeslutt · Kosthold · Holde avtaler med helsetjenesten · Fysisk aktivitet · Vektreduksjon Bedre generell livskvalitet/velvære, for eksempel: · Livskvalitet · Søvn · Utbrenthet · Selvfølelse · Empati · Oppmerksomt nærvær · Sosial støtte · Motivasjon til å være sosial Reduserte symptomer, for eksempel: · Posttraumatisk stresslidelse (PTSD) · Depresjon · Smerte · Angst · Plager ved symptomer · Mental helse · Stress · Kontroll astma · Hyppighet migrene Bedre mestring av sykdom, for eksempel: · Opplevelse av mestringsevne

	· Evne til selvledelse Kunnskap
Publikasjonsår	2012-2021
Land/kontekst	Ingen begrensning
Språk	Engelsk
Studiestatus	Publisert
Annet	*Begrenset til apper som er offentlig tilgjengelig og ikke er utviklet spesifikt for medisinsk oppfølging (helsearbeidere kontrollerer appen eller appen sender data direkte til helsetjenester). Kun de som er tilgjengelig som nedlastbare apper

Eksklusjonskriterier

Vi ekskluderte studier og publikasjoner som:

- Tiltaket var «chat»-apper som Wechat og Whatsapp
- Appen var helsetjenestestyrt
- RCTer så på en applikasjon som var kombinert med støtte fra helsevesenet
- Appen var kombinert med annet utstyr som måtte kjøpes, for eksempel en fitbit
- Konferansesammendrag
- Protokoller og pågående studier

Litteratursøk

Søk i databaser

Vi søkte systematisk etter litteratur i følgende databaser:

· APA PsycINFO (Ovid)	SR + RCT
· Cochrane Central Register of Controlled Trials (Wiley)	RCT
· Cochrane Database of Systematic Reviews (Wiley)	SR
· Epistemonikos (Epistemonikos Foundation)	SR
· MEDLINE (Ovid)	SR + RCT
· Microsoft Academic (via EPPI-Reviewer)	SR + RCT

SR: systematisk oversikt; RCT: randomisert kontrollert studie

Bibliotekar Elisabet Hafstad (EH) planla søkestrategi i samarbeid med prosjektgruppa og utførte deretter samtlige søk (vedlegg 1). Bibliotekar Lien Nguyen fagfellevurderte søkestrategien.
Søk etter studier ble avsluttet i desember 2021.

Vi la bestillingen til grunn for utarbeiding av litteratursøket og søkte etter studier som oppfylte våre inklusjonskriterier.

Siden populasjonen (voksne) var uspesifisert og utfallene var utfordrende å operasjonalisere for søk, ble søket strukturert rundt to konsepter: (selvhjelps)apper og studiedesign, henholdsvis systematiske oversikter/metodevurderinger (SR) og randomiserte studier (RCTer). Hvert søkekonsept ble bygget opp av kontrollerte emneord (f.eks. Medical Subject Headings) og tekstord, dvs. synonymer og varianter av ord i tittel, sammendrag og forfatters nøkkelord, innbyrdes kombinert med boolsk operator "OR". De to søkekonseptene ble deretter koblet sammen ved hjelp av boolsk operator "AND".

Den delen av søket som gjelder apper, ble en forenkling og modifisering av Ayiku og medarbeidere sitt validerte filter for helseapper (9). Etter avtale med oppdragsgiver, benyttet vi kun den delen av filteret som bruker ordene app eller applikasjon.

Hvert søk ble tilpasset de respektive databasenes funksjonalitet og grensesnitt. Søk i Microsoft Academic via EPPI-Reviewer (10;11) ble basert på 57 inkluderte artikler fra et testsøk i MEDLINE (nærmere beskrevet nedenfor), og foregikk ved at programvaren innhentet referanser som lignet de inkluderte og som ikke var identifisert blant de øvrige søketreffene.

Vi samlet søketreffene (unntatt fra Microsoft Academic) i EndNote (12), og fjernet dubletter ved en kombinasjon av halvautomatisert og manuell gjennomgang. Deretter eksporterte vi de unike referansene til EPPI-Reviewer for screening.

Testsøk

I tråd med Campbell Collaborations anbefalinger for forskningskart (7;8), gjennomførte bibliotekaren (EH) et testsøk i MEDLINE (1875 søketreff fra 2021). Heather Ames (HA) kjørte en «study design classifier» for å identifisere randomiserte kontrollerte studier (RCTer) i EPPI-Reviewer (10). Studier predikert >50 % sannsynlig til å være RCTer var kjørt gjennom en rangeringsalgoritme, «priority screening», for å vurderes manuelt av forskere. HA og Henriette Tyse Nygård (HN) screenet deretter de første 125 referansene for å kartlegge hva slags forskning som finnes og begynne å sette opp kategoriene for populasjon, utfall og antall deltakere for sortering i kartet. Vi brukte også resultatene fra piloteringen for å endelig fastsette inklusjonskriteriene med oppdragsgiver.

Søk i andre kilder

På grunn av begrenset tid til prosjektet og stort søketreff i databasene og MAG søkte vi ikke i andre kilder.

Utvelging av studier

I tråd med prosjektplanen ble studiene vurdert opp mot inklusjonskriteriene på grunnlag av tittel og sammendrag. Publikasjonene ble ikke vurdert i fullteksts. To prosjektmedarbeidere gjorde uavhengige vurderinger. Uenighet om vurderingene av tit-

tel/sammendrag ble løst ved diskusjon eller ved å konferere med en tredje prosjektmedarbeider. Vi brukte det elektroniske verktøyet Eppi-Reviewer (10;11) i utvelgelsesprosessen.

Vi brukte maskinlæringsfunksjoner for å vurdere titler og sammendrag mer effektivt. Se Vedlegg 3 om avansert maskinlæring for ytterligere detaljer.

Se flytdiagram (figur 1) for oversikt fra identifisering av studier fra databasene til endelig inklusjon på tittel- og sammendragsnivå. Flytdiagrammet viser også antall referansene som ble vurdert av prosjektmedarbeidere og antall som ble maskinvurdert (vurdert av den opplærte algoritmen).

Vurdering av risiko for systematiske skjevheter

På grunn av rammene for prosjektet vurderte vi ikke risiko for systematiske skjevheter i de inkluderte studiene.

Uthenting av data

To prosjektmedarbeidere har, uavhengig av hverandre, kategorisert de utvalgte oversiktene og primærstudiene basert på sammendrag i det digitale verktøyet EPPI-Reviewer (12). Ved konflikter har de to personene løst disse i fellesskap. Ved ytterligere uenighet har vi konferert med en tredje prosjektmedarbeider for å bidra til enighet.

Vi har ikke samlet data om resultater og derfor heller ikke har syntetisert resultatene. Kartet kan ikke si noe om effekt av appene.

Studiekarakteristika

Vi hentet ut følgende studiekarakteristika fra de inkluderte studiene: forfatter (e), publikasjonsår, studiedesign, type intervensjon (appens mål), utfall gruppert i brede kategorier, antall deltakere i studien og et begrenset antall diagnoser/tilstander. Siden inklusjonen var basert på tittel og sammendrag var datauthentingen forenklet og mindre detaljert. Datauthentingen var derfor begrenset til det som var rapportert i sammendraget.

Kodebok

Utviklingen av en kodebok var en del av prosjektet (Vedlegg 2). Hensikten med kodeboken var at prosjektmedarbeiderne skulle ha en felles forståelse for hvordan kodene skulle brukes. Kodeboken skulle derfor spesifisere hvilke hoved- og underkategorier som skulle inngå i forskningskartets akser, filter og segmenter, med definisjoner og eksempler.

Prosjektgruppen ved FHI laget et forslag til kodebok basert på kategorier som ble brukt i relevante publikasjoner identifisert gjennom prøvesøket og screening. Prosjektgruppen ferdigstilte kodeboken basert på innspill fra fageksperter og oppdragsgiver, og piloterte den på et utvalg studier.

Vi endret noen av kodene underveis i kodingen for å bedre reflektere dataene de inkluderer. Et eksempel på dette er at vi endret "mestring av kronisk sykdom" til "mestring av kronisk sykdom/tilstand". Vi la til en ekstra kode, "mestring av psykisk lidelse". I samråd med oppdragsgiver la vi til filter for "depresjon" og "overvekt og fedme" basert på trendene i dataene.

Kategoriene vi har brukt i kodingen er:

- Studiedesign (RCT/SR)
- Antall deltakere (0-99/100-499/500+/ikke rapportert)
- Utfall (Etterlevelse medikamenter/ Etterlevelse anbefalinger livsstil/ Bedre generell livskvalitet/velvære/ Endring i symptomer/tilstand/ Bedre mestringsforventning)
- Diagnoser/tilstander (Kreft/ Diabetes/ Gravid og postpartum/ Hypertensjon/Blodtrykk/ Depresjon/ Overvekt og fedme (obesity))

Vi hadde ikke mulighet til å kode alle typer tilstander og diagnoser på grunn av prosjektets tidsramme. I samråd med oppdragsgiver valgte vi derfor ut de tilstander og diagnoser som var mest relevant for dem.

Presentasjon

Vi hentet ut forekomster av studier fordelt på de ulike kategoriene ved hjelp av frekvens- og krysstabellfunksjoner i EPPI-Vis.

Digital formidlingsplattform

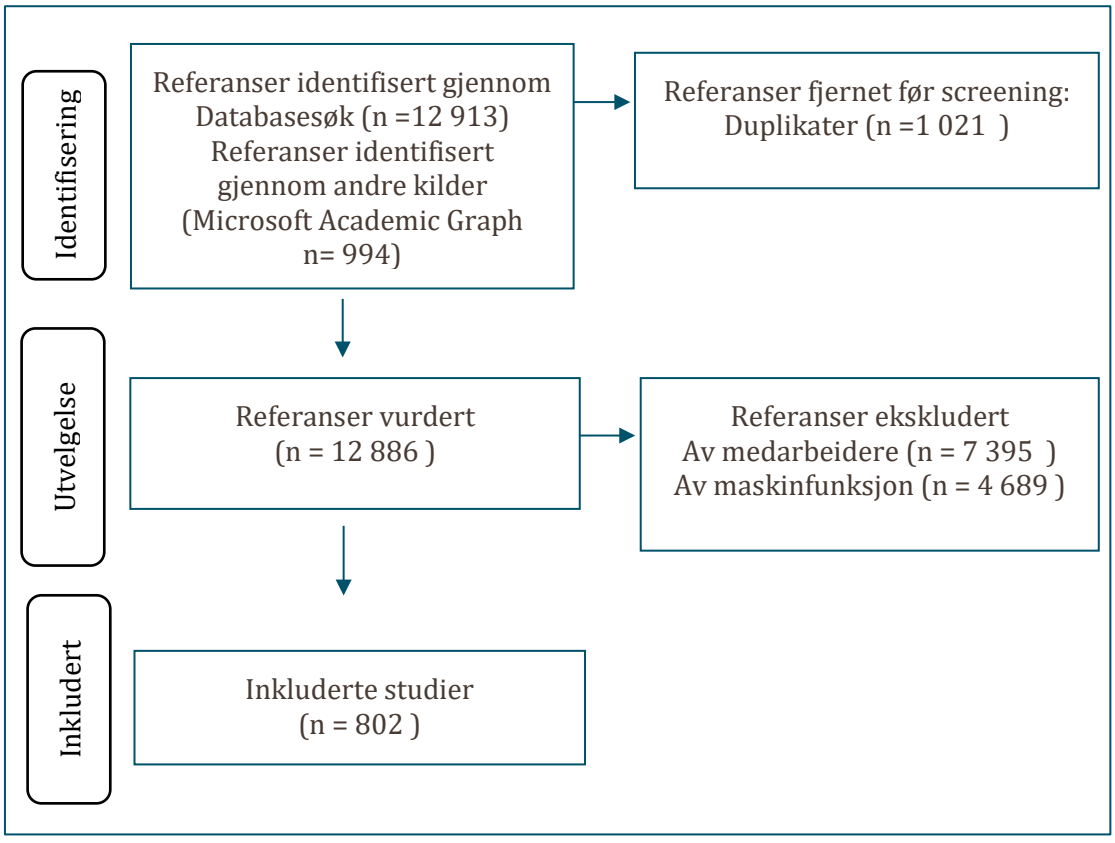
Vi eksporterte dataene fra EPPI-Reviewer i form av en .json-fil, som vi lastet opp i programvaren EPPI-Mapper (13). Herfra genererte vi en html-fil som, når den åpnes i Google Chrome, viser et interaktivt forskningskart. Intervensjoner/eksponering og antall deltaker presenteres i hver sin akse i det interaktive, nettbaserte forskningskartet. Forskningskartet angir antall studier som er RCTer eller systematiske oversikter for hver kombinasjon av de to hovedkategoriene med underkategorier. Forskningskartet kan filtreres på utfall grupper (etterlevelse medikamenter, etterlevelse anbefalinger livsstil, bedre generell livskvalitet/velvære, endring i symptomer/tilstand, bedre mestringsforventning) og diagnoser/tilstander (kreft, diabetes, gravid/post partum, blodtrykk/hypertensjon, depresjon og overvekt/fedme).

I tillegg lagde vi ytterligere forskningskart ved bruk av EPPI-Reviewers nye «EPPI Vis» funksjon.

Resultater

Resultater av litteratursøket og utvelgelse av studier

Databasesøkene ga 12 913 treff før fjerning av dubletter (figur 1). Etter fjerning av dubletter satt vi igjen med 12 886 referanser. Av disse ekskluderte vi 12 084 referanser som åpenbart ikke oppfylte inklusjonskriteriene våre. Vi inkluderte 802 studier på grunnlag av tittel og sammendrag.

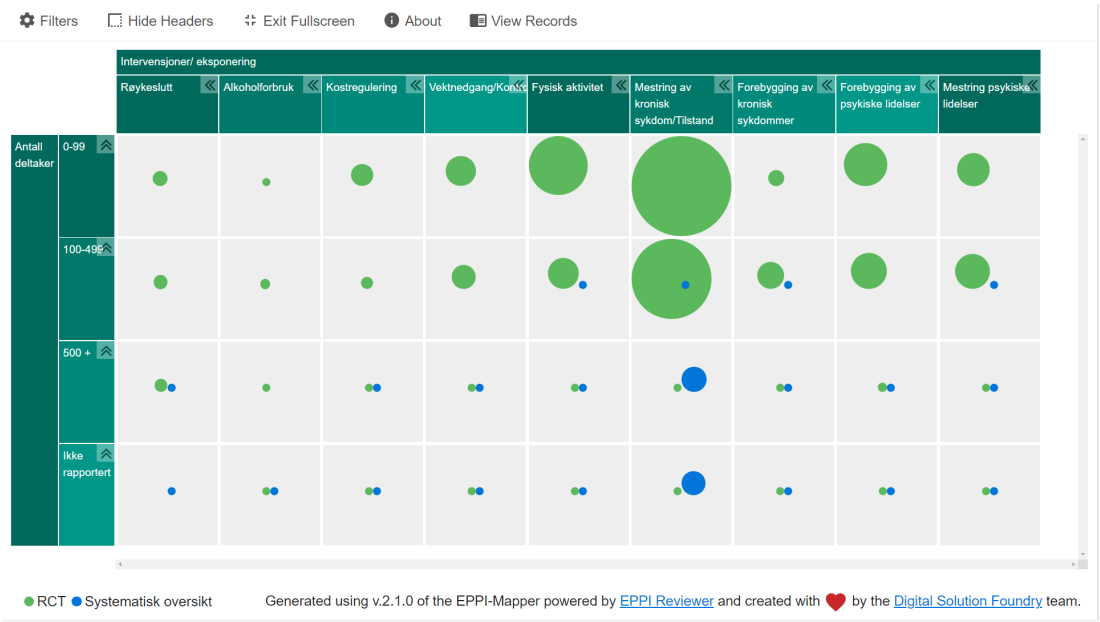


Figur 1: *Flytdiagram over utvelgelse av studier*

Interaktivt forskningskart

Forskningskartet viser antall RCTer og SRer som rapporterer om effekt av de ulike intervensjonene/eksponeringene. De grønne boblene er RCTer og de blå er SRer. Størrelsen på boblene sier noe om antall studier som er funnet. Kartet deler videre inn etter størrelsen på studien. Et eksempel er at den store grønne boblen tilhørende kategorien «Mestring av kronisk sykdom/tilstand» viser at det er mange RCTer og ingen SR som har 0-99 deltakere.

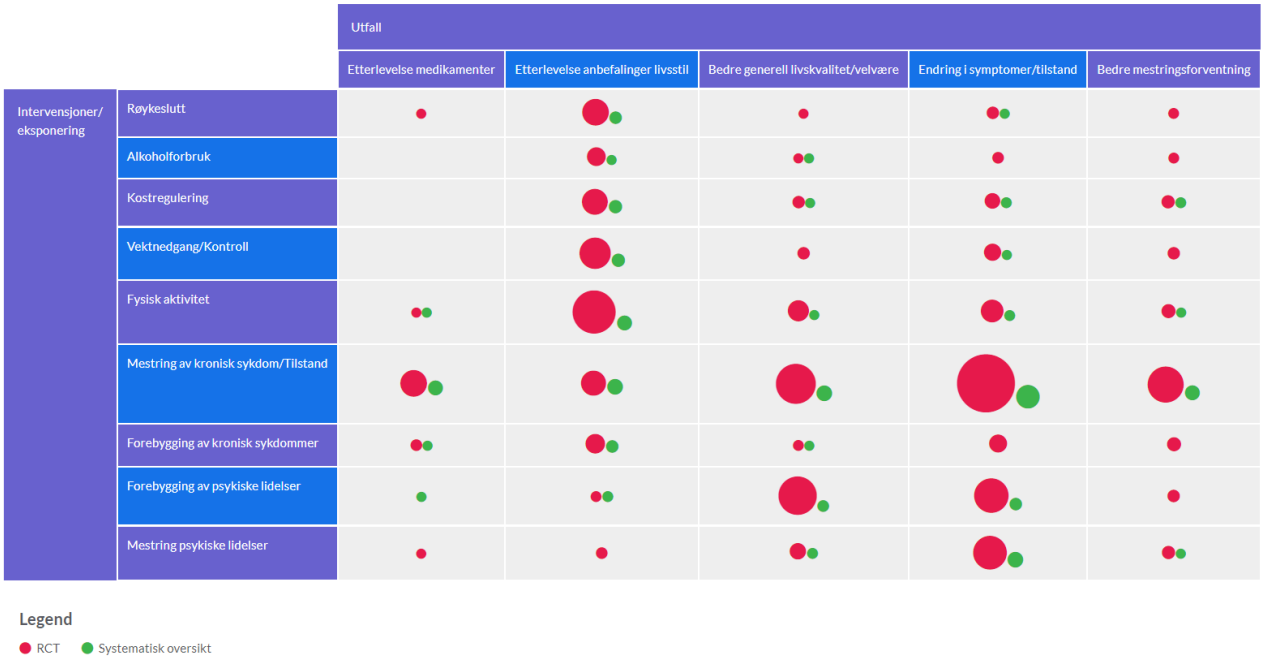
Hvis man fører pekeren over en av boblene i kartet, vises en liste over antall per størrelse og intervensjon/eksponering. Ved å klikke på en boble kommer man til en referanseliste over studiene, hvor man kan klikke seg videre til originalkilden. Det er også mulig å filtrere kartet på diagnoser/tilstand (kreft, diabetes, hypertensjon/blodtrykk, depresjon, overvekt/fedme og gravid/post partum) og utfall (etterlevelse medikamenter/ etterlevelse anbefalinger livsstil/ bedre generell livskvalitet/velvære/ endring i symptomer/tilstand/ bedre mestringsforventning). For å gjøre det, velg «Filters» øverst til venstre over kartet. Hak av for eksempel depresjon og trykk «update» oppe i det blå båndet øverst på siden. Kartet vil nå kun vise de studiene som er kodet med depresjon.



Figur 2. *Bilde av interaktivt forskningskart i EPPI Mapper (*www.nornesk.no/forskningskart-selvhjepsapper/forskningskart-selvhjelpsapper.html)

I EPPI-Vis kan brukeren selv sette opp forskningskart ved å bestemme hvilke koder en vil ha med i kartet. Tilgang til prosjektet i EPPI-Vis er her: https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=153

Figur 3. *Kart 1 fra EPPI-Vis (intervensjoner/eksponering vs. antall deltaker).*



Figur 4. *Kart 2 fra Eppi-Vis (intervensjoner/eksponering vs. utfall).*

Studiekarakteristika

Vi inkluderte 802 studier i denne oversikten, 682 (85 %) randomiserte kontrollerte studier og 120 (15 %) systematiske oversikter (figur 5). Totalt antall studier i tabeller og figurer kan likevel være noe større siden noen av de er kodet med flere intervensjoner og har utfall på tvers av kategoriene.

Figur 5. *Antall studier fordelt på studiedesign.*

Tema for appene fordelt på studiedesign

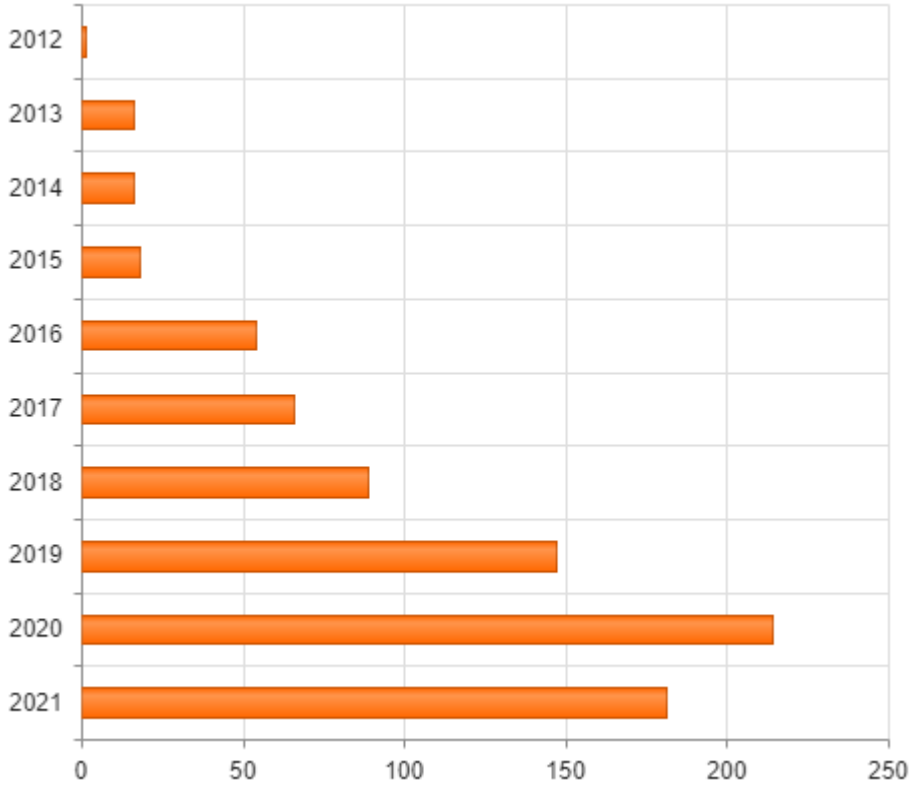
Det var flest RCTer som omhandlet mestring av kronisk sykdom/tilstand (212 studier), fysisk aktivitet (109 studier) og forebygging av psykiske lidelser (104 studier) (tabell 1). Det var flest systematiske oversikter som omhandlet mestring av kronisk sykdom/tilstand (56 studier). Det var kun få apper som ble kodet under tema alkoholforbruk innen begge studiedesign (26 RCT, 2 SR).

Tabell 1. Tema for appene fordelt på studiedesign.

	RCT	Systematisk oversikt
Røykeslutt	46	7
Alkoholforbruk	26	2
Kostregulering	46	10
Vektnedgang/Kontroll	61	9
Fysisk aktivitet	109	13
Mestring av kronisk sykdom/Tilstand	212	56
Forebygging av kronisk sykdommer	53	8
Mestring psykiske lidelser	79	17
Forebygging av psykiske lidelser	104	9

Publikasjonsår

De inkluderte studiene var publisert mellom 2012 og 2021 (figur 6). Det er en økende trend av publiserte studier, særlig fra 2016 og utover. Det er noen færre studier publisert i 2021 i forhold til 2020, men det er mulig at vi ikke har fått med alle studier fra 2021 da søket ble utført i desember.

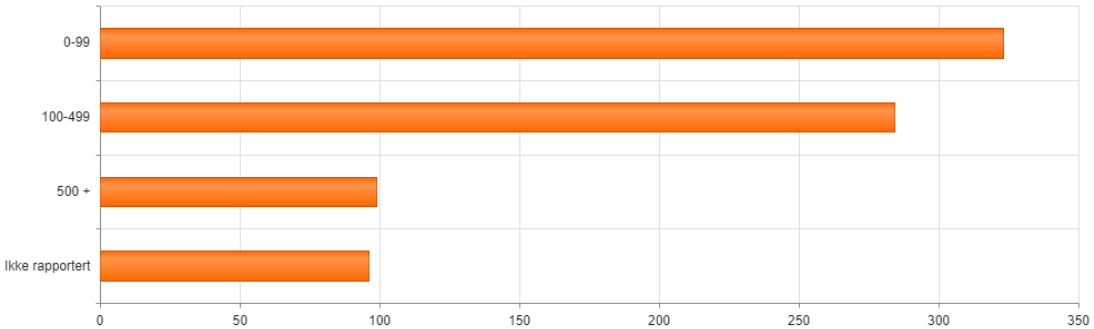


Figur 6. *Antall studier fordelt på publikasjonsår.*

Populasjoner

Antall deltakere

Antall deltakere i de ulike studiene ble delt opp i fire grupper; 0-99, 100-499, 500+ og ikke rapportert. Det er flest studier i gruppen 0-99 deltakere, etterfulgt av gruppen 100-499 deltakere (figur 7). Det er kun cirka 100 studier med 500+ deltakere.



Figur 7. *Antall deltakere*

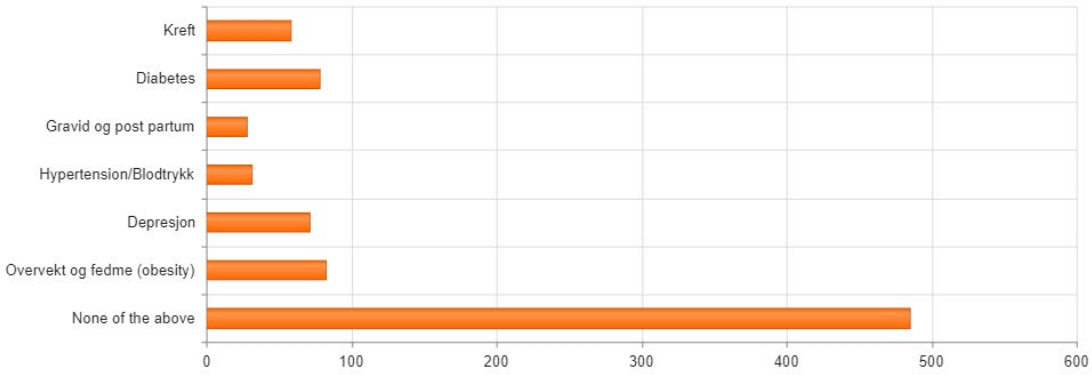
Det er flest RCTer med få deltakere, i gruppene 0-99 og 100-499 (tabell 2). Når det gjelder systematiske oversikter er det generelt flere deltakere, men de fleste er i gruppen 'ikke rapportert'.

Tabell 2. Antall deltakere versus studiedesign

	0-99	100-499	500 +	Ikke rapportert
RCT	325	279	53	33
Systematisk oversikt	0	7	47	66

Diagnose/tilstandsgrupper

Populasjonene i de inkluderte studiene var voksne fra 18 år. Vi kodet ikke alle typer tilstander og diagnoser, kun de seks som var mest relevant for oppdragsgiver. Derfor er det et stort antall, nesten 500 studier, som kan ikke kodes under de forhåndsbestemte diagnosene/tilstandene (figur 8). Det er flest studier innen overvekt og diabetes og færrest innen graviditet/post partum og hypertensjon.

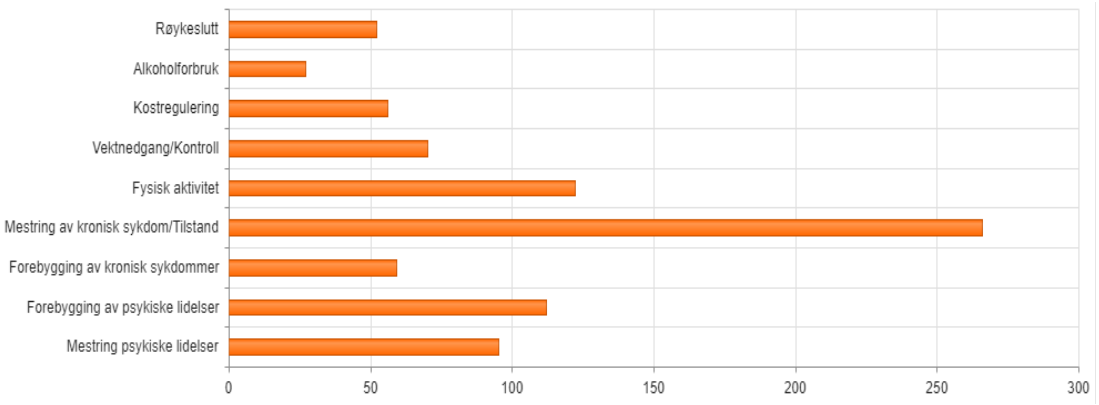


Figur 8. *Antall studier fordelt på diagnose/tilstandsgrupper.*

Intervensjoner

Tema intervensjoner

Det er flest studier som omhandler mestring av kronisk sykdom/tilstand (figur 9). Deretter følger studier som omhandler fysisk aktivitet og forebygging av psykiske lidelser. Det er færrest studier som omhandler alkoholforbruk og røykeslutt.



Figur 9. *Tema intervensjoner.*

Intervensjoner og antall deltakere

I gruppen mestring av kronisk sykdom/tilstand er det mange små studier (107) med 0-99 deltakere, og færre større studier (35) med 500+ deltakere (tabell 3). Innen de fleste temaer er det tilsvarende tall, med flere studier i gruppe 0-99 enn i gruppe 500+. Et unntak er innen røykeslutt, der det er cirka like mange studier fordelt i de tre gruppene.

Tabell 3. Intervensjoner versus antall deltakere

	0-99	**100-499**	**500 +**	**Ikke rapportert**
Røykeslutt	16	15	16	6
Alkoholforbruk	8	11	6	3
Kostregulering	24	13	9	10
Vektnedgang/Kontroll	32	26	5	7
Fysisk aktivitet	63	34	11	14
Mestring av kronisk sykdom/Tilstand	107	89	35	37
Forebygging av kroniske sykdommer	17	31	6	7
Mestring psykiske lidelser	36	39	11	10
Forebygging av psykiske lidelser	46	40	12	15
Total	349	298	111	109

Innen diagnosene kreft, diabetes og hypertensjon/blodtrykk er det flest studier som setter søkelys på intervensjoner som omhandler mestring av kronisk sykdom/tilstand, henholdsvis 39, 59 og 23 studier (tabell 4). Innen populasjonen gravid/postpartum fokuserer intervensjonene på kostregulering (8 studier), forebygging av psykiske lidelser

(7 studier), vektnedgang/kontroll (6 studier) og fysisk aktivitet (6 studier). Når det gjelder psykiske lidelser har intervensjonene søkelys på forebygging (24 studier) og mestring (40 studier). Innen diagnosene har de fleste studiene overvekt/fedme som tema (52), etterfulgt av kostregulering (18) og fysisk aktivitet (10).

Tabell 4. Intervensjon versus populasjon.

	Kreft	**Diabetes**	**Gravid og post partum**	**Hypertensjon/ Blodtrykk**	**Depresjon**	**Overvekt og fedme (obesity)**	**Ingen**
Røykeslutt	1	0	1	0	0	1	50
Alkoholforbruk	0	0	0	0	1	0	27
Kostregulering	1	5	8	2	1	18	29
Vektnedgang/ Kontroll	0	5	6	2	1	52	11
Fysisk aktivitet	7	9	6	1	4	10	92
Mestring av kronisk sykdom/Tilstand	39	59	2	23	3	3	146
Forebygging av kroniske sykdommer	5	6	2	4	1	2	43
Forebygging av psykiske lidelser	4	1	7	0	24	1	80
Usikker	0	0	0	0	0	0	0
Mestring psykiske lidelser	4	0	3	0	40	1	50
Ingen	0	0	0	0	0	1	0

Utfall

Utfall og antall studier

Det er flest studier med utfallene endring i symptomer/tilstand (416) og etterlevelse anbefalinger livsstil (357), og færrest med utfallet etterlevelse medikamenter (71) (figur 10).

Figur 10. *Antall studier og utfall*

Utfall og intervensjoner

Utfallet etterlevelse av medikamentbruken er hyppigst brukt i studier innen mestring av kronisk sykdom/tilstand (59), og få eller ingen innen de andre temaene (tabell 5). Når det gjelder utfallet etterlevelse av anbefalinger livsstil er det en jevn fordeling innen de ulike intervensjonene. Utfallet bedre generell livskvalitet/velvære er hyppigst brukt i studier som omhandler mestring av kronisk sykdom (96), forebygging av psykiske lidelser (83) og fysisk aktivitet (32). Når det gjelder endring i symptomer/tilstand er dette utfallet hyppigst brukt i studier som omhandler mestring av kronisk sykdom/tilstand (166) og kun få ganger i studier som omhandler røykeslutt (9) og alkoholforbruk (5). Utfallet bedre mestringsforventning er hyppigst brukt i studier som omhandler mestring av kronisk sykdom/tilstand (86 studier).

Tabell 5. Intervensjoner versus utfall

	Etterlevelse medikamentbruk	**Etterlevelse anbefalinger livsstil**	**Bedre generell livskvalitet/ velvære**	**Endring i symptomer/ tilstand**	**Bedre mestringsforventning**
Røykeslutt	2	52	2	9	4
Alkoholforbruk	0	28	2	5	3
Kostregulering	0	53	8	19	13
Vektnedgang/ Kontroll	0	67	7	22	7
Fysisk aktivitet	2	103	32	39	13
Mestring av kronisk sykdom/Tilstand	59	58	96	166	86
Forebygging av kroniske sykdommer	6	34	5	22	12

Forebygging av psykiske lidelser	1	7	83	74	8
Mestring psykiske lidelser	2	6	22	80	11

Diskusjon

Hovedfunn

Databasesøkene ga 12 886 referanser. Vi inkluderte 802 studier på grunnlag av tittel og sammendrag (682 (85 %) randomiserte studier og 120 (15 %) systematiske oversikter). Cirka 50 % var fra de to siste årene. Totalt antall studier i tabeller og figurer kan likevel være noe større siden noen av de er kodet med flere intervensjoner og har utfall på tvers av kategoriene.

Flertallet av studiene hadde 0-99 deltakere og mange var utført innen mestring av kronisk sykdom/tilstand sammenliknet med forebygging av kronisk sykdom/tilstand. Det var flest studier med utfallene endring i symptomer/tilstand og etterlevelse anbefalinger livsstil, og færrest med utfallet etterlevelse av medikamentbruken.

Kunnskapshull

Når det gjelder kronisk sykdom er det få studier som ser på intervensjoner for mestring og forebygging av psykiske lidelser. Det er også få studier der man har vurdert apper med intervensjoner rettet mot alkoholbruk og røykeslutt. Det er kun få større studier med over 500 deltakere innen alle intervensjoner. Minimum antall deltakere som kreves per studie er selvfølgelig avhengig av den estimerte effektstørrelsen, som er spesifikk for hvert utfall. Veldig ofte mangler små studier statistisk styrke for å konkludere at en observert forskjell mellom tiltaks- og sammenligningsgruppene skyldes *effekten* av tiltaket istedenfor en tilfeldig forskjell basert på utfallets fordelinger mellom de to gruppene.

I studier med mer spesifikke intervensjoner som røykeslutt, kostregulering og fysisk aktivitet, er utfallet stort sett etterlevelse av anbefalinger livsstil. Det er i liten grad målt livskvalitet/velvære, endring av symptomer/tilstander og mestringsforventning. Innen forebygging og mestring av kroniske sykdommer og psykiske lidelser er utfallet som oftest endring av symptomer og i liten grad mestringsforventning eller etterlevelse livsstil. Disse observasjonene må tolkes med forsiktighet da de kun er basert på informasjon fra tittel og sammendrag.

Styrker og begrensninger ved dette forskningskartet

Vi utførte et forskningskart. Det inneholder et kart over randomiserte kontrollerte studier og systematiske oversikter som ser på effekter av selvhjelpsapper. Dette forskningskartet gir et innblikk i og en oversikt over forskningsfeltet, og er ikke ment å brukes for å støtte kunnskapsbaserte beslutninger. Dette kartet har kun kartlagt forskning som ser på effekt av selvhjelpsapper, men kartet kan ikke konkludere om effekten av disse appene eller kvaliteten på forskningen. Det kan brukes til å se på kunnskapshull eller se hvor det er nok forskning til å gå videre med en systematisk oversikt. Under screeningen observerte vi at det finnes studier som går inn i app stores for å finne apper for så å identifisere studier som er gjort om den spesifikke appen. Vi fant også flere verktøy som vurderer kvaliteten av appen, for eksempel the Mobile App Rating Scale (MARS) [19, 20]. Dette kan brukes dersom nye oppdrag krever mer i dybden informasjon om effekt av en app heller enn av apper generelt.

Under utarbeidelsen av dette forskningskartet leste vi bare studienes tittel og sammendrag, og vi har ikke vurdert studiene på fulltekstnivå. Det var store ulikheter med tanke på hvor utfyllende informasjon de ulike sammendragene inneholdt. Vi har heller ikke tatt stilling til om flere sammendrag kan være hentet fra samme studie. Det totale antallet inkluderte studier kan derfor være lavere enn antallet inkluderte sammendrag.

Vi vurderte ikke studienes metodiske kvalitet eller analyserte resultater på tvers av studiene. Det er viktig å påpeke at vi ikke kodet for oppfølgingstid eller sammenlikninger. Vi har kun kodet for et begresent antall diagnoser/tilstander som var mest relevant for oppdragsgiver. Vi har ikke rapportert eller sammenstilt effekt av disse appene. Derfor gir dette forskningskartet et veldig overordnet blikk over forskning innen dette feltet og går ikke i dybden.

Komplekse intervensjoner og utfall gjorde jobben med å sortere og kategorisere utfordrende. Et eksempel for intervensjon/eksponering er forebygging av kroniske sykdommer som hadde relativt få studier, men denne kategorien hadde vært betydelig større dersom vi hadde dobbeltkodet røykeslutt, fysisk aktivitet osv. Et eksempel for utfall er at endring i symptomer/tilstand og etterlevelse av livstils-anbefalinger er de største gruppene, men mange av de samme studiene kan være inkludert i begge disse da de ofte påvirker hverandre.

Vi identifiserte et stort antall randomiserte studier som undersøkte effekt av selvhjelpsapper, men det var uklart hvor mange av disse appene som var tilgjengelig for allmennheten. Noen av studiene var klare på at de så på effekt av en app som var allment tilgjengelig, mens andre studier testet en app som de selv hadde utviklet og det var sannsynlig at appen kun var tilgjengelig for deltakere i studien. Vi inkluderte studier fra en rekke ulike land, men kodet ikke for dette. Det er uklart i hvilken grad kulturelle forskjeller vil påvirke intervensjonene og derved overførbarheten til andre kontekster, som for eksempel Norge.

Vi benyttet en mengde maskinlæringsfunksjoner, spesielt av typen «veiledet maskinlæring». Dette betyr at algoritmene lærer å replisere menneskelige avgjørelser ved å bli opptrent og testet på slike avgjørelser. Veiledete metoder som repliserer menneskelige avgjørelser, repliserer også menneskelige systematiske skjevheter. Bruk av slike metoder er kun så treffsikker som menneskene som har formet modellen med avgjørelsene sine. Det har vært fordelaktig at lagleder også er nestleder av maskinlæringslaget på Folkehelseinstituttet. Bruk av maskinlæring har foregått under hennes veiledning og med ytterligere veiledning fra maskinlæringslaget ved behov. Vi føler oss derfor sikre på at vi har brukt maskinlæringsfunksjoner korrekt og hensiktsmessig. Vi reflekterer mer rundt bruk av maskinlæring i Vedlegg 3- Avansert maskinlæring.

Implikasjoner for praksis

Vi har kartlagt effektforskning, men uten å vurdere effekten av appene. Vi kan ikke gi anbefalinger for praksis basert på dette forskningskartet.

Konklusjon

Dette forskningskartet gir et overblikk over omfanget av forskningen på effekter av selvhjelpsapper. Det finnes et bredt utvalg av randomiserte studier og systematiske oversikter om effekt av apper som selvhjelpsverktøy innen helse. En stor andel av studiene var små med mindre enn 99 deltakere. Det er viktig å påpeke at vi ikke kodet for oppfølgingstid eller sammenlikninger. Det er flest studier som ser på fysisk helse. Utfallet som var med i fleste studier var endringer i symptomer/tilstand. Vi fant kun to systematiske oversikter som ser på effekt av selvhjelpsapper på alkoholforbruk på tross av at det finnes flere randomiserte studier med mer enn 100 deltakere. Med forbehold om at vi kun har vurdert studiene på grunnlag av tittel og sammendrag, kan det se ut som det innen feltet selvhjelpsapper er behov for flere studier innen forebygging av kronisk sykdom/tilstand, og mestring og forebygging av psykiske lidelser. Det vil også være behov for randomiserte studier med flere deltakere. Disse observasjonene må tolkes med forsiktighet da de kun er basert på informasjon fra tittel og sammendrag.

Apper som selvhjelpsverktøy er et felt i rask endring og vekst. Det er sannsynlig at dette forskningskartet vil være utdatert i løpet av relativt kort tid.

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Vedlegg 1: Søkestrategi

Bibliografiske databaser	Antall referanser
APA PsycINFO (Ovid)	3142
Cochrane Central Register of Controlled Trials (Wiley)	11124
Cochrane Database of Systematic Reviews (Wiley)	71
Epistemonikos (Epistemonikos Foundation)	1803
MEDLINE (Ovid)	8997
Totalt importert til EndNote	**25137**
Fjernet i EndNote (dubletter, referanser til konferansesammendrag og studieregistre)	**13180**
Totalt til screening	**11957**

Søkedato: 2021-12-10
Søkeansvarlig: Elisabet Hafstad
Fagfellevurdering: Lien Nguyen
Søkestrenger for helseapper basert på Ayiku 2020 (9). Vi beholdt "app", "apps" og kombinasjonene med "applications". Lagt til AppStore, Google Play, Android og iOS (application) samt noen flere ordvarianter.

	APA PsycInfo 1806 to November Week 5 2021 Advanced search	
1	Mobile Applications/ or (app or apps or AppStore or Google Play).ti,ot,ab,id. or ((online or on-line or web or internet or digital*) adj3 application*).ti,ot,ab,id. or ((phone* or iphone* or telephone* or smartphone* or cellphone* or smartwatch* or smart-watch* or mobile or Android or iOS) adj3 application*).ti,ot,ab,id. or ((mobile health or mhealth or m-health or ehealth or e-health or emental or e-mental) adj3 application*).ti,bt,ot,ab,id.	13216
2	limit 1 to "reviews (maximizes specificity)"	769
3	(0830 or 1200).md or systematic review/ or meta analysis/ or (systematic adj2 review).ti,bt	57906
4	limit 3 to "therapy (maximizes specificity)"	760

5	Clinical trials/ or Randomized controlled trials/ or 0300.md or (randomized or randomised).ab. or placebo.ab. or randomly.ab. or trial.ab. or groups.ab.	712152
6	(1 and (3 or 5)) or 2 or 4	3885
7	limit 6 to yr="2012 -Current"	3142

	Cochrane Database of Systematic Reviews; Cochrane Central Register of Trials Issue 12 of 12, December 2021 Advanced search – Search manager	
#1	[mh ^"Mobile Applications"] OR (app OR apps OR AppStore OR "Google Play"):ti,ab,kw OR ((online OR on-line OR web OR internet OR digital*) NEAR/3 application*):ti,ab,kw OR ((phone* OR iphone* OR telephone* OR smartphone* OR cellphone* OR smartwatch* OR smart-watch* OR smart NEXT watch* OR mobile OR Android OR iOS) NEAR/3 application*):ti,ab,kw OR ((mobile NEXT health OR mhealth OR m-health OR ehealth OR e-health OR emental OR e-mental) NEAR/3 application*):ti,ab,kw with Cochrane Library publication date from Jan 2012 to present, in Cochrane Reviews and Trials [Cochrane Reviews: 71; Trials: 11124]	11195

	Epistemonikos **Advanced search – Title/abstract** **Publication year: 2012 ->>** (Søkeresultater fra hver rad samlet i EndNote)	
1	(app OR apps OR AppStore OR "Google Play" OR "online application" OR "online applications" OR "web application" OR "web applications" OR "web-based application" OR "web-based applications" OR "web based application" OR "web based applications" OR "internet application" OR "internet applications" OR "internet-based application" OR "internet-based applications" OR "internet based application" OR "internet based applications" OR "digital application" OR "digital applications" OR "mobile application" OR "mobile applications" OR "mobile-based application" OR "mobile-based applications" OR "mobile based application" OR "mobile based applications")	BS: 96 SS: 8 SR: 1086

2	("Android application" OR "Android applications" OR "Android-based application" OR "Android-based applications" OR "Android based application" OR "Android based applications" OR "mobile health application" OR "mobile health applications" OR "mhealth application" OR "mhealth applications" OR "m-health application" OR "m-health applications" OR "ehealth application" OR "ehealth applications" OR "e-health application" OR "e-health applications" OR "emental health application" OR "emental health applications" OR "e-mental health application" OR "e-mental health applications" OR "phone application" OR "phone applications" OR "phone-based application" OR "phone-based applications" OR "phone based application" OR "phone based applications")	BS: 19 SS: 0 SR: 161
3	("iphone application" OR "iphone applications" OR "iphone-based application" OR "iphone-based applications" OR "iphone based application" OR "iphone based applications" OR "telephone application" OR "telephone applications" OR "telephone-based application" OR "telephone-based applications" OR "telephone based application" OR "telephone based applications" OR "smartphone application" OR "smartphone applications" OR "smart-phone application" OR "smart-phone applications" OR "smart phone application" OR "smart phone applications")	BS:7 SS: 1 SR: 141
4	("cellphone application" OR "cellphone applications" OR "cellphone-based application" OR "cellphone-based applications" OR "cellphone based application" OR "cellphone based applications" OR "cell-phone application" OR "cell-phone applications" OR "cell-phone based application" OR "cell-phone based applications" OR "cell phone application" OR "cell phone applications" OR "cell phone based application" OR "cell phone based applications" OR "smartwatch application" OR "smartwatch applications" OR "smart-watch application" OR "smart-watch applications" OR "smart watch application" OR "smart watch applications")	BS:0 SS: 0 SR: 1
5	Title: ((online OR on-line OR web OR web-based OR internet OR internet-based OR digital OR mobile OR mobile-based OR Android OR Android-based OR mhealth OR m-health OR ehealth OR e-health OR phone* OR iphone* OR telephone* OR smartphone* OR smart-phone* OR cell-phone* OR cell-phone* OR smartwatch* OR smart-watch* OR Android OR Android-based OR iOS OR iOS-based) AND application*)	BS:17 SS: 3 SR: 263
	Ovid MEDLINE(R) ALL 1946 to December 09, 2021 Advanced search	

1	Mobile Applications/ or (app or apps or AppStore or Google Play).ti,bt,ot,ab,kf. or ((online or on-line or web or internet or digital*) adj3 application*).ti,bt,ot,ab,kf. or ((phone* or iphone* or telephone* or smartphone* or cellphone* or smartwatch* or smartwatch* or mobile or Android or iOS) adj3 application*).ti,bt,ot,ab,kf. or ((mobile health or mhealth or m-health or ehealth or e-health or emental or e-mental) adj3 application*).ti,bt,ot,ab,kf.	52513
2	limit 1 to "reviews (maximizes specificity)"	1383
3	Systematic Review.pt or Meta-Analysis.pt or (systematic adj2 review).ti,bt	293562
4	limit 1 to "therapy (maximizes specificity)"	2623
5 **	(randomized controlled trial or controlled clinical trial).pt. or (randomized or randomised).ab. or placebo.ab. or randomly.ab. or trial.ab. or groups.ab.	3306686
6	(1 and (3 or 5)) or 2 or 4	10059
7	limit 6 to yr="2012 -Current"	8997

** Cochrane Highly Sensitive Search Strategy for identifying randomized trials in MEDLINE: sensitivity-maximizing version (2008 revision); Ovid format. 2021 February 2021. I: Cochrane Handbook for Systematic Reviews of Interventions [nettdokument]. Cochrane. Version 6.2. Tilgjengelig fra: www.training.cochrane.org/handbook
Revisjoner:
- lagt til randomised.ab
- utelatt drug therapy.fs og (NOT) dyrestudier

Vedlegg 2: Kodebok

Foreldre kode	Barn kode	Kommentar
Tittel og sammendrag	Inn Ut	
Intervensjoner/Eksponering	• røykeslutt • alkoholforbruk • kostregulering • vektnedgang • fysisk aktivitet • mestring av kronisk sykdom • mestring av psykiske lidelser • forebygging av kronisk sykdommer • forebygging av psykiske lidelser	Mulig å hake av mer en enn
Studie design	• RCT • Systematisk oversikter av RCTer	
Antall deltakere	• 0-99 • 100-499 • 500+ • Ikke rapportert	
Utfall	Etterlevelse av medikamentbruken, Etterlevelse anbefalinger livsstil, for eksempel: • Røykeslutt • Kosthold • Holde avtaler • Fysisk aktivitet • Vektreduksjon	Mulig å hake av mer en enn

	Bedre generell livskvalitet/velvære, for eksempel: • Livskvalitet • Søvn • Utbrenthet • Selvfølelse • Empati • Oppmerksomt nærvær • Sosial støtte • Motivasjon til å være sosial Reduserte symptomer, for eksempel: • Posttraumatisk stresslidelse (PTSD) • Depresjon • Smerte • Angst • Plager ved symptomer • Mental helse • Stress • Kontroll astma • Hyppighet migrene Bedre mestring av sykdom, for eksempel: • Følelse av mestringsevne • Evne til selvledelse • Kunnskap	
Diagnoser/Tilstander	• Kreft • Diabetes • Gravid og post partum • Hypertension/Blodtrykk • Depressjon • Overvekt og fedme (Obesity)	Mulig å hake av mer en enn

Vedlegg 3: Avansert maskinlæring

Ytterligere forklaring om studieutvelgelse

Vi begynte med å bruke to eksisterende «study design classifiers» for å raskt identifisere systematiske oversikter og RCTer (14). Studier klassifisert med > 80 % sannsynlighet for å enten være en systematisk oversikt eller en RCT ble prioritert for vurdering. Vi screenet manuelt (men ved hjelp av en rangeringsalgoritme) fram til inklusjonsraten sank betraktelig, ned til cirka 5 % i de siste 100 studiene. Først bygget vi en «custom classifier», som vi trente opp med de første 1141 studiene, herav 191 relevante og 950 irrelevante. Vi testet classifieren på 4076 studier som vi allerede hadde screenet, men klarte ikke å finne en stabil terskel for å automatisk ekskludere studier med 100 % «recall», det vil si uten å gå glipp av minst én relevant studie. Deretter brukte vi en type uveiledet maskinlæring, clustering, ved en clustering-engine inn i EPPI-Reviewer som kalles for Lingo3G (se Muller et al. 2021 (15) for flere detaljer), for å hjelpe oss å raskere identifisere åpenbare irrelevante grupperinger av studier. Vi kjørte clustering med følgende parametrer: *maximum hierarchy depth* 1, *maximum cluster size* 0.35, *minimum label length* 1, *minimum cluster size* 0.01, og *single word label weight* 0.5. Grupperinger ble vurdert av to screenere og 1365 studier ekskludert. Etter dette kjørte vi alle gjenstående studier gjennom rangeringsalgoritme. Etter at vi ikke hadde identifisert én studie i de siste 500 leste studier, var vi sikker på at det ikke gjensto noen relevante studier, og vi ekskluderte resten av studiene automatisk.

Ytterligere refleksjoner rundt bruk av maskinlæring

I denne oversikten brukte vi en mengde maskinlæringsfunksjoner, såkalt aktiv læring med en rangeringsalgoritme, to allerede oppbyggete og godt validerte studiedesign classifierene, en custom classifier, og for første gang i en publisert FHI kunnskapsoppsummering, clustering. De tre første funksjonene er type «veiledet maskinlæring», som betyr at algoritmene lærer å replisere menneskelige avgjørelser ved å ha blitt opptrent og testet på slike avgjørelser. Aktuelle avgjørelser her var om studier var relevante og møtte inklusjonskriterier, eller ikke. Hensikten var å kunne replisere våre egne avgjørelser – stort sett å ekskludere irrelevante studier – uten å måtte lese dem manuelt av to forskere. Det er fordelaktig at lagleder også er co-leder av maskinlæringslaget på Folkehelseinstituttet, og all bruk av maskinlæring har foregått under hennes veiledning

eller ytterligere veiledning fra maskinlæringslaget; vi føler oss derfor sikre at vi har brukt maskinlæringsfunksjoner korrekt og hensiktsmessig.

Likevel må man anerkjenne at veiledete metoder som repliserer menneskelige avgjørelser, også repliserer menneskelige systematiske skjevheter. Systematiske skjevheter referer både til misforståelser innad i prosjektlaget, eller mellom prosjektlaget og oppdragsgiver; men også til fordommer og feile antagelser, for eksempel at én gruppe pasienter ikke kan antas å være i stand til å ta ansvar over egen helse og dermed aldri ville ta selvhjelpsapper i bruk, eller at studieforfatter fra et visst land eller forskningsgruppe ikke kan stoles på og dermed skal ekskluderes fra et forskningskart. Uten maskinlæring prøver man å redusere slike skjevheter ved å la flere medforfattere utføre den samme oppgaven, men duplikat arbeid hjelper ikke dersom flere har lignende skjevheter. Med andre ord er maskinlæring ikke magisk, og fører ikke nødvendigvis til bedre kvalitet. Kvaliteten når det gjelder *tilfeldige feil* er forbedret med maskinlæring, fordi maskinlæring ikke gjør tilfeldige feil, og dette er et viktig element når man må håndtere et så stort antall studier som vi hadde. Men maskinlæring repliserer menneskelige *systematiske skjevheter*, og den er kun så god som de menneskene som har opplært den.

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