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Implementacja, kontekst i ewaluacja interwencji mającej na celu redukcję i utrzymanie masy ciała

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Spis treści

Abstrakt

Niniejsza rozprawa doktorska obejmuje trzy badania, towarzyszące indywidualnie dopasowanej, opartej na teorii, cyfrowej interwencji dotyczącej redukcji i utrzymania masy ciała: „Wybieramy zdrowie". Celem Badania 1 była systematyczna ocena procesu projektowania i implementacji interwencji (*N*= 288). Celem Badania 2 było zdefiniowanie indywidualnych percepcji zdrowia w celu oceny kontekstu i wsparcia procesu projektowania i implementacji przyszłych programów promocji zdrowia. Celem Badania 3 była ewaluacja procesu implementacji interwencji: „Wybieramy zdrowie", ze szczególnym uwzględnieniem wniosków dotyczących akceptowalności (ang. *acceptability*) oraz wykonalności (ang. *feasibility*) interwencji. Badanie 1 przeprowadzono w oparciu o model mapowania interwencji (ang. *Intervention Mapping*). W Badaniu 2 wykorzystano model kontekstu i implementacji kompleksowych interwencji (*ang. Context and Implementation of Complex Interventions*). Badanie 3 zostało oparte na metodologii brytyjskiej Rady ds. Badań Medycznych oraz modelu wskaźników implementacji interwencji zdrowotnych. W Badaniu 1 przeprowadzono grupy fokusowe z potencjalnymi uczestnikami (*N*=40) oraz wywiady z potencjalnymi uczestnikami (*N*=11), a także zaangażowano specjalistów ochrony zdrowia (*N*=12) w proces ocen eksperckich. Badanie 2 (*N*=50) oparto o metodologię foto-elicytacji (*ang. photo-elicitation*). Metody użyte w Badaniu 3 to: anonimowe ankiety ewaluacyjne dla uczestników interwencji po zakończeniu fazy redukcji masy ciała (*n*=116) oraz po zakończeniu fazy utrzymania masy ciała (*n*=99), wywiady oparte o indywidualne dane uczestników (*ang. data-prompted interviews*) (*N*=26) oraz wywiady częściowo ustrukturyzowane z osobami implementującymi interwencję (*N*=4). W wyniku Badania 1 stworzono model logiki problemu nadwagi i otyłości, model logiki oczekiwanej zmiany w interwencji, a także zaplanowano, zaprojektowano i ewaluowano interwencję. Badanie 2

umożliwiło zdefiniowanie subiektywnych percepcji zdrowia oraz czynników wspierających zdrowie. W oparciu o wygenerowane obszary tematyczne przedstawiono implikacje dla przyszłych interwencji zdrowotnych. Wyniki Badania 3 dowodzą akceptowalności i wykonalności zaprojektowanej interwencji, wskazując na potencjalne moderatory tychże wskaźników w interwencjach zdrowotnych. Opisany proces przygotowania, implementacji oraz ewaluacji przebiegu cyfrowej interwencji zdrowotnej pozwolił na opracowanie złożonej interwencji redukcji i utrzymania masy ciała, a przedstawione wnioski i rekomendacje stanowią wkład w rozwój dalszych interwencji zdrowotnych.

Słowa kluczowe: interwencje zdrowotne, zdrowie cyfrowe, nadwaga, otyłość, personalizacja, mapowanie interwencji, ewaluacja procesu, implementacja, metodologie wizualne

Abstract

This dissertation includes three studies embedded within a tailored theory-based, online-delivered intervention for weight loss and weight loss maintenance (*Choosing Health).* The aim of Study 1 was to systematically evaluate the process of designing and implementing this health intervention (*N*=288). The aim of Study 2 was to define individual perceptions of health to support design and implementation process of future health interventions. The aim of Study 3 was to evaluate the process of *Choosing Health* intervention, assessing acceptability and feasibility of the intervention. Study 1 was conducted using the Intervention Mapping approach. Study 2 used the model of Context and Implementation of Complex Interventions. Study 3 used a framework for developing and evaluating complex interventions developed by British Medical Research Council and a model of implementation outcomes. Study 1 included focus groups (*N*=40) and interviews with potential participants (*N*=11), and involved health professionals (*N*=12) in the process of Intervention Mapping. Study 2 (*N*=50) employed photo-elicitation methodology. The methods used in Study 3 were: anonymous evaluation surveys of study participants at the end of weight loss phase (n=116) and at the end of weight loss maintenance phase (n=99), data-prompted interviews with study participants (*n*=26), and semi-structured interviews with the intervention implementers (*N*=4). As a result of Study 1, a logic model of overweight and obesity problem, and a logic model of the expected change during the intervention were created, the intervention was planned, designed and implemented. Study 2 provided a definition of subjective perceptions of health and facilitators to health. Implications for future health interventions were presented based on the generated themes. The results of Study 3 demonstrated acceptability and feasibility of the designed intervention, indicating potential moderators of acceptability and feasibility in health interventions. The described process of preparation, implementation and process evaluation

of the digital health intervention, allowed for the development of a complex weight loss and weight loss maintenance intervention. Presented findings and recommendations contribute to the development of further health interventions.

Keywords: health interventions, digital health, overweight, obesity, personalisation, intervention mapping, process evaluation, visual methodologies, photo elicitation

1. Wprowadzenie

Nadwaga i otyłość stanowią poważny problem dla zdrowia publicznego na całym świecie, wykazując nieustanny wzrost w ciągu ostatnich czterech dekad (Światowa Organizacja Zdrowia, 2021). Nadmierna masa ciała jest czynnikiem ryzyka dla wielu przewlekłych schorzeń i chorób, w tym chorób układu krążenia, nowotworów i cukrzycy typu 2 (Swinburn i in., 2019). Co więcej, otyłość może mieć związek z występowaniem zaburzeń nastroju oraz zaburzeń lękowych (Scott i in., 2008). Nadmierna masa ciała ma również związek z trudnościami natury psychospołecznej, m.in.: doświadczaniem dyskryminacji, obniżonym poczuciem poziomu ogólnej jakości życia czy obniżoną samooceną (Sarwer & Polonsky, 2016). Redukcja masy ciała powyżej 5% początkowej masy jest uważana za klinicznie istotną, ponieważ prowadzi do zmniejszenia ryzyka chorób przewlekłych i skutktuje zazwyczaj ogólną poprawą zdrowia (Franz i in., 2007).

Ponad połowa dorosłych w Europie (59%) ma nadwagę lub jest otyła, a problem nadmiernej masy ciała dotyczy niemal co trzeciego dziecka w Europie (Europejskie Biuro Światowej Organizacji Zdrowia, 2022). W Polsce rozpowszechnienie nadwagi i otyłości jest podobne, gdyż szacuje się, że 53.3% Polek i Polaków zmaga się z problemem nadmiernej masy ciała, a odsetek ten regularnie wzrasta i prognozuje się jego dalszy wzrost w kolejnych latach (Narodowy Fundusz Zdrowia, 2019). Istnieje pilna potrzeba opracowania interwencji, które wspierają osoby zarówno w początkowej redukcji masy ciała, jak i jej utrzymaniu, a także są dopasowane do osobistych przekonań, kompetencji oraz potrzeb populacji docelowej.

1.1 Indywidualnie dopasowane interwencje zdrowotne

Istnieją już programy skierowane na redukcję i utrzymanie prawidłowej masy ciała (Twells i in., 2021), jednak zazwyczaj nie są one dostosowane do indywidualnych potrzeb uczestników. Wcześniejsze badania oceniające predyktory redukcji i utrzymania prawidłowej

masy ciała opierały się przede wszystkim na analizie różnic pomiędzy grupami poprzez badania randomizowane (Madigan i in., 2022). Długoterminowa kontrola masy ciała zależy od indywidualnych zmian w czynnikach psychospołecznych oraz zachowaniach (Evans i in., 2019), a fluktuacja tych zmiennych nie jest wystarczająco badana przy stosowaniu wyłącznie porównań między grupami. Czynniki psychospołeczne, które często wpływają na fluktuację masy ciała (np. stres, poziom energii) są często niestabilne i mają tendencję do zmian w czasie (Hofmann i in., 2003).

Aby zapewnić skuteczne wsparcie osobom żyjącym z nadwagą i otyłością, wskazuje się na potrzebę odejścia od ogólnych rozwiązań typu „ten sam model dla każdego" na rzecz indywidualnie dopasowanych programów promocji zdrowia i interwencji zdrowotnych (Flint & Batterham, 2023; Kelsey & Pagidipati, 2021). Szczególny potencjał wykazują interwencje cyfrowe, czyli takie, które są dostarczane do odbiorców z użyciem technologii informacyjnych (Wienert i in., 2022). Co więcej, interwencje cyfrowe oparte na dowodach empirycznych i indywidualnie zidentyfikowanych charakterystykach uczestników mogą stanowić alternatywę lub dodatek do tradycyjnego poradnictwa udzielanego przez wykwalifikowanych specjalistów (Beck i in., 2010).

Przegląd systematyczny indywidualnie dopasowanych, cyfrowych interwencji zdrowotnych, dotyczących redukcji masy ciała (Ryan i in., 2019) wykazał, że dopasowane interwencje były ogólnie bardziej skuteczne we wspieraniu redukcji masy ciała w porównaniu z interwencjami ogólnymi oraz w porównaniu z grupami kontrolnymi. Indywidualne dopasowanie (ang. *tailoring*) oznacza dostosowanie interwencji w oparciu o specyficzne cechy odbiorcy (Rakowski, 1999). Większość interwencji stosuje dostosowanie opisowe, co oznacza, że uczestnicy otrzymują informacje, które są dostosowane na podstawie ich jednorazowej odpowiedzi na serię pytań (Rakowski, 1999).

Alternatywnym sposobem dostosowania interwencji do jednostki jest dostosowanie inferencyjne, w którym uczestnicy są monitorowani przez pewien okres, a informacje dotyczące ich cech, predyktorów behawioralnych i wyników behawioralnych są gromadzone, np. za pomocą zbieranych w określonym przedziale czasu danych ekologicznych (ang. *Ecological Momentary Assessment*) (Shiffman i in., 2008). W procesie gromadzenia danych podłużnych, badacz gromadzi, a następnie analizuje dane o uczestniku (zebrane przy użyciu technologii cyfrowych), które mogą dostarczyć wniosków na temat tego, jakie są najsilniejsze predyktory istotnych wyników redukcji i utrzymania masy ciała (Hobbs i in., 2013), odpowiadając tym samym na pytanie, w jaki sposób treść interwencji może być możliwie najlepiej dostosowana do danej osoby.

1.2 Kontekst badań własnych: Interwencja dotycząca redukcji oraz utrzymania masy ciała „Wybieramy zdrowie”

Badania prezentowane w niniejszej rozprawie doktorskiej towarzyszyły badaniu głównemu, którego celem była ewaluacja efektywności interwencji: „Wybieramy zdrowie”. Badania własne zostały zrealizowane w ramach większego projektu (program HOMING Fundacji na Rzecz Nauki Polskiej, współfinansowany przez Europejski Fundusz Rozwoju Regionalnego Unii Europejskiej, POIR.04.04.00-00-5CF3/18-00; HOMING 5/2018; kierowniczka projektu: dr Dominika Kwaśnicka), w ramach którego przeprowadzono procedurę randomizowanego badania z grupą kontrolną, zarejestrowanego w repozytorium *ClinicalTrials.gov* (nr rejestracji: NCT04291482). Procedura badawcza całego badania randomizowanego oraz wszystkich badań omówionych w niniejszej rozprawie została zatwierdzona przez Komisję ds. Etyki Badań Naukowych SWPS (nr zgody: 03/P/12/2019).

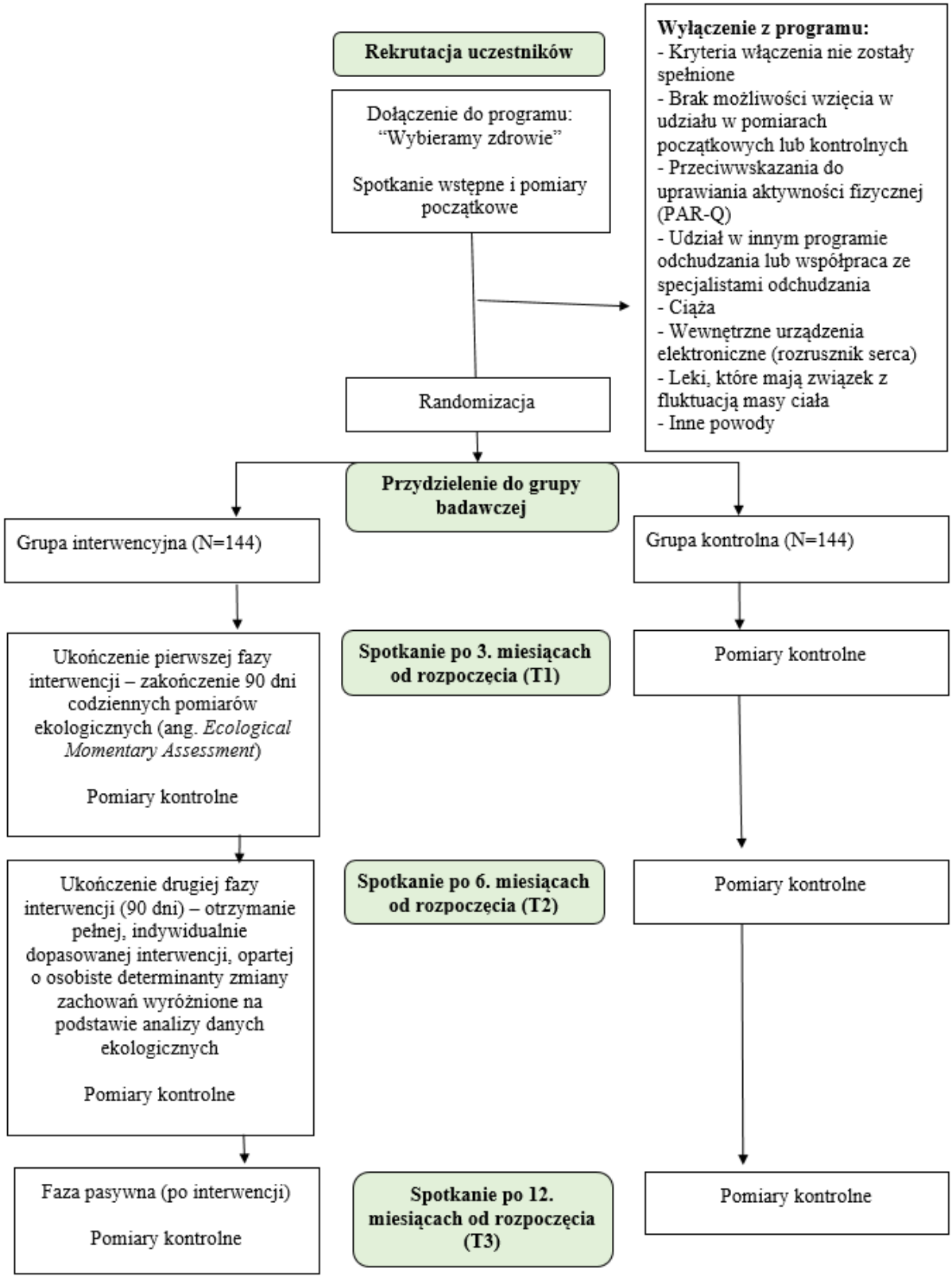
Badanie dotyczące efektywności interwencji przeprowadzono zgodne ze standardami raportowania CONSORT (Schulz i in., 2010) (Ryc. 1). Jego celem było przetestowanie opartej na teorii psychologicznej, dostarczanej zdalnie, indywidualnie dopasowanej

interwencji redukcji masy ciała i utrzymania prawidłowej masy ciała (Kwasnicka et al., 2020). W szczególności, celem większego badania badania była weryfikacja tezy, iż uczestnicy otrzymujący indywidualnie dopasowane wsparcie w ramach dostosowanej interwencji, powinni schudnąć istotnie więcej i istotnie częściej utrzymywać masę ciała w normie, niż uczestnicy z grupy kontrolnej, otrzymujący ogólne wsparcie (Kwasnicka i in., 2020).

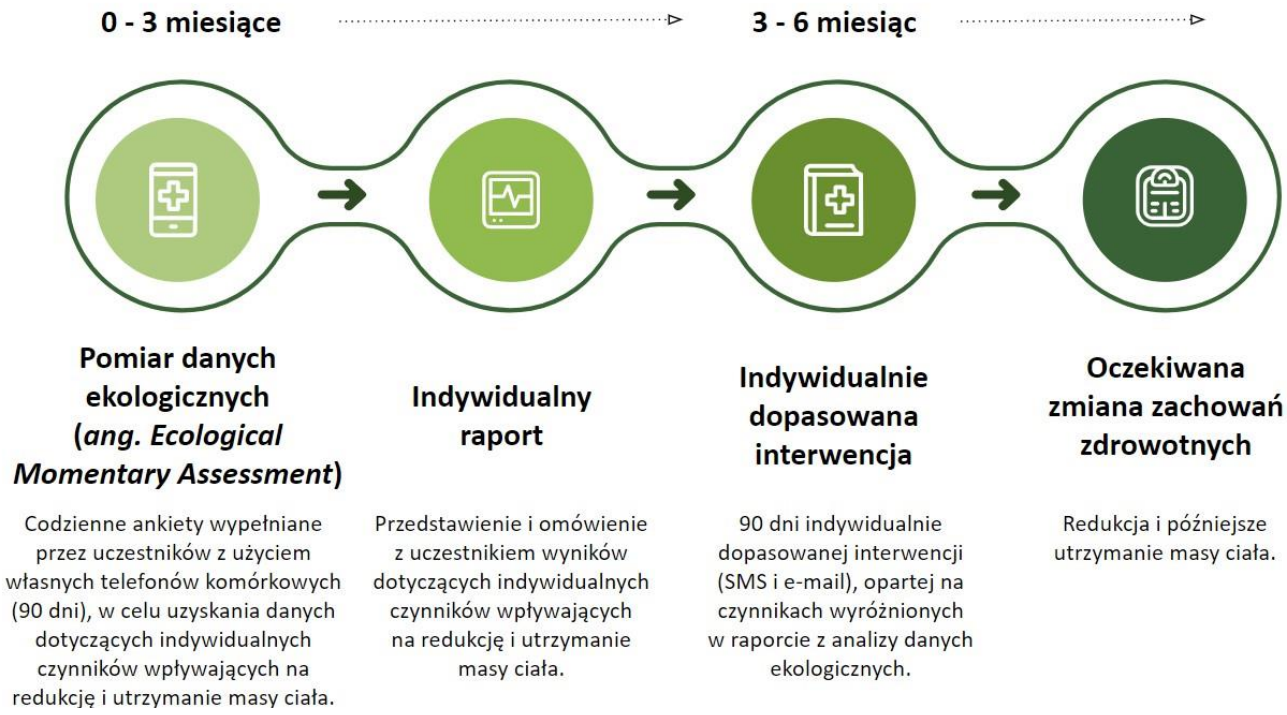
W badaniu służącym ewaluacji efektywności interwencji wzięło udział 288 osób (16% mężczyzn, 84% kobiet, wiek: 21-71 lat, *M*= 36, *SD*= 9,89; BMI 25-50, *M*= 32, *SD*= 4,62). Do kryteriów włączenia należały: wiek powyżej 18 lat, BMI powyżej 25, posiadanie dostępu do Internetu oraz telefonu komórkowego, a także możliwość uczestniczenia w spotkaniach kontrolnych programu w siedzibie Uniwersytetu SWPS we Wrocławiu. Do kryteriów wyłączenia należały: przeciwwskazania do uprawiania aktywności fizycznej, potwierdzone Kwestionariuszem Gotowości do Aktywności Fizycznej (PAR-Q) (Duncan i in., 2016); równoległe uczestnictwo w innym programie odchudzania; przyjmowanie leków, które mogą mieć związek z fluktuacją masy ciała, ciąża oraz posiadanie wewnętrznych urządzeń elektronicznych (np. rozrusznik serca), ze względu na badanie analizatorem składu ciała. Uczestnicy zostali zrekrutowani za pośrednictwem: reklam w mediach społecznościowych, współpracy z lokalnymi społecznościami i organizacjami non-profit oraz ogłoszeń umieszczonych na stronie internetowej programu. Działania rekrutacyjne miały miejsce między marcem a październikiem 2020 r., a pomiary w ramach badania zostały wykonane między lipcem 2020 r. a kwietniem 2022 r. Badanie miało miejsce w Polsce (Wrocław, województwo dolnośląskie), wszyscy uczestnicy pochodzili z Dolnego Śląska lub sąsiednich regionów, ponieważ pomiary obiektywne zostały zebrane podczas bezpośrednich spotkań z osobami implementującymi interwencję. Uczestnicy nie otrzymywali wynagrodzenia za udział w badaniu.

Obie grupy (eksperymentalna i kontrolna) zostały poddane pomiarom na początku badania, a następnie po trzech miesiącach, sześciu miesiącach i po dwunastu miesiącach. W trakcie trwania badania każdy uczestnik spotkał się czterokrotnie z osobami implementującymi interwencję, które każdorazowo przeprowadzały analizę składu ciała w połączeniu z omówieniem szczegółowego raportu z tejże analizy (model analizatora składu ciała: Tanita MC-780 S MA, Japonia). Osoby implementujące interwencję wyjaśniały uczestnikom badania, jak interpretować dane dotyczące składu ciała. Każdy uczestnik otrzymał podręcznik zawierający podstawowe informacje na temat zdrowego odżywiania, procesu redukcji i utrzymywania masy ciała oraz aktywności fizycznej. Przed otrzymaniem interwencji, uczestnicy z grupy eksperymentalnej dostarczali podłużnych danych ekologicznych (ang. *Ecological Momentary Assessmen*t), aby uchwycić najbardziej istotne predyktory przestrzegania planu redukcji i utrzymania masy ciała na indywidualnym poziomie, spośród domen, przygotowanych w oparciu o teorie dotyczące zmiany i utrzymania zachowań zdrowotnych (Kwasnicka i in., 2016). Ocena składała się z codziennych ankiet wysyłanych za pośrednictwem wiadomości SMS i trwała dziewięćdziesiąt dni dla każdego uczestnika w grupie eksperymentalnej. Każdy uczestnik przydzielony do grupy eksperymentalnej mógł wybrać dogodną porę dnia, aby otrzymać przypomnienie SMS o codziennej ankiecie i otrzymać treści interwencyjne. Sama interwencja trwała dwanaście tygodni i obejmowała codzienne wiadomości SMS oraz cotygodniowe wiadomości e-mail. Obie formy dostarczania treści interwencji zawierały oparte na dowodach, dostosowane porady, oparte na zmierzonych wcześniej, najsilniejszych predyktorach redukcji masy ciała i utrzymania prawidłowej masy ciała (Ryc. 2).

Rycina 1. Diagram przebiegu badań randomizowanych z grupą kontrolną w programie: „Wybieramy Zdrowie”



Rycina 2. Przebieg interwencji: „Wybieramy zdrowie”



1.3 Poza oceną efektywności: Oparte o teorię projektowanie interwencji, kontekstualizacja interwencji w percepcji zdrowia u odbiorców oraz ocena implementacji

Współczesne teorie i badania dotyczące interwencji mających na celu zmianę zachowań zdrowotnych, takich jak zachowania związane z nadwagą i otyłością, odchodzą od wyłącznej koncentracji na efektywności interwencji. Zamiast tego, badacze konstruują modele opisujące procesy konstruowania optymalnych interwencji, czego przykładem może być model mapowania interwencji (ang. *Intervention Mapping*) (Barthomolew Eldridge i in., 2016). Model ten zakłada wielopoziomość czynników wpływających na zdrowie jednostki (poziomy: indywidualny, interpersonalny, organizacyjny, społeczności i całego społeczeństwa), postulując tym samym systematyczne i transparentne ujęcie tych czynników w uporządkowanym procesie projektowania i implementacji interwencji. Zgodnie z założeniami, mapowanie interwencji powinno odbywać się w sześciu

krokach: (1) stworzeniu modelu logicznego problemu, którego ma dotyczyć interwencja; (2) zdefiniowaniu oczekiwanych rezultatów interwencji oraz oczekiwanego modelu logicznego zmiany w kierunku zdefiniowanych rezultatów; (3) projektowaniu interwencji w oparciu o dane naukowe, (4) przygotowaniu i doskonaleniu komponentów oraz treści interwencji, (5) przygotowaniu planu implementacji programu, (6) opracowaniu planu ewaluacji interwencji. Wymienione kroki powinny być wykonywane iteracyjnie, gdyż w trakcie całego procesu mapowania interwencji, badacze zdobywają nową wiedzą na temat docelowej populacji, możliwych determinant zmiany, czy też odpowiednich metod do użycia w interwencji (Fernandez i in., 2019).

Ponadto, kładzie się nacisk na analizę i budowanie modeli opisujących rolę kontekstu, w którym interwencje są prowadzone. Kontekst interwencji jest ściśle związany z dotarciem do odpowiedniej populacji oraz ma krytyczne znaczenie dla efektywności interwencji (Taylor i in., 2011). Dlatego też, stworzono oparty na teorii i dowodach naukowych model kontekstu iimplementacji złożonych interwencji *(ang. the Context and Implementation of Complex Intervention, CICI)* (Pfadenhauer i in., 2017). Zgodnie z tym modelem, kontekst rozumiany jest jako zestaw okoliczności i środowiskowych charakterystyk, w których osadzona jest implementacja interwencji. Co ważne, kontekst nie stanowi w tym ujęciu jedynie tła interwencji, lecz może ją modyfikować, wpływać na poszczególne elementy, wspierać lub ograniczać jej działanie. Kontekst ujmowany jest w ośmiu domenach: lokalizacji, geograficznej, epidemiologicznej, socjokulturowej, socjoekonomicznej, etycznej, prawnej oraz politycznej. Wszystkie te perspektywy mogą stanowić istotny kontekst dla interwencji dotyczących redukcji i utrzymania masy ciała (Taggart i in., 2021). Szczególnie ważne może być w tym przypadku socjokulturowe ujęcie kontekstu interwencji, ze względu na subiektywne percepcje zdrowia i zachowań zdrowotnych w określonej populacji.

Na indywidualne postrzeganie zdrowia może wpływać wiele czynników fizycznych, emocjonalnych i społecznych (Cloninger & Zohar, 2011). Rozumienie zdrowia, jest związane z występującymi indywidualnie chorobami przewlekłymi lub możlwiościami codziennego funkcjonowania (Gumà, 2021). Obecne badania prowadzone są jedynie na wybranych populacjach (Borraccino i in., 2019; Deeks i in., 2009), dlatego wartościowe może być zbadanie, czy istnieją wspólne mianowniki postrzegania tego, co stanowi zdrowie i co wspiera zdrowy styl życia w populacji ogólnej. Umożliwiłoby to sformułowanie ogólnych wniosków do wykorzystania we wszystkich przyszłych interwencjach zdrowotnych i programach promocji zdrowia, dla lepszego dopasowania procedury i treści przyszłych interwencji. Potencjalni uczestnicy interwencji zdrowotnych powinni być traktowani jako kluczowi interesariusze w procesie ustalania priorytetów zdrowotnych w interwencjach i programach promocji zdrowia. Podkreśla się, że zaangażowanie społeczne potencjalnych uczestników ułatwia dostosowanie interwencji do potrzeb uczestników i ich doświadczeń (Crocker i in., 2018). Zbadanie indywidualnego postrzegania zdrowia i czynników wspierających występowanie zachowań zdrowotnych może wspierać rozwój skutecznych i trwałych interwencji w zakresie promocji zdrowia. Oparty na dowodach, partycypacyjny proces ustalania priorytetów zdrowotnych wspiera skuteczność interwencji i polityk zdrowotnych i pozytywnie wpływa na równy dostęp oraz zaangażowanie uczestników o różnym statusie socjoekonomicznym (McGregor i in., 2014).

Poza analizą procesu przygotowania interwencji oraz jej kontekstu, szczególną uwagę zwraca się na ocenę wskaźników procesu implementacji, czyli poszukiwanie odpowiedzi na to, w jakim stopniu sama implementacja interwencji była efektywna. Według modelu wskaźników implementacji, do najważniejszych wskaźników należą akceptowalność interwencji (ang. *acceptability*) oraz wykonalność interwencji (*ang. feasbility*) (Proctor i in., 2011, 2023). Akceptowalność jest wskaźnikiem umożliwiającym analizę tego, w jakim

stopniu metody użyte w interwencji są postrzegane przez odbiorców jako właściwe, przyjemne i trafne. Oceny akceptowalności można dokonywać zarówno z uczestnikami interwencji, jak i z osobami odpowiedzialnymi za implementację czy przygotowanie interwencji (Proctor i in., 2011). Wskaźnik ten wymienia się jako kluczowy dla interwencji cyfrowych (Perski & Short, 2021) i rozpatruje się na płaszczyznach: afektywnego stosunku do interwencji, możliwych skutków ubocznych, skali obciążenia aktywnościami związanymi z interwencją, subiektywnie postrzeganych kosztów uczestnictwa, osobistych doświadczeń oraz osobistych intencji związanych z uczestnictwem w interwencji (Sekhon i in., 2017). Odpowiedź na pytanie, jakie czynniki związane z akceptowalnością mogą jednoznacznie poprawiać efektywność interwencji, wciąż pozostaje otwarta (Proctor i in., 2023).

Drugim kluczowym wskaźnikiem w ocenie procesu implementacji interwencji zdrowotnych jest wykonalność (ang. *feasibility*). Stanowi on podstawę dalszego rozpowszechniania interwencji zdrowotnych i stosowania zaproponowanych rozwiązań na szeroką skalę. Ocena wykonalności interwencji pozwala odpowiedzieć na pytanie o to, w jakim stopniu realne jest wykonanie interwencji zgodnie z założonych planem. Potencjalnymi barierami dla wykonalności interwencji mogą być: problemy z rekrutacją uczestników, niski poziom zaangażowania w interwencję, zbyt wysokie wymagania technologiczne do przeprowadzenia interwencji lub zbyt wysokie wymagania dotyczące szkolenia osób implementujących interwencję (Proctor i in., 2011). Empiryczne zbadanie czynników, które mogą moderować wykonalność interwencji w określonych kontekstach, jest kluczowe dla dalszego postępu w tworzeniu trwałych interwencji zdrowotnych.

2. Cele badań własnych

Niniejsza rozprawa doktorska prezentuje wyniki trzech badań, towarzyszących badaniu efektywności interwencji, realizowanych w ramach większego projektu („Wybieramy zdrowie"). Cele badań własnych dotyczą przygotowania, implementacji, oceny kontekstu oraz ewaluacji procesu omawianej interwencji. W szczególności:

- Cel badania 1 to systematyczna ocena procesu projektowania i implementacji interwencji zdrowotnej: „Wybieramy zdrowie".
- Cel badania 2 to zdefiniowanie indywidualnych percepcji zdrowia w celu wsparcia procesu projektowania i implementacji przyszłych programów promocji zdrowia.
- Cel badania 3 to ewaluacja procesu interwencji zdrowotnej: „Wybieramy zdrowie" ze szczególnym uwzględnieniem czynników dotyczących akceptowalności (ang. *acceptability*) oraz wykonalności (ang. *feasibility*) interwencji.

3. Badanie 1

(por. Palacz-Poborczyk i in., 2022)

3.1 Podstawa teoretyczna i cel Badania 1

W tym artykule opisujemy systematyczny proces projektowania interwencji zdrowotnej: „Wybieramy Zdrowie". Głównym celem badania było zaprojektowanie cyfrowego programu zmiany zachowań zdrowotnych z użyciem protokołu badawczego, opartego o model teoretyczny mapowania interwencji (ang. *Intervention Mapping)* (Barthomolew Eldridge i in., 2016). Wykorzystanie tego modelu służy: sformułowaniu głównych celów interwencji, wyborowi metod zmiany zachowań, wyborowi sposobów dostarczania interwencji i przygotowania materiałów, zaplanowaniu implementacji oraz ewaluacji interwencji.

Celem Badania 1 była systematyczna ocena procesu projektowania i implementacji interwencji zdrowotnej: „Wybieramy zdrowie".

3.2 Metoda Badania 1

Procedura mapowania interwencji (ang. *Intervention Mapping*) opiera się na sześciu krokach, zawierających zadania integrujące teorię z wynikami badań naukowych (Barthomolew Eldridge i in., 2016). Wskazane w modelu kroki stanowią jednocześnie plan projektowania, implementacji i ewaluacji interwencji.

Krok 1: Ocena potrzeb

Utworzyliśmy grupę odpowiedzialną za zaplanowanie interwencji (N=11), która obejmowała: osoby reprezentujące grupę docelową (osoby z nadwagą lub otyłością), ekspertów żywienia i aktywności fizycznej, praktyków ochrony zdrowia, osoby

odpowiadające za implementację programu (osoby prowadzące program i przekazujące interwencję). Stworzyliśmy logiczny model problemu (Ryc. 3). Grupa planująca dokonała oceny: problematyki nadwagi i otyłości w Polsce (Gańczak i in., 2020), odpowiednich zachowań związanych z nadwagą i otyłością, czynników środowiskowych oraz możliwych do zmiany determinant nadwagi i otyłości w populacji potencjalnych odbiorców interwencji. Zbadaliśmy również kontekst interwencji, włączając w to lokalną społeczność i biorąc pod uwagę cele programu.

Krok 2: Identyfikowanie celów interwencji

Opracowaliśmy model logiczny zmiany, definiując szczegółowe cele interwencji i oczekiwane rezultaty (Ryc. 4). Zgodnie z protokołem mapowania interwencji, opisano: indywidualne determinanty zmiany, oczekiwane zmiany zachowań wśród uczestników, oczekiwane rezultaty na poziomie zachowań oraz środowiska, a także oczekiwaną utratę masy ciała i utrzymanie prawidłowej masy ciała jako głównego celu interwencji.

Krok 3: Projektowanie interwencji

Dokonano wyboru obszarów teoretycznych, które miały stanowić podstawę interwencji, w oparciu o przegląd teorii dotyczących utrzymywania zmiany zachowań zdrowotnych (Kwasnicka i in., 2016). Na bazie celów zdefiniowanych w modelu logicznym zmiany, wybraliśmy techniki zmiany zachowań (Michie i in., 2013), które zostały połączone z wyselekcjonowanymi obszarami teoretycznymi. Grupa planująca zdecydowała również o wykorzystaniu wiadomości SMS, wiadomości e-mail oraz podręcznika (w formie e-booka lub tradycyjnej) jako środków dostarczania interwencji, z uwzględnieniem możliwości dalszego skalowania programu.

Krok 4: Przygotowanie interwencji

Celem tego etapu było iteracyjne przygotowanie struktury programu i materiałów interwencji. W skład aktywności wykonanych w tym etapie wchodzą: przygotowanie treści

opartych o teorię i dane z badań naukowych (wiadomości SMS, wiadomości e-mail, treści podręcznika). Przetestowaliśmy i rewidowaliśmy przygotowane treści poprzez: grupy fokusowe, oceny ekspertów oraz wywiady z potencjalnymi uczestnikami programu.

Grupy fokusowe

Przeprowadziliśmy badania w czterech grupach fokusowych (*N*=40). Uczestnicy oceniali próbne materiały interwencji, biorąc pod uwagę: zrozumiałość, atrakcyjność oraz informatywność treści. Łącznie oceniono 25% wszystkich przygotowanych do interwencji wiadomości e-mail oraz 44,9% przygotowanych treści wiadomości SMS. Materiały były również dyskutowane na forum z uwzględnieniem ewentualnych ulepszeń, które mogły zostać wprowadzone, a także dobrych praktyk, które uczestnicy grup zaobserwowali w prezentowanych materiałach.

Przebieg badań w grupach fokusowych został poddany zapisowi głosowemu, następnie poddany transkrypcji i zweryfikowany. Transkrypty zostały przeanalizowane z użyciem metody Framework (Gale i in., 2013).

Oceny ekspertów

Cały zestaw przygotowanych wstępnie treści interwencji (109 wiadomości e-mail oraz 759 wiadomości e-mail) został poddany ocenie ekspertów (*N*=12) z dziedziny: psychologii, aktywności fizycznej i odżywiania. Eksperci oceniali treści na tych samych skalach, które wykorzystano w przypadku grup fokusowych (zrozumiałość, atrakcyjność, informatywność), zostali również poproszeni o przyporządkowanie treści do domen, opracowanych na podstawie obszarów teoretycznych zdefiniowanych na etapie projektowania interwencji. Eksperci mogli również udzielić dowolnej informacji zwrotnej na temat każdego fragmentu treści.

Wywiady z potencjalnymi uczestnikami

Zaprosiliśmy przedstawicieli ogólnej populacji (*N*=11) do ewaluacji przygotowanych wstępnie treści podręcznika (e-book oraz wersji tradycyjnej). Każda osoba była zobowiązana do szczegółowego zapoznania się z zawartością podręcznika i poproszona o informacje zwrotne dotyczące: zrozumiałości, użytkowalności oraz inkluzywności. Główne wnioski zostały uwzględnione podczas rewizji treści podręcznika.

Po przeprowadzeniu badań w grupach fokusowych, ocenach ekspertów oraz wywiadach z potencjalnymi użytkownikami, główni członkowie grupy planującej interwencję iteracyjnie rewidowali ocenione treści. Ustalono również kolejność, intensywność oraz częstotliwość przekazywania treści. Wyselekcjonowano również kwestionariusze przeznaczone do pomiarów w trakcie programu.

Krok 5: Plan implementacji

W tej fazie zdefiniowano plan implementacji oraz zapewnienia trwałości, poprzez ustalenie celów dla promocji programu, z uwzględnieniem rekomendacji opartych o skonsolidowany model teoretyczny dla badań implementacyjnych (ang. *Consolidated Framework for Implementation Research*) (Damschroder i in., 2009, 2022).

Krok 6: Plan ewaluacji

W ostatnim kroku opracowaliśmy plan ewaluacji interwencji, biorąc pod uwagę jego efekty, proces oraz opłacalność. Opracowaliśmy protokół całej interwencji (Kwasnicka i in., 2020), gdzie opisaliśmy oczekiwane rezultaty i sposoby ich ewaluacji.

3.3 Wyniki Badania 1

W oparciu o metodę mapowania interwencji, przygotowaliśmy złożoną interwencję zdrowotną z uwzględnieniem: oceny potrzeb, zidentyfikowania celów interwencji,

zaprojektowania interwencji, przygotowania interwencji, opracowania planu implementacji oraz planu ewaluacji interwencji.

Ocena potrzeb pomogła w zdefiniowaniu problemu, a problem nadwagi i otyłości w Polsce oceniono jako poważny i rosnący (Gańczak i in., 2020), jednocześnie dostrzegając pilną potrzebę zaproponowania programów, które są efektywne, trwałe i opłacalne, skupiając się zarówno na redukcji masy ciała, jak i późniejszym utrzymaniu prawidłowej masy ciała. Zidentyfikowano istotny wpływ nadmiernej masy ciała na jakość życia, poprzez obniżony, subiektywny poziom zdrowia w wymiarze fizycznym i psychicznym (Gańczak i in., 2020). Zdefiniowane czynniki kontekstualne, środowiskowe czy dotyczące zachowań wskazały na konieczność zaprojektowania programu wyraźnie dopasowanego do indywidualnych potrzeb uczestników, przy jednoczesnej konieczności możliwie najniższego kosztu udziału w interwencji.

Dzięki zidentyfikowaniu szczegółowych celów interwencji, określiliśmy, że uczestnicy, którzy wezmą udział w programie, przejdą przez dwie fazy: odchudzania i utrzymania masy ciała. Przed rozpoczęciem interwencji konieczne było zebranie informacji dotyczących indywidualnych predyktorów redukcji i utrzymania masy ciała, by móc następnie dopasować interwencję do personalnych charakterystyk uczestników. W oparciu o indywidualnie zidentyfikowane predyktory, zaplanowano dostarczenie odpowiadającej im interwencji. Dla każdej z determinant określono konieczność powiązania jej z technikami zmiany zachowań (Michie i in., 2013). W oparciu o wcześniejsze badania (Kwasnicka i in., 2017), przewidywaliśmy że każdy z uczestników może mieć różny profil determinant istotnych dla zmiany zachowań zdrowotnych w celu redukcji i późniejszego utrzymania masy ciała.

Podczas projektowania interwencji, wybraliśmy szczegółowe techniki i domeny, które zostały użyte do przygotowania treści interwencji. Postanowiliśmy zaprojektować treści

w oparciu o pięć najważniejszych domen teoretycznych w kontekście utrzymania zmiany zachowań zdrowotnych: utrzymania motywacji, nawyku, samoregulacji, indywidualnych zasobów oraz wpływów środowiskowych (Kwasnicka i in., 2016). Do każdej z domen zmapowaliśmy odpowiednie techniki zmiany zachowań, aby móc je systematycznie zoperacjonalizować w treściach interwencji.

Przygotowanie interwencji uwzględniające grupy fokusowe pozwoliło na sformułowanie dwóch obszarów tematycznych istotnych dla przygotowania złożonych interwencji zdrowotnych: treści interwencji oraz dostarczenia interwencji. Jeśli chodzi o treści interwencji, to wygenerowane tematy obejmowały: (1) rolę uczestnika jako aktywnego partnera w procesie zmiany zachowań zdrowotnych, (2) inkluzywność zapewnianych informacji, (3) nastawienie na rozwiązywanie problemów. Obszar związany z dostarczeniem interwencji obejmował tematy: (1) informatywności dostarczanych elementów interwencji, (2) jednoznaczności dostarczanych informacji, (3) konieczności skupienia na bezpośrednich komunikatach, oferujących propozycje działań. Oceny uczestników dotyczące zrozumiałości, atrakcyjności oraz informatywności umożliwiły skupienie się na treściach, które wymagały rewizji. Również oceny ekspertów umożliwiły skupienie się na rewizji treści, które zostały uznane za nieodpowiednie lub szkodliwe – z puli treści usunięto 3,7% wstępnych treści wiadomości SMS oraz 0,9% wstępnych treści wiadomości e-mail.

Dzięki opracowaniu planu implementacji, zdefiniowaliśmy grupy potencjalnych uczestników – były to osoby z nadwagą lub otyłością, zamieszkujące Wrocław i okolice, z uwagi na to, że udział w programie wymagał spotkań twarzą w twarz z osobami odpowiadającymi za implementację. Osobami implementującymi interwencję miała być część osób odpowiedzialnych za przygotowanie całej interwencji, prowadzących niniejsze badania. Program projektowano jednak z myślą o późniejszym utrzymaniu i możliwości prowadzenia

go przez praktyków ochrony zdrowia, ze wsparciem w postaci edukacji dotyczącej podstawowych zasad zmiany zachowań zdrowotnych.

Zaplanowano również ewaluację interwencji pod kątem: efektywności, kosztów oraz oceny procesu. Ocena efektywności interwencji została zaplanowana w oparciu o randomizowane badania z grupą kontrolną i elementem badań idiograficznych z wykorzystaniem danych ekologicznych (Kwasnicka, i in., 2020). Podjęto decyzję o wykorzystaniu zasad do ewaluacji procesu złożonych interwencji zdrowotnych, opracowanych przez brytyjską Radę ds. Badań Medycznych (Moore i in., 2015).

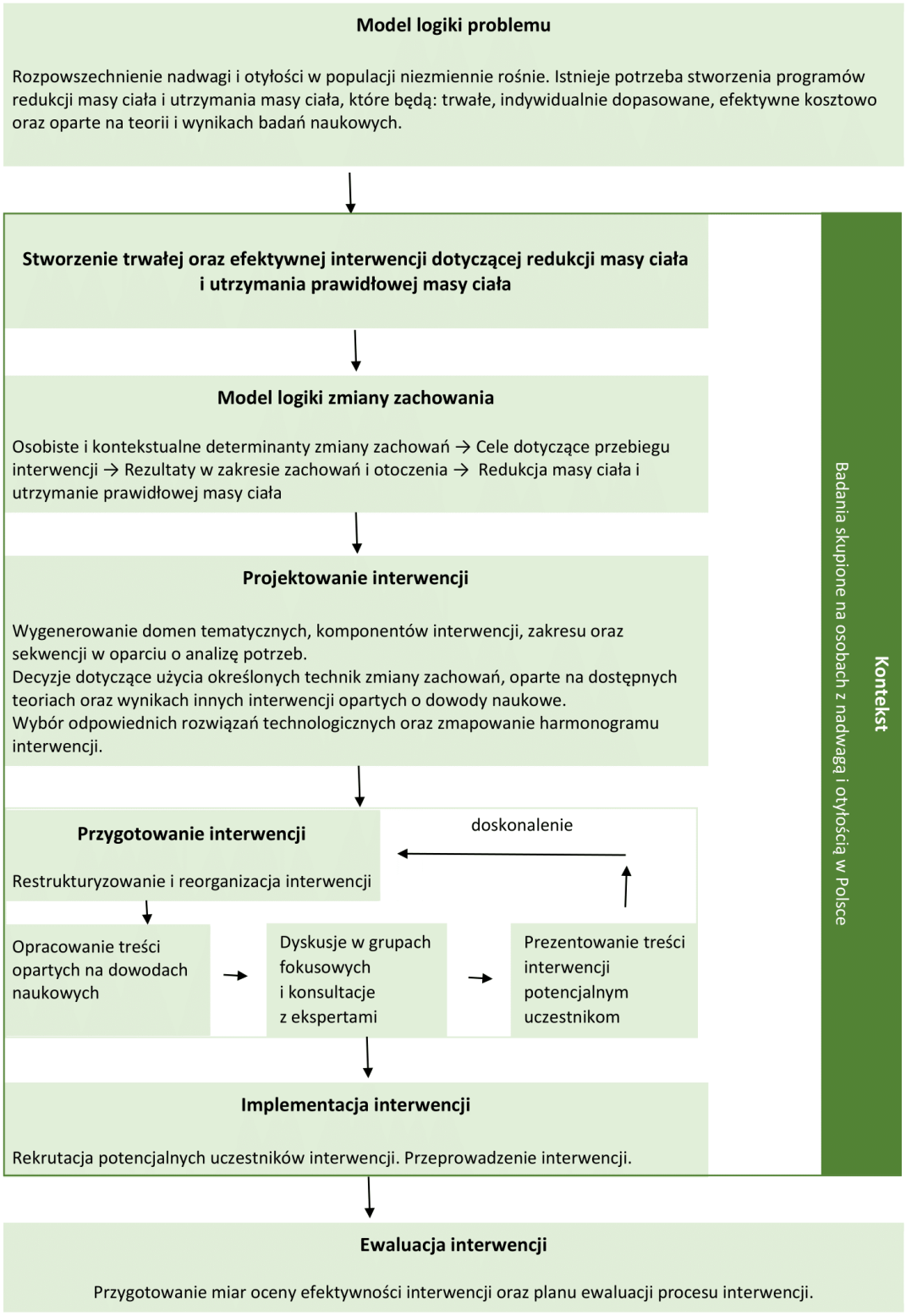
3.4 Dyskusja Badania 1

Celem Badania 1 było opracowanie kompleksowej interwencji dotyczącej redukcji i utrzymania masy ciała, a opracowanie tej interwencji przeprowadzono zgodnie z modelem mapowania interwencji (Barthomolew Eldridge i in., 2016). Aktywne zaangażowanie interesariuszy pozwoliło na zbadanie potrzeb i dopasowanie interwencji do oczekiwań potencjalnych beneficjentów, co jest zgodne z teorią (Ng i in., 2012) oraz wynikami innych interwencji zdrowotnych (Kwasnicka, Ntoumanis, i in., 2020). Dla utrzymania długotrwałych efektów w zakresie redukcji i utrzymania masy ciała, pomocna może być inkluzywna forma komunikacji i skupienie na sposobach rozwiązywania problemów, na co wskazują również wcześniejsze badania (Presseau i in., 2009). Ponadto, treści i forma interwencji zdrowotnej powinny być formułowane w sposób precyzyjny, jednoznaczny i praktyczny (Quested i in., 2018), co potwierdzają wyniki zaangażowania potencjalnych uczestników w proces projektowania interwencji: „Wybieramy zdrowie".

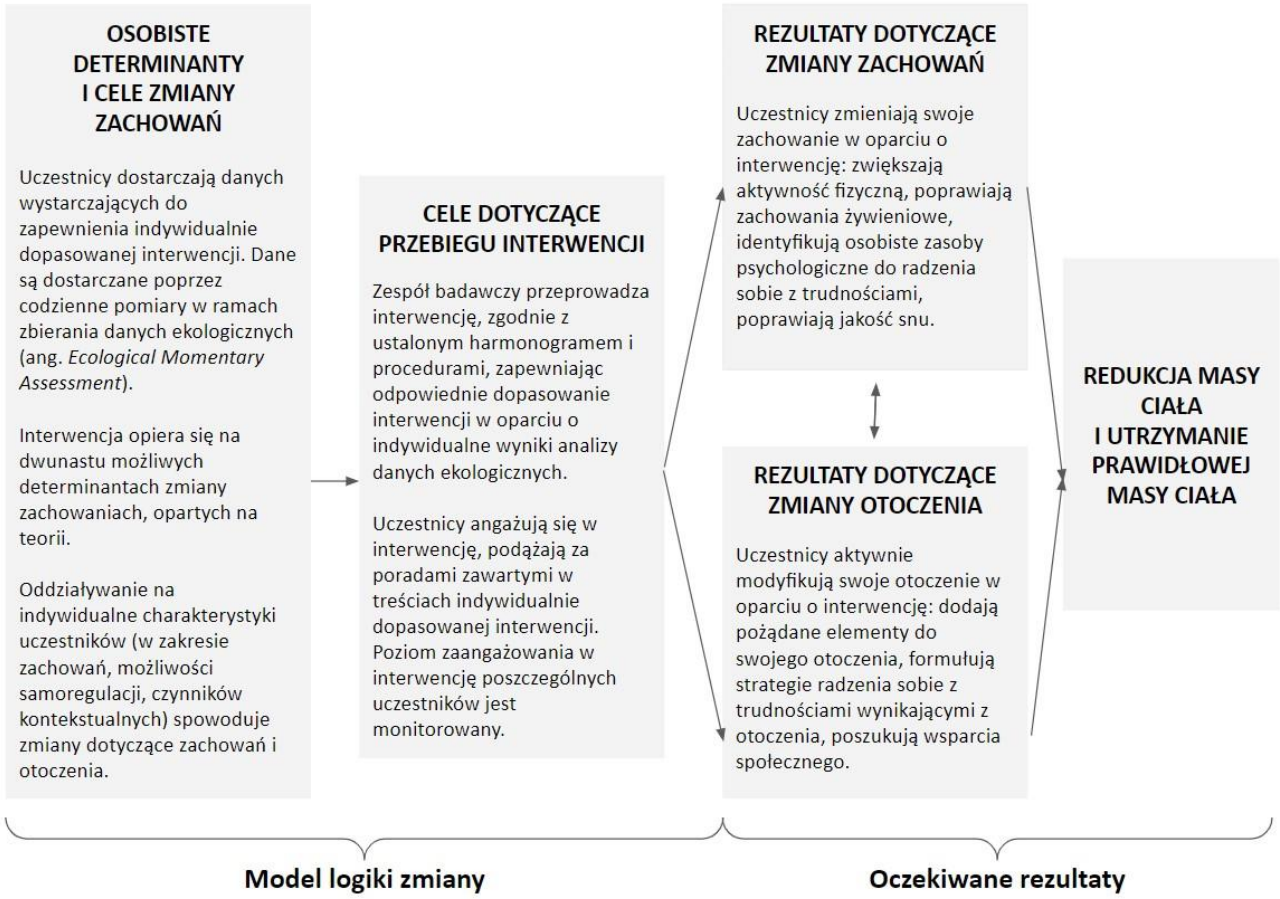
Wyniki tego badania mogą być szczególnie przydatne dla innych twórców interwencji, którzy planują zaprojektować i wdrożyć spersonalizowane, cyfrowe interwencje zdrowotne,

ukierunkowane na behawioralne determinanty żywienia, aktywności fizycznej i zmianę zachowań zdrowotnych.

Rycina 3. Model logiki przygotowania i implementacji interwencji dotyczącej redukcji nadwagi i otyłości, przygotowany w oparciu o model mapowania interwencji (ang. *Intervention Mapping*).



Rycina 4. Model logiki oceny efektywności interwencji dotyczącej redukcji nadwagi i otyłości, przygotowany w oparciu o model mapowania interwencji (ang. *Intervention Mapping*).



4. Badanie 2

(por. Palacz-Poborczyk i in., 2023a)

4.1 Podstawa teoretyczna i cele Badania 2

Współczesna debata naukowa proponuje szerokie ujęcie definicji zdrowia i postuluje włączenie złego samopoczucia i strategii radzenia sobie jako kluczowych aspektów tej definicji (Leonardi, 2018). Biorąc pod uwagę wieloczynnikowe, szerokie definicje zdrowia, ważne jest zbadanie postrzegania zdrowia w populacji ogólnej. Wyniki dotychczasowych badań na temat subiektywnych koncepcji zdrowia i zachowań zdrowotnych (Heszen-Celińska & Sęk, 2020; Sęk, 2000) wskazują na postrzeganie zdrowia jako konstruktu o wydźwięku zdecydowanie pozytywnym, rozumianym m.in. jako: wartość konieczna do życia, zmienny obiekt, który wymaga pielęgnacji; źródło energii do życia czy przyjemność.

Teorie dotyczące kompleksowych interwencji promujących zdrowie, takich jak model kontekstu i implementacji złożonych interwencji *(ang. the Context and Implementation of Complex Intervention, CICI)* (Pfadenhauer i in., 2017) sugerują, iż dla adekwatnej implementacji interwencji i zwiększenia efektywności interwencji konieczna jest kontekstualizacja tych interwencji, dotycząca między innymi tego w jaki sposób potencjalni uczestnicy interwencji definiują i postrzegają zdrowie. Odpowiedzi na te pytania ułatwiłyby rozwój interwencji w zakresie promocji zdrowia, ponieważ pozwoliłoby to na lepsze dostosowywanie programów do rzeczywistego postrzegania zdrowia ogółu społeczeństwa

Celem Badania 2 było zbadanie indywidualnego postrzegania zdrowia i zidentyfikowanie głównych czynników wspierających występowanie zachowań zdrowotnych w ogólnej populacji. Dodatkowym celem badania była ocena, czy pandemia COVID-19 miała związek z postrzeganiem zdrowia.

4.2 Metoda Badania 2

W badaniu wykorzystano metodę foto-elicytacji (*ang. photo-elicitation*) (Kyololo i in., 2023), zbierając autorskie zdjęcia z odpowiadającymi im narracjami. Metoda ta pozwala na poszukiwanie odpowiedzi na pytania badawcze za pomocą zdjęć i narracji dostarczonych przez uczestników (Bates i in., 2017). Przedmiot zainteresowania badano prosząc uczestników o odpowiedź na pytanie: "Co oznacza dla Ciebie bycie zdrowym?" poprzez zrobienie zdjęcia i dołączenie szczegółowego podpisu. W badaniu wykorzystano częściowo ustrukturyzowany format kierowany przez uczestników (Bates i in., 2017), co oznacza, że uczestnicy mogli przesłać dowolne oryginalne zdjęcia, wykonane samodzielnie, które uznali za istotne dla tematu. Badanie zostało przeprowadzone online w Polsce, z fotografiami przesłanymi za pośrednictwem mediów społecznościowych (wybranych przez uczestników) lub pocztą elektroniczną.

Uczestnicy

Kryteriami włączenia do badania były: wiek powyżej 18 lat, zgoda na udział w badaniu i zgoda na publikację zdjęć w mediach społecznościowych (Twitter, Facebook i Instagram), na stronie internetowej badania oraz w późniejszej publikacji oraz prezentacjach dotyczących badania. Aby przesłać zdjęcie z podpisem, uczestnicy musieli posiadać połączenie internetowe oraz konto w mediach społecznościowych lub adres e-mail. Uczestnicy musieli posługiwać się językiem polskim.

Wszyscy uczestnicy (N=50) wyrazili pełną zgodę na udział w badaniu. Większość uczestników (n=41) przesłało tylko jedno zdjęcie; dziewięć pozostałych osób przesłało 2–10. Średnia długość podpisów dołączonych do zdjęć wynosiła 275 słów (SD=69,15).

Procedura

Ogłoszenie o badaniu zostało opublikowane na stronie internetowej oraz w mediach społecznościowych programu: „Wybieramy zdrowie” (Instagram, Facebook, Twitter).

Zawierało ono informację o celu badania i warunkach uczestnictwa. Uczestnicy mogli opublikować swoje odpowiedzi za pośrednictwem mediów społecznościowych lub wysłać je bezpośrednio do koordynatora badania za pośrednictwem poczty elektronicznej. Poinstruowaliśmy uczestników, aby wykonali oryginalne zdjęcie, które przedstawia ich odpowiedź na pytanie: „Co oznacza dla Ciebie bycie zdrowym?". Uczestnicy byli proszeni o dodanie podpisu do każdego zdjęcia (minimum 200 słów, bez ustalonego limitu maksymalnego). Uczestnicy mieli dostęp online do arkusza informacyjnego badania, zawierającego pytania pomocnicze pomagające w zdefiniowaniu podpisu pod zdjęciem. Kierowaliśmy się wytycznymi dotyczącymi formy wywiadu kierowanego przez uczestnika (Bates i in., 2017) i zadawaliśmy uczestnikom serię pytań otwartych, przy czym treść podpisów kierowana była zdjęciami uczestników. Wszyscy uczestnicy dostarczyli oryginalne zdjęcia wraz z załącznikami. Głównym celem podpisów było opisanie fotografii i wyjaśnienie, w jaki sposób fotografia wiąże się z postrzeganiem zdrowia. Następnie, uczestnicy byli proszeni o opisanie, w jaki sposób utrzymują zdrowie i co jest dla nich ważne, aby osiągnąć i utrzymać zdrowy tryb życia. Dodatkowe pytania dotyczyły postrzeganego związku pomiędzy pandemią COVID-19 a osobistą percepcją zdrowia i zachowań zdrowotnych. Wszystkie podpisy zostały dostarczone w formie pisemnej.

Większość uczestników (72%, n=36) udzieliła odpowiedzi za pośrednictwem poczty elektronicznej, inni zamieścili swoje odpowiedzi na Instagramie (28%, n = 14). Zachętą do udziału w badaniu była możliwość umieszczenia zdjęcia na wirtualnej wystawie: „Wybieramy zdrowie". Na wystawie zaprezentowano wszystkie nadesłane fotografie, gdyż uzyskaliśmy zgodę na publikację zdjęć od wszystkich uczestników.

Metoda analizy danych

Zdjęcia wraz z podpisami analizowano w celu wygenerowania i zinterpretowania głównych tematów związanych z postrzeganiem zdrowia przez uczestników i samodzielnie

zdefiniowanymi czynnikami wspierającymi występowanie zachowań zdrowotnych. Dane wizualne (zdjęcia) i narracyjne (podpisy) analizowano przy użyciu podejścia analizy tematycznej (Braun & Clarke, 2006) i politekstualnej analizy tematycznej (Gleeson, 2020). Kierując się wytycznymi politekstualnej analizy tematycznej, przyjęliśmy założenie że dane werbalne i wizualne są ze sobą powiązane. Przeprowadziliśmy również procedurę zsyntezowanego sprawdzenia wyników z uczestnikami badania, zgodnie z wytycznymi metodologicznymi (Birt i in., 2016), w celu zapewnienia maksymalnej trafności uzyskanych wyników.

4.3 Wyniki Badania 2

Zidentyfikowaliśmy trzy główne kategorie tematyczne, zgodne z celami badania. Pierwszą kategorią były percepcje zdrowia, drugą czynniki wspierające występowanie zachowań zdrowotnych, trzecią był związek pandemii COVID-19 z postrzeganiem zdrowia. W zakresie percepcji zdrowia, wygenerowaliśmy trzy główne obszary tematyczne: (1) zdrowie postrzegane jako „długa podróż", (2) zdrowie postrzegane jako utrzymywanie równowagi, (3) zdrowie postrzegane jako samoakceptacja. Jeśli chodzi o czynniki wspierające występowanie zachowań zdrowotnych, do wygenerowanych tematów zaliczają się: (1) odczuwanie przyjemności w związku z zachowaniami wspierającymi zdrowy styl życia, (2) planowanie czasu na odpoczynek, (3) wspierające relacje z innymi ludźmi, (4) kontakt z naturą (ten obszar tematyczny przejawiał wyraźne związki z pandemią COVID-19). W kwestii powiązań pomiędzy COVID-19 a postrzeganiem zdrowia wyróżniliśmy dwa kierunki pojawiających się zmian. Część badanych przedstawiała pandemię COVID-19 jako czynnik zaburzający inicjowanie i utrzymywanie zachowań zdrowotnych. Duża grupa badanych wskazała jednak, że pandemia COVID-19 zwiększyła motywację do skupienia się na własnym zdrowiu i inicjowania oraz utrzymywania zachowań zdrowotnych.

4.4 Dyskusja Badania 2

Wyniki badań sugerują, iż osoby badane podkreślają pozytywne aspektach zdrowia, osobistych i kontekstualnych zasobach pomocnych w utrzymaniu zdrowego stylu życia, a także opisują zachowania, które pomagają podejmować i utrzymywać zachowania zdrowotne. Uzyskane wyniki nawiązują do współczesnych definicji zdrowia (Leonardi, 2018) i obejmują tematykę związaną ze: zdrowiem postrzeganym jako proces, poszukiwaniem równowagi w życiu i samoakceptacją. Ponadto, powiązania między zdrowiem, dobrostanem, osobistymi możliwościami i jakością życia (Tengland, 2006) miały istotne znaczenie dla uczestników, którzy deklarowali, że cenią pozytywne doświadczenia i relacje, kontakt z naturą i czas odpoczynku, w celu utrzymania własnego zdrowia. Postrzeganie zdrowia i czynników je wspierających w niniejszym badaniu, odnosi się także do zdrowia psychicznego z punktu widzenia osobistych zasobów, a nie zdrowia rozumianego jako brak choroby. Jest to zgodne z obecnymi definicjami zdrowia (Kobau i in., 2011; Vaillant, 2012). Pozytywna perspektywa w percepcji zdrowia może rówież przyczynić się do stawienia czoła jednemu z głównych wyzwań polskiego systemu zdrowia, czyli niewystarczającej promocji zdrowia i profilaktyce chorób poprzez zachęcanie do zachowań zdrowotnych (Światowa Organizacja Zdrowia, 2019).

Wyniki Badania 2 mogą służyć procesowi opracowywania przyszłych programów promocji zdrowia i interwencji zdrowotnych. Wiedza na temat postrzegania zdrowia i czynników ułatwiających jego osiągnięcie może pomóc w zaangażowaniu potencjalnych uczestników, a także określeniu formy, procesu oraz celów programów promocji zdrowia i interwencji zdrowotnych.

5. Badanie 3

(por. Palacz-Poborczyk i in., 2023b)

5.1 Podstawa teoretyczna i cele Badania 3

Według modelu wskaźników implementacji (ang. *implementation outcomes*) (Proctor i in., 2011, 2023), kluczowymi pojęciami, niezbędnymi do oceny procesu interwencji zdrowotnych, są: akceptowalność (*ang. acceptability*), pozwalająca określić stopień, w jakim interwencja była odpowiednia i trafna wobec problematyki interwencji, z perspektywy osób biorących udział, ale też innych osób (np. osób projektujących czy implementujących interwencję) oraz wykonalność (ang. *feasibility*) interwencji, dotycząca realnych możliwości przeprowadzenia zaprojektowanego procesu.. Ocena tych wymiarów zapewnia wgląd w realizację, mechanizmy wpływu i czynniki kontekstowe kształtujące każdą złożoną interwencję zdrowotną (Moore i in., 2015). Co więcej, ewaluacja procesu implementacji może pomóc w określeniu, w jaki sposób uczestnicy angażują się w interwencję oraz jakie czynniki wpływają na akceptację poszczególnych elementów interwencji.

Celami tego badania były: (1) ocena akceptowalności interwencji zdrowotnej w programie" „Wybieramy zdrowie", szczególnie w odniesieniu do wykorzystania 3-miesięcznego okresu na zebranie danych ekologicznych, które następnie umożliwiły indywidualne dopasowanie interwencji; oraz (2) określenie wykonalności przeprowadzenia interwencji: „Wybieramy zdrowie" z punktu widzenia uczestników badania i osób implementujących interwencję.

5.2 Metoda Badania 3

Zbadaliśmy akceptowalność i wykonalność interwencji, stanowiące podstawowe wyznaczniki procesu implementacji wg modelu Proctor i in. (2011), stosując się do wytycznych brytyjskiej Rady ds. Badań Medycznych (Moore i in., 2015). Narzędzia wykorzystane przy ewaluacji procesu interwencji obejmowały: (1) ankiety ewaluacyjne wypełnione przez uczestników interwencji przed spotkaniami kontrolnymi po szóstym i dwunastym miesiącu od rozpoczęcia udziału w programie, (2) wywiady oparte na danych (ang. *data-prompted interviews)* (Kwasnicka i in., 2015) przeprowadzone z uczestnikami po zakończeniu udziału w programie, (3) częściowo ustrukturyzowane wywiady z osobami implementującymi interwencję, (4) dane dotyczące zaangażowania w poszczególne komponenty interwencji.

Ankiety ewaluacyjne wypełniane przez uczestników interwencji

Dane z ankiet ewaluacyjnych zebrano anonimowo przed spotkaniami kontrolnymi po sześciu (n=116) oraz dwunastu (n=99) miesiącach od rozpoczęcia programu. Pytania zamknięte ankiety służyły ocenie: postrzeganej atrakcyjności interwencji, pozytywnego afektu związanego w udziałem w interwencji, wartości informacyjnej i akceptowalności treści interwencji dostarczanej online. Odpowiedzi udzielane były na skali 1-100 (1 – *całkowicie nie do zaakceptowania,* 100 – *w pełni akceptowalne*). Pozycje otwarte obejmowały pytania dotyczące: wszelkich zauważonych zmian w indywidualnych zachowaniach zdrowotnych, które wystąpiły podczas interwencji; osobistych doświadczeń związanych z udziałem w interwencji, a także możliwych sugestii dotyczących ulepszeń interwencji.

Wywiady oparte od dane przeprowadzone z uczestnikami interwencji

Przeprowadziliśmy częściowo ustrukturyzowane wywiady oparte na danych (ang. *data-prompted interviews*) z częścią uczestników, którzy ukończyli udział w interwencji (N=26). Wywiady oparte na danych są stymulowane poprzez omówienie indywidualnych

danych uczestników (Kwasnicka i in., 2015) i były wcześniej wykorzystywane do badania doświadczeń w zakresie redukcji i utrzymania masy ciała (Kwasnicka i in., 2019). W trakcie wywiadów korzystaliśmy z raportów opartych na analizie składu ciała oraz raportów z analizy danych ekologicznych, podsumowujących indywidualne czynniki wpływające na redukcję i utrzymanie masy ciała. Wywiady zostały przeprowadzone po spotkaniach kończących udział w interwencji i całym programie (dwanaście miesięcy od rozpoczęcia).

Wywiady trwały średnio 27 minut (*SD* = 6 min). Miały na celu zbadanie doświadczeń uczestników interwencji, postrzeganych czynników ułatwiających zmianę zachowania oraz trudności związanych ze zmianą zachowania w trakcie interwencji. Zbadaliśmy także strategie utraty i utrzymania masy ciała stosowane podczas interwencji oraz te, które uczestnicy chcieli stosować po zakończeniu interwencji.

Wywiady z osobami implementującymi interwencję

Osoby implementujące interwencję (*N*=4, kobiety) poproszono o wzięcie udziału w częściowo ustrukturyzowanych wywiadach, aby poznać ich doświadczenia związane z implementacją, sugestie dotyczące przyszłych ulepszeń. Pytaliśmy również o elementy interwencji, które w ocenie osób implementujących ułatwiały zmianę i utrzymanie zachowań zdrowotnych, a także o elementy, które mogły być niewystarczająco pomocne w tym zakresie. Wywiady trwały średnio 24 minuty (*SD* = 1 min).

Metoda monitorowania zaangażowania uczestników w poszczególne komponenty interwencji

Dostarczenie interwencji w formie wiadomości SMS oraz wiadomości e-mail zostało zautomatyzowane poprzez dedykowane oprogramowanie. Monitorowaliśmy zaangażowanie w interwencję, zbierając dane o dostępie do treści przekazywanych uczestnikom interwencji (zaplanowane e-maile, zaplanowane wiadomości SMS). Monitorowano, ile osób otworzyło każdą wiadomość e-mail i w jaki sposób się z nią zaangażowało (np. otworzyło link

w wiadomości). Śledziliśmy dostarczanie wiadomości SMS i naprawiliśmy wszelkie występujące problemy z dostawą zgodnie z opracowanymi standardowymi procedurami postępowania. Wszyscy uczestnicy otrzymali na początku podręcznik interwencji (drukowany lub e-book) i oceniliśmy, która forma jest preferowana.

Analiza danych

Dane jakościowe (komentarze z ankiety ewaluacyjnej, wywiady oparte o dane z uczestnikami interwencji oraz wywiady częściowo ustrukturyzowane z osobami implementującymi interwencję) poddano analizie, stosując zasady refleksyjnej analizy tematycznej (Braun & Clarke, 2019). Dane ilościowe z pytań zamkniętych w ankietach ewaluacyjnych dla uczestników interwencji zostały przeanalizowane przy użyciu statystyk opisowych.

5.3 Wyniki Badania 3

Akceptowalność interwencji

Wyniki dotyczące akceptowalności interwencji opisano za pomocą siedmiu obszarów tematycznych: (1) zbieranie danych ekologicznych (ang. *Ecological Momentary Assessment*) uznawane przez uczestników za technikę monitorowania zmiany zachowania, (2) kluczowa rola spersonalizowanych raportów na podstawie indywidualnych danych ekologicznych, (3) użyteczność analizy składu ciała w zrozumieniu procesu kontroli masy ciała, (4) współpraca z osobami implementującymi interwencję w celu osiągnięcia indywidualnych celów uczestników, (5) korzyści z nieoceniającego tonu interwencji, skupionej na rozwiązywaniu problemów i radzeniu sobie z trudnościami, (6) indywidualne dopasowanie interwencji jako czynnik wspierający korzystne zmiany w osobistym postrzeganiu procesu kontroli masy ciała, (7) niewystarczające dostosowanie treści interwencji.

Wykonalność interwencji

Większość uczestników wybrała wersję drukowaną podręcznika interwencji (n=266, 92,36%), pozostali – formę e-booka (n=22, 7,64%). Za łatwo dostępną formę stałego kontaktu uznano wiadomości SMS. Wszyscy uczestnicy korzystali z własnych telefonów komórkowych, aby otrzymywać treści interwencyjne za pomocą wiadomości SMS. Decydując się na dogodną godzinę odbioru codziennych SMS-ów, uczestnicy wybierali najczęściej godzinę zaraz po przebudzeniu. Nie byliśmy w stanie sprawdzić, czy wiadomości tekstowe zostały otwarte i przeczytane. Trzej uczestnicy zgłosili, że nie otrzymali wiadomości tekstowych, a wszystkie problemy zostały rozwiązane w ciągu dwóch dni. Z punktu widzenia osób implementujących interwencję, automatyzacja dystrybucji wiadomości SMS wymagała dużych zasobów, gdyż wymagała intensywnych szkoleń, a następnie zaprogramowania bazy wiadomości osobno dla każdego uczestnika.

Wiadomości e-mail oceniono jako mniej dostępne niż wiadomości tekstowe. Wiadomości e-mail dotyczące interwencji bywały przeoczone w skrzynkach odbiorczych. Uczestnicy zgłaszali, że ta forma interwencji była przydatna w inny sposób niż wiadomości SMS – wiadomości tekstowe były odbierane jako wskazówki do działania lub przypomnienia, natomiast wiadomości e-mail były dłuższe i wymagały czasu na przetworzenie oraz przemyślenie treści. Większość wiadomości e-mail była otwierana na komputerach osobistych (95,36%), a tylko nieliczni uczestnicy korzystali z telefonów komórkowych do ich otwierania i czytania (4,64%). Określając dogodny dzień otrzymywania wiadomości e-mail, uczestnicy zazwyczaj wybierali dzień, w którym wiedzieli, że będą mieli więcej czasu na przejrzenie skrzynki odbiorczej. Ogółem otwarto 60,00% wiadomości e-mail, a 11,70% uczestników użyło odnośników do innych stron, zawartych w wiadomościach (np. odnośnik do strony internetowej interwencji lub dodatkowe zasoby na temat poruszany w wiadomości e-mail).

5.4 Dyskusja Badania 3

Dzięki systematycznej metodzie ewaluacji procesu, określono akceptowalność oraz wykonalność (Proctor i in., 2011, 2023) interwencji „Wybieramy zdrowie", biorąc pod uwagę kontekst interwencji, proces implementacji, a także zaobserwowane mechanizmy zmiany zachowań zdrowotnych (Moore i in., 2015). Poczucie autonomii uzyskane poprzez codzienne monitorowanie zachowań zdrowotnych, a także osobiste poczucie kompetencji podkreślane przez uczestników, z którymi dokładnie omówiono wyniki analizy indywidualnych danych ekologicznych, odnoszą się do teorii autodeterminacji (*ang. Self-Determination Theory*) (Ryan & Deci, 2020). Ujęcie elementów wzmacniających osobiste poczucie kompetencji, autonomii, a także przynależności, może zwiększać akceptowalność interwencji zdrowotnych. Spotkania z osobami implementującymi interwencję pozytywnie wpływają na poziom zaangażowania uczestników (Burke i in., 2017). Złożone, wysoce spersonalizowane interwencje mogą być wspierane przez uczenie maszynowe (Goh i in., 2022), jednak wyzwaniem może być zastąpienie elementów bezpośredniego kontaktu z osobami implementującymi interwencję, regularnej informacji zwrotnej na temat postępów za pomocą metod, takich jak analiza składu ciała, oraz poprzez wyjaśnianie czynników osobistych wykorzystywanych do dopasowania interwencji.

Wiele programów redukcji i utrzymania masy ciała wciąż zawiera elementy stygmatyzacji osób z nadwagą lub otyłością (Kite i in., 2022). Ponad połowa osób z nadmierną masą ciała deklaruje doświadczenie dyskryminacji lub wykluczenia społecznego (Hoffmann i in., 2022), co jest nieskuteczne dla redukcji i utrzymania masy ciała u osób z nadwagą i otyłością (Major i in., 2012, 2014). Uczestnicy interwencji: „Wybieramy zdrowie" zdecydowanie docenili nieoceniający ton interwencji, oparty na poszukiwaniu osobistych zasobów i rozwiązywaniu problemów. Dostosowanie tonu komunikacji w trakcie

całej interwencji jest więc jednym z kluczowych kryteriów akceptowalności i wykonalności interwencji zdrowotnych, szczególnie tych, które dotyczą redukcji i utrzymania masy ciała.

Dopasowanie interwencji, oparte na domenach było często niewystarczające dla uczestników, ponieważ oczekiwali oni wysoce spersonalizowanych treści interwencyjnych. Akceptowalność przekazywanego wsparcia mogłaby zostać zwiększona poprzez dodatkowe dopasowanie ze względu na charakterystykę demograficzną (Noar i in., 2011) poszczególnych uczestników lub płeć (Kwasnicka i in., 2021). Rozwiązaniem, które mogłoby pozytywnie wpłynąć na poziom akceptowalności interwencji, jest też wykorzystanie dopasowania w czasie rzeczywistym (ang. *just-in-time*) (Hardeman i in., 2019), które pozwoliłoby na dopasowanie treści interwencji do zmieniających się okoliczności lub preferencji uczestników.

6. Konkluzje dla Badań 1-3

W toku przygotowania interwencji, opartego o model mapowania interwencji (Barthomolew Eldridge i in., 2016) podjęto decyzję o wykorzystaniu indywidualnego dopasowania treści interwencji, na podstawie przeprowadzonych wcześniej podłużnych badań idiograficznych, wykorzystujących dane ekologiczne przekazywane regularnie przez uczestników. Indywidualne dopasowanie interwencji zostało oparte o domeny stworzone na podstawie teorii utrzymania zachowań zdrowotnych (Kwasnicka i in., 2016). Wyniki ewaluacji procesu interwencji (Badanie 3) pokazały, że dopasowanie interwencji na poziomie indywidualnym jest związane z jej akceptowalnością, pod warunkiem, że podstawy dopasowania i wyniki analizy indywidualnych danych są dokładnie wyjaśnione i omówione z uczestnikami. Jednakże, dopasowanie oparte o domeny oparte na teorii zmiany i utrzymania zachowań zdrowotnych może być niewystarczające dla uczestników. Ponad tego typu indywidualne dopasowanie, warto rozważyć dodatkową personalizację na podstawie charakterystyk takich jak: sytuacja rodzinna, miejsce zamieszkania, płeć, osobiste preferencje dotyczące aktywności fizycznej, odżywiania czy planu dnia. Cennym uzupełnieniem może być również dopasowywanie interwencji w czasie rzeczywistym (ang. *just-in-time*).

Włączenie kontekstu jako potencjalnego moderatora mechanizmów zachodzących w interwencji (Pfadenhauer i in., 2017), a także ocena akceptowalności i wykonalności interwencji (Proctor i in., 2011) z uwzględnieniem kontekstu, implementacji oraz mechanizmów wpływu (Moore i in., 2015) pozwoliły na sformułowanie wniosków i rekomendacji dla konstruowania i wdrażania przyszłych interwencji dotyczących redukcji i utrzymania masy ciała, a także różnego rodzaju zachowań zdrowotnych. Najważniejsze wnioski i rekomendacje to: (1) zapewnienie wsparcia długoterminowego, z jednoczesną edukacją o zasobach umożliwiających utrzymanie zachowań zdrowotnych i radzenie sobie z nawrotami lub zmieniającymi się okolicznościami; (2) podkreślanie roli akceptacji

okoliczności życiowych i własnego wyglądu jako ważnych elementów procesu zmiany zachowań zdrowotnych, a także uwzględnienie inkluzywnych, nieoceniających treści; (3) proponowanie zachowań zdrowotnych, które wywołują pozytywne emocje i stanowią przyjemne doświadczenia, uwzględniające także odpoczynek jako zachowanie zdrowotne, (4) zachęcanie uczestników do aktywności na zewnątrz i rozwijanie możliwości spędzania czasu na świeżym powietrzu w społecznościach; (5) włączenie uczestnika interwencji zdrowotnej jako aktywnego partnera w procesie zmiany i utrzymania zachowań zdrowotnych, w zakresie: projektowania interwencji, wspólnego ustalania indywidualnych celów uczestnika dotyczących zmiany, we współpracy z osobami implementującymi interwencję oraz stałego kontaktu i utrzymania relacji z osobami odpowiadającymi za implementację interwencji, (6) skupienie na treściach zawierających komunikaty oparte na dowody naukowe, wykraczające poza wiedzę potoczną lub powszechnie znane fakty dotyczące zdrowia, a także uwzględnienie treści jednoznacznych, zrozumiałych, dostosowanych do kontekstu populacji; (7) umożliwienie monitorowania przebiegu procesu zmiany zachowań zdrowotnych, najlepiej łącząc pomiary obiektywne (np. regularna analiza składu ciała) z pomiarami subiektywnymi (np. regularne ankiety wypełniane przez uczestników z użyciem telefonów komórkowych w ramach pomiarów ekologicznych).

Systematyczny, oparty na teorii i dowodach naukowych, proces przygotowania, implementacji oraz ewaluacji przebiegu cyfrowej interwencji zdrowotnej, pozwolił na opracowanie złożonej interwencji redukcji i utrzymania masy ciała: „Wybieramy zdrowie". Co więcej, zgromadzone wnioski i rekomendacje mogą stanowić wkład w rozwój dalszych interwencji zdrowotnych dotyczących różnych zachowań zdrowotnych, gdyż wyniki przedstawionych badań wykraczają poza tematykę redukcji i utrzymania masy ciała.

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Spis publikacji naukowych stanowiących spójny tematycznie zbiór artykułów

Publikacja dotycząca Badania 1:

Palacz-Poborczyk, I., Idziak, P., Januszewicz, A., Luszczynska, A., Quested, E., Naughton, F., Hagger, M. S., Pagoto, S., Verboon, P., Robinson, S., & Kwasnicka, D. (2022). Developing the „Choosing Health" Digital Weight Loss and Maintenance Intervention: Intervention Mapping Study. *Journal of Medical Internet Research*, *24*(10), e34089. https://doi.org/10.2196/34089

Publikacja dotycząca Badania 2:

Palacz-Poborczyk, I., Chamberlain, K., Naughton, F., Baska, A., Luszczynska, A., Quested, E., Hagger, M. S., Pagoto, S., Verboon, P., Robinson, S., & Kwasnicka, D. (2023). 'A healthy lifestyle is a journey': Exploring health perceptions and self-defined facilitators to health through photo-elicitation. *Psychology & Health*, *0*(0), 1–29. https://doi.org/10.1080/08870446.2023.2252874

Publikacja dotycząca Badania 3:

Palacz-Poborczyk, I., Naughton, F., Luszczynska, A., Januszewicz, A., Quested, E., Hagger, M. S., Pagoto, S., Verboon, P., Robinson, S., & Kwasnicka, D. (2023). *Choosing Health*: Acceptability and feasibility of a theory-based, online-delivered, tailored weight loss and weight maintenance intervention. *Translational Behavioural Medicine* (w recenzji)

Oświadczenia współautorów publikacji dotyczącej Badania 1

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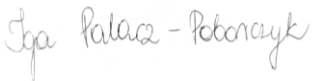

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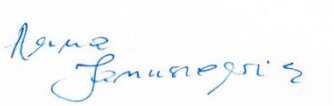

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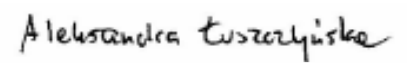

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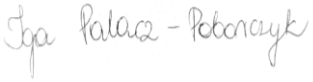

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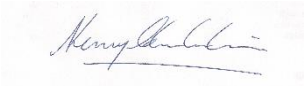

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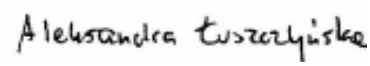

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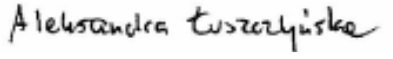

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Publikacja dotycząca Badania 1

Original Paper

Developing the "Choosing Health" Digital Weight Loss and Maintenance Intervention: Intervention Mapping Study

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Abstract

Background: Digital health promotion programs tailored to the individual are a potential cost-effective and scalable solution to enable self-management and provide support to people with excess body weight. However, solutions that are widely accessible, personalized, and theory- and evidence-based are still limited.

Objective: This study aimed to develop a digital behavior change program, *Choosing Health*, that could identify modifiable predictors of weight loss and maintenance for each individual and use these to provide tailored support.

Methods: We applied an Intervention Mapping protocol to design the program. This systematic approach to develop theory- and evidence-based health promotion programs consisted of 6 steps: development of a logic model of the problem, a model of change, intervention design and intervention production, the implementation plan, and the evaluation plan. The decisions made during the Intervention Mapping process were guided by theory, existing evidence, and our own research—including 4 focus groups (n=40), expert consultations (n=12), and interviews (n=11). The stakeholders included researchers, public representatives (including individuals with overweight and obesity), and experts from a variety of relevant backgrounds (including nutrition, physical activity, and the health care sector).

Results: Following a structured process, we developed a tailored intervention that has the potential to reduce excess body weight and support behavior changes in people with overweight and obesity. The *Choosing Health* intervention consists of tailored, personalized text messages and email support that correspond with theoretical domains potentially predictive of weight outcomes for each participant. The intervention content includes behavior change techniques to support motivation maintenance, self-regulation, habit formation, environmental restructuring, social support, and addressing physical and psychological resources.

Conclusions: The use of an Intervention Mapping protocol enabled the systematic development of the *Choosing Health* intervention and guided the implementation and evaluation of the program. Through the involvement of different stakeholders,

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including representatives of the general public, we were able to map out program facilitators and barriers while increasing the ecological validity of the program to ensure that we build an intervention that is useful, user-friendly, and informative. We also summarized the lessons learned for the *Choosing Health* intervention development and for other health promotion programs.

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KEYWORDS

behavior change; behavior maintenance; behavioral theory; weight loss; overweight; obesity; randomized controlled trial; digital health; within-person design; Intervention Mapping

Introduction

Background

Worldwide, overweight and obesity are a major public health concern showing continuous increase over the past 4 decades [1]. Excess body weight is a risk factor for multiple chronic health conditions and diseases, including cardiovascular disease, cancer, and type 2 diabetes [2]. Overweight and obesity are also risk factors for severe illness in patients with COVID-19 [3]. The development of programs that support people with overweight and obesity to lose and maintain weight loss is urgently needed [4], especially programs that promote healthy nutrition, physical activity, and health behavior change as a means to lose weight and maintain weight loss. Several evidence-based state-of-the-art weight loss programs exist [5,6]; however, often they are not tailored specifically to the individual. Personalization and tailoring of health promotion programs can increase the cost and complexity of the program [7]; however, it also has multiple advantages.

Intervention tailoring involves adapting the intervention based on specific characteristics of the recipient [8]. A recent systematic review of tailored digital health interventions for weight loss [9] showed that tailored interventions were generally more effective in supporting weight loss compared with generic interventions or waitlist controls. Information can be tailored to the participants in several ways that are reported to vary in effectiveness; most interventions apply *descriptive tailoring*, meaning that participants are provided with information that is tailored based on their responses to a series of questions [9]. For example, participants who report low levels of self-efficacy may receive intervention content that will support them in developing mastery to perform a specific task [10].

An alternative way to tailor the intervention is through *inferential tailoring*, meaning that participants are monitored over a period and information regarding their characteristics, behavioral predictors, and behavioral outcomes is collected (eg, by means of ecological momentary assessment [EMA]) [11,12]. Through the process of longitudinal data collection, the researcher gathers and then analyzes data about the participant (collected using digital technologies) that can provide inferences about what the strongest predictors of relevant outcomes are [13] and, therefore, how the content of the intervention can be most appropriately tailored for them. Inferential tailoring can also account for trends in data and be applied at the time and situation when the intervention is most desirable (eg, by means of just-in-time adaptive interventions [14,15]).

To the best of our knowledge, to date, only 1 study has explored the predictors and outcomes associated with weight loss maintenance in individuals using EMA and N-of-1 designs [16]. The results showed that individuals who lost weight had unique psychological profiles (ie, specific psychological predictors of health behavior change) that could be accounted for in subsequent interventions. However, this study did not use the collected data to personalize the interventions.

To develop personalized interventions, within-person studies exploring weight loss trajectories and changes in cognition and outcomes are needed [17]. Web-based interventions for weight loss and weight loss maintenance in people with overweight and obesity have small to moderate overall effects compared with minimal or control conditions [18]. To move the science forward toward personalized behavioral medicine, new data-driven methods of tailoring and digital health support need to be tested [19]. We now have the opportunity to develop health interventions that are truly individualized and tailored to individuals' psychological profiles by applying new technologies that support unobtrusive data collection and EMA.

Intervention mapping protocols [20] can be used as a powerful tool to develop effective personalized interventions in a systematic manner. Intervention mapping [21] is a comprehensive framework that can be used to develop new interventions and health promotion programs, adjust existing programs to new contexts and realities [20], and develop implementation strategies [22]. It is an ecological approach that includes active involvement of stakeholders in program development and follows a series of 6 established steps. The steps undertaken are sequential; however, they are also iterative, and intervention developers often move back and forth between the steps to design the most optimal intervention.

Intervention mapping protocols have been successfully applied to design several health promotion programs, including interventions to decrease sedentary behavior [23], improve self-management of type 2 diabetes [24], improve self-care in heart failure [25], prevent risks and hazards in occupational settings [26], and in several other health-related settings. The approach was also applied to design programs that aimed to tackle overweight and obesity in various populations, including children [27,28], pregnant women [29], adolescents [30], adults [31], and workers [32]. Most of the aforementioned health promotion programs used digital technologies; however, none of them included a health behavior change program that was tailored to each individual and based on the participants' own data via *inferential tailoring*.

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Objectives

In this manuscript, we describe the systematic development of the *Choosing Health* program. An Intervention Mapping protocol guided decisions regarding program objectives, behavior change methods, production, implementation, and evaluation. All decisions made during the Intervention Mapping process were guided by theory [33], evidence [16,34], and our own research undertaken during the intervention design phase (including focus groups, local expert consultations, and interviews). The *Choosing Health* program is a complex health promotion intervention that applies digital technology to collect participants' EMA data and then use them to provide a tailored intervention. The intervention is aimed at supporting individuals to change their physical activity and nutritional behaviors to ultimately help them lose weight and maintain weight loss. This study aimed to develop a digital behavior change program, *Choosing Health*, following a comprehensive Intervention Mapping protocol.

Methods

Study Design

This was an Intervention Mapping study; all study materials, standard operating procedures, and design decisions were documented, and the intervention content was published in the Open Science Framework repository [35]. This Intervention Mapping study resulted in the development of the *Choosing Health* program, which is currently being evaluated through a randomized controlled trial (RCT); this trial was registered at ClinicalTrials.gov (NCT04291482), and the trial protocol was published elsewhere [36].

The Intervention Mapping procedure included 6 steps that comprised several tasks integrating theory and evidence [20]. The completion of all the steps served as a blueprint for designing, implementing, and evaluating the *Choosing Health* intervention based on theoretical, empirical, and practical information. The 6 steps and related tasks of the Intervention Mapping process are described in the following sections and summarized in Multimedia Appendix 1 [9,18,33,36-38].

Step 1: Needs Assessment

In step 1, we established the planning group (ie, study authors) and conducted a needs assessment to create a logic model of the health problem (Multimedia Appendix 2). The intervention planning group guided the design, implementation, and evaluation of the *Choosing Health* program. This group consisted of 11 key stakeholders representing a variety of backgrounds supported by public representatives, including those representing the program target group (ie, people with overweight and obesity), nutrition and physical activity experts, health care practitioners, and implementers of the program (ie, individuals who could support future rollout of the program). The characteristics of various stakeholders are further described in the Step 4: Intervention Production section. The planning group assessed the issue of overweight and obesity in Poland [39], relevant behaviors, environmental factors, and their associated changeable determinants in the population (ie, individuals with overweight and obesity who require relevant support to lose weight and maintain weight loss). By means of a scoping review, we researched and described overweight and obesity and their impact on quality of life, stating environmental and behavioral changeable determinants. We researched and described the context of the intervention, including contextual factors, community and setting, and defined program goals.

Step 2: Identifying Objectives

In step 2, we created a logic model of change (Multimedia Appendix 3) defining specific program outcomes and objectives. Following the Intervention Mapping protocol, the planning group worked collaboratively to create a matrix that combined performance objectives (rows) and relevant changeable determinants (columns), listing in the cells specific change objectives. For each change objective, we specified who and what would change as a result of the proposed intervention, setting the foundation for the *Choosing Health* intervention.

Step 3: Intervention Design

Step 3 consisted of generating theory-based program themes, components, scopes, and sequences. The planning group chose theories that were relevant to the program and decided to include 5 theoretical themes from a recent theory review of behavior change maintenance as underpinning the program [33]. On the basis of the change objectives and determinants identified in the logic model, we also selected change methods and behavior change techniques (BCTs) underpinning the program (which are described in the protocol [36]). Theoretical themes were then mapped to specific BCTs [40], which are also described in the trial protocol [36]. For instance, the theoretical theme of habit formation was supported by specific BCTs such as performing the same behavior in the same context and adding cues to the environment (eg, setting reminders to exercise and putting fresh fruit and vegetables in the lunch pack) so that the context elicits the behavior. We also selected methods of delivery of the program (ie, practical applications to deliver change methods). The planning group chose digital health delivery via text messages, emails, and an intervention book (or e-book) to ensure that the proposed intervention was scalable if proven effective.

Step 4: Intervention Production

The aim of step 4 was to develop and refine the program structure and organization, preparation of program materials—including drafting theory- and evidence-based messages (emails, text messages, and book)—and program protocols. During this stage, we pretested and refined the materials through focus groups, expert ratings, and interviews.

Focus Groups

We conducted 4 focus groups (framed as user engagement workshops, of which 3/4 (75%) were conducted face-to-face and 1/4 (25%) were held on the web because of the COVID-19 pandemic) between November 2019 and May 2020. The focus group participants were recruited through Facebook (event advertisements posted on health-related pages) and through websites listing local events. They were also advertised through newsletters (of the university and of local health-related organizations) and posters placed in community venues and the university. Representatives of the general population (n=40),

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including some people with overweight (10/40, 25%; 8/10, 80% women and 2/10, 20% men) and obesity (6/40, 15%; 4/6, 67% women and 2/6, 33% men), took part in the focus groups to discuss the project's rationale, aim, proposed format, and materials. The focus group participants' mean age was 31.55 (SD 13.15, range 19-65) years, and 22% (9/40) men and 78% (31/40) women took part, with most having a high school education (21/40, 52%) and some having higher education (11/40, 28% Bachelor of Arts or Bachelor of Science and 8/40, 20% Master of Arts or Master of Science. Their average BMI was 24.09 (SD 6.26, range 16.94-34.09; 1/40, 2% of the participants specified their height but not their weight).

The focus group participants assessed and rated the sample intervention materials to assess their clarity (on a scale of 1=unclear to 10=clear), attractiveness (on a scale of 1=unattractive to 10=attractive), and informativeness (on a scale of 1=uninformative to 10=informative). They rated some of the emails (25/96, 25%) and text messages (340/757, 44.9%). Materials were discussed within the group, and the pros and cons were elaborated on. The focus groups were audio recorded, transcribed (by PI), and verified (by IPP), and the transcripts were analyzed verbatim using the framework method [41] in NVivo software (version 12; QSR International) [42]. After familiarization with the transcripts, the first coder (IPP) generated initial themes and indexed the codes in a preliminary framework. These codes and preliminary themes were discussed with the second coder (PI), who independently coded 50% of the transcripts and provided feedback on the themes. The final set of themes was generated using an iterative approach, and all disagreements were discussed with a third researcher (DK) until a consensus was reached.

Expert Rating

The full set of intervention materials, including 109 emails and 759 text messages, was pretested with psychology, physical activity, and nutrition experts (n=12). The experts were recruited through the researchers' network as well as through web-based message boards and Facebook groups for professionals with relevant expertise. The experts were Polish, based in Poland, and they reviewed materials written in Polish. The experts had a mean age of 30.42 (SD 10.9, range 24-64) years and were 8% (1/12) men and 92% (11/12) women; 33% (4/12) had an MSc in Nutrition, 33% (4/12) had an MSc in Psychology, 25% (3/12) had an MSc in Public Health, and 8% (1/12) had a PhD in Health Sciences (including physical activity background). All text messages were assessed by at least two experts who rated the content using the same measures as the ones used during the focus groups to assess content attractiveness and informativeness and, in addition, emotional reactions (*How did it make you feel?* on a scale of 1 indicating negative reactions to 10 indicating positive reactions).

The experts were asked to assign each text message to relevant theoretical domains, with clear definitions of each domain provided (eg, habits, stress, and obstacles). The experts were asked to indicate their first, second, and third choice for the domain that the message aligned with. The experts did not have to have any background in behavioral science to assign messages to theoretical domains as clear definitions were provided and examples were given. They also provided additional open-ended comments if they had any feedback or reflections regarding specific text messages or emails. The experts completed this task in a Microsoft Excel form in their own time. The theoretical domains and definitions of the theoretical constructs were based on a comprehensive theory review [33].

Interviews

We also asked 11 representatives of the general population (n=6, 55% men and n=5, 45% women; mean age 39.27, SD 16.32, range 18-72 years) to evaluate the intervention book or e-book (our program participants had a choice between a physical book and an e-book). Interviewed participants were recruited through the researchers' networks. Each person read through the whole book and, by means of unstructured interviews (conducted by IPP), provided feedback on content, comprehensibility, user-friendliness of the design, and inclusiveness. The key points from each interview were summarized and noted by the interviewer, and the book was revised in line with the suggestions given.

The materials (emails, text messages, and book) were iteratively revised by 4 members of the project team (IPP, PI, DK, and AJ) and continuously adapted based on insights from the focus groups, interviews, and study experts. During the intervention content development stage (June 2020-August 2020), the core team (IPP, PI, DK, and AJ) met 11 times; each meeting took 2 to 3 hours, approximately 30 hours in total. The *Choosing Health* program protocol, including frequency, intensity, and sequence, was also discussed and agreed upon. All materials were developed in Polish and later translated into English and published on the Open Science Framework website. All study measures were forward and backward translated [43] if language-specific versions of the questionnaires were not available. All questions were adjusted for culture- and language-specific appropriateness and piloted with Polish speakers (n=15), with changes made in line with the feedback received. The project team members (IPP, PI, AJ, and DK) met 3 times (approximately 12 hours in total) to finalize the translation and adaptation of the questions and measurement tools for the trial (October 2019-November 2019).

Step 5: Implementation Plan

In step 5, we defined the intervention adaptation, implementation, and sustainability plan developing matrices defining change objectives to promote *Choosing Health* program adaptation and use. These objectives were operationalized forming theory-informed plans for intervention adaptation and implementation [44,45]. Through discussion, the planning group identified potential program users (adopters, implementers, and maintainers) considering both the initial program test (RCT) and if the program was to be widely implemented. Behavioral outcomes were defined and linked to the behavioral and environmental determinants. The resulting change objectives for program use were used to map the intervention for potential adopters, implementers, and maintainers designing the intervention implementation plan, which is further described in the Results section.

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Step 6: Evaluation Plan

In the final step, we planned how to best evaluate the program effects, costs, and processes. A specific evaluation plan was developed by the core planning group, and the trial protocol was published [36]. We defined the mechanisms of intervention effectiveness informed by the previous Intervention Mapping steps. Following the Intervention Mapping protocol [20], we listed the effect, cost, and process evaluation research questions that are listed in the protocol [36]. We developed indicators and measures of success by defining study measures, measurement points, and thresholds for effectiveness based on the previous literature [17]. The intervention is currently ongoing through an RCT with an embedded N-of-1 study and ongoing cost and process evaluations.

Ethics Approval

Ethics approval was granted by the Faculty of Psychology, SWPS University of Social Sciences and Humanities, Poland (approval 03/P/12/2019).

Results

In this study, we used the Intervention Mapping approach following the aforementioned steps (Multimedia Appendix 1). In step 1, a needs assessment was used to define the problem—namely, high levels of obesity and overweight in Poland (reaching >53.3%) [39,46] and the need to design effective, cost-effective, and scalable programs that can support people in weight loss and subsequent weight loss maintenance. The impact on quality of life was prominent, with people with overweight and obesity reporting lower physical and mental health [39,46]. Several environmental and behavioral determinants were described and listed, including limited access to weight loss programs, the high cost of weight loss programs, obstacles to accessing healthy foods (eg, perceived as more expensive than unhealthy foods), and obstacles to engaging in physical activity (eg, perceived lack of time and limited access). Contextual factors included personal, family, work, and broader community influences, which could both enable and hinder behaviors conducive to weight loss and weight loss maintenance. The variety of determinants and contexts that needed to be considered pointed toward the need for a highly personalized and cost-effective program.

In step 2, the program's objectives were specified—namely, to develop a program that could support self-guided personalized weight loss, including behavior changes in physical activity, nutrition, and prompting psychological changes (in motivation, habits, self-regulation, resources, and context). The list of combined performance objectives and relevant changeable determinants included the following: individuals who complete the program will need to complete 2 key phases to lose weight and maintain weight loss. First, we need to learn about their individual predictors of weight loss and weight loss maintenance (therefore, we will encourage program users to self-monitor their determinants—theory-based constructs including motivation, habits, self-regulation, resources, and context). Subsequently, we will intervene on the strongest predictors of behavioral outcomes, providing relevant intervention content. For each determinant, we mapped the corresponding theoretical explanations and techniques [36]. We predicted that there are several changeable determinants that are relevant to each program user; however, each user is likely to have a different profile of determinants that are the most predictive of weight change and maintenance.

In step 3, techniques fitting the problem and objectives were chosen. On the basis of theory and evidence, we divided our intervention into 5 conceptual domains (maintained motivation, habit, self-regulation, resources, and environmental influences) and, within these domains, suitable BCTs were identified [36]. For instance, to support habit formation, we prompted rehearsal and repetition of the behavior in the same context so that the context elicited the behavior. We mapped out BCTs to each domain and operationalized them in intervention materials, including text messages, emails, and e-book.

In step 4, we conducted focus groups to refine the intervention content. A total of 40 participants took part in the focus groups, and the key themes discussed were analyzed and divided into 2 groups of themes: intervention content and form of program delivery. The first theme had three main subthemes: (1) the participant being an active agent in the change process, (2) inclusivity of the information provided, and (3) problem-solving. The second theme also had three main subthemes: (1) ensuring that the content was informative, (2) unambiguity of the provided information, and (3) including direct actionable messages. In Table 1, we include *lessons learnt* from the focus groups in relation to intervention content and form and direct quotes from focus group participants that align with different themes and subthemes.

The focus group participants' mean scores for the proposed text message content were relatively high on a scale of 1 to 10 (mean 8.38; clarity mean 9.27, SD 1.32; attractiveness mean 8.48, SD 1.24; informativeness mean 8.6, SD 1.33); higher scores reflected positive results, and lower scores reflected negative results for each category. These findings were corroborated in the focus group discussions (Table 1).

Experts rated the quality of the text messages as moderately high (mean 7.21; positive emotions mean 6.95, SD 1.41; attractiveness mean 7.23, SD 1.38; informativeness mean 7.47, SD 1.61). All text messages rated below an average of 4.5 across all categories were excluded or adjusted, and text messages that did not fit specific themes were reallocated or adjusted. In total, we excluded 3.7% (28/759) of text messages and 0.9% (1/109) of emails that were considered inappropriate or scored low overall.

In step 5, we identified potential program users as adults with overweight and obesity living in Poland. Initial program users were individuals living in Wroclaw and nearby areas as the initial test of the program (via RCT) required face-to-face assessments to objectively measure weight. Implementers of the program initially included the researchers involved in the program development and research assistants. Future program implementers and maintainers (if the program is proven effective) could include representatives from the government, health care representatives recommending the program, and community representatives. One of the routes to intervention implementation that we are assessing now is wide

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implementation through the program partner Lifestyle Medicine [47,48]—an organization that provides medical training for health care practitioners educating them on the principles of behavior change and advocating to promote health behavior change in patients and minimize the overmedicalization of people with overweight and obesity. If the intervention is effective, it could contribute to lowering overweight and obesity rates in Poland, resulting in health improvements and cost savings.

In step 6, we generated a plan for cost, effect, and process evaluations. Currently, the program is being evaluated through an RCT assessing between-group effects (intervention vs control), and it is also being evaluated within people looking at the trajectories of change investigated through EMA using an N-of-1 design and inferential tailoring [36]. The resulting program is evidence-based, delivered through technology (text messages, email, and book), and tailored to each participant based on the data gathered through EMA. The evaluation plan follows the principles of process evaluation defined by the Medical Research Council (United Kingdom) following the guidelines for developing and evaluating complex interventions [37].

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Table 1. Lessons learnt for the *Choosing Health* program and for other intervention developers from the focus groups undertaken (N=40)[a].

Theme and theme description	Lessons learned	Example quotes
Intervention content		
The participant being an active agent in the change process: study participants much preferred the messages that treated them as experts in their own behavior change. Any messages that could come across as condescending or coming from the perspective of a "teacher" or a person who "knows it all" or "knows better" were considered inappropriate.	• Study participants need to be treated as equal partners in the behavior change and behavior maintenance process. • Understanding of personal needs and preferences is key to providing useful intervention content. • Each message needs to contain elements of flexibility (the participant may want to take the suggestion on or not; they do not need to follow the suggestions fully).	• Condescending, stereotypical, and negative messages were unacceptable: "Not everyone who carries extra kilograms sits nonstop in front of the TV and eats crisps. We can't speak to them [intervention users] as if they did not have a clue that a week without the TV or a week without crisps is possible. The worse thing we could do is to look down on them." [Participant 14, woman, aged 24 years, BMI 29] • Intervention aims should be personalized and defined with the study participants: "I would simply ask what are the intentions of this person, what exactly motivates them? Why are they taking part in your program? Probably they want to lose weight but you need to understand other factors too..." [Participant 7, woman, aged 30 years, BMI 20] • To many participants, the provided information was not new and often complemented what they already knew and what they had already experienced: "From my own experience I can say that the feeling of hunger is just so personal. I had to relearn to understand when I'm hungry, when I'm full and when I've totally overeaten. Since childhood I was 'trained' to eat like a horse, to just feel more than full. I had to relearn to eat till I'm almost full, so I feel slightly unsatisfied. Some people still need to learn it and work on it." [Participant 9, man, aged 47 years, BMI 20] • People's levels of motivation and motivation sources vary, and interventions need to account for that: "Social support is very important but if other people don't want to support me, they should at least not criticise my choices. I look for support or at least lack of criticism of what I do. Maybe other people find it helpful to be criticised, for me, I find it really demotivating." [Participant 9, man, aged 47 years, BMI 20] • All messages suggesting that physical activity needs to be chosen in line with personal preferences were rated positively: "I really get on board with this, I really like that you suggest that physical activity doesn't need to be forced, and that I can just pick whatever I like, as long as I am active." [Participant 39, man, aged 39 years, BMI 25] • Most messages need to give the participant some options and choices. The participants prefer to choose what fits their lifestyle and preferences: "I love this message—I like that you say that there is not one type of food that makes someone feel better—one person may like nuts, other one may prefer fish, I just really like how you pointed out that this is all personal." [Participant 38, man, aged 65 years, BMI 30]

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Theme and theme description	Lessons learned	Example quotes
Inclusivity of the information provided: it was important to tailor messages so that they fit in with people who are of different socioeconomic statuses or different personal circumstances, prefer different leisure activities, and have different health statuses and professions.	• The person's identity needs to be considered when defining intervention content. • The information provided needs to be inclusive, especially when discussing social support.	• Participants who did not have close family or lived far away from their family felt excluded when reading the messages pointing toward fun social family activities: "Someone who I don't actually even know, writes to me and says hug a family member, and I'm alone, I do not have any close family, I would get so p***** off, and sorry to phrase it like that, but I would just not continue with this." [Participant 32, woman, aged 44 years, BMI 28]
Problem-solving: study participants wanted to receive positive messages that motivated them to problem solve. The superficial approach of "it's all good" and "you can do it!" was not perceived as helpful. The participants needed some acknowledgment that weight loss is not easy and often comes with barriers and difficulties.	• People usually knew what the negative consequences were, and they did not need to be reminded. • They needed constructive suggestions for how to best problem solve. • Messages based on fear and negative emotions were considered unhelpful.	• Participants appreciated messages that emphasized their psychological resources and constructive ways of using self-motivation: "The message I really, really like is this one: 'Think about the day when you decided to join Choosing Health program! What motivated you to join? Note down thoughts that you had then.' I really liked this message coz people often undertake challenges and then half way through they forget why they actually doing it. The motivation is gone, and sometimes it's enough to just remind someone why are they doing it. Remembering your past success, can really reinforce your motivation and help you look more positively towards the future." [Participant 24, woman, aged 24 years, BMI 26] • The messages that described unpleasant situations, evoked negative emotions, and reminded the participants of some negative past events but did not include any actionable solutions that needed to be avoided: "Imagine, I'm in a good mood, having a really good day, everything going well and then I'm getting one of your messages, this one, it says 'consider what's causing stress in your life and think about how you could tackle it and change it'—So now what? I'm doing my exercise, drinking water, I eat healthily and now what? I'm stressing thinking oh dear God...my husband, all the debt I have..." [Participant 29, woman, aged 34 years, BMI 28] • The participants rated positively the messages that encouraged them to self-monitor and pointed them toward the strategies that they could implement immediately to improve: "I really like these messages that said that I should write down certain things, note what motivates me, and note what my goals are. That was great, a systematic way of doing things, if I write it down, I will remember it. If I read your text and I'm on the go, I may remember it but I may not..." [Participant 30, woman, aged 37 years, BMI 21]
Intervention form		

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Theme and theme description	Lessons learned	Example quotes
Ensuring that the content is informative: the participants really appreciated the fact that the intervention was evidence-based. The expectations were high in terms of providing the most recent psychological knowledge. The participants wanted to receive fresh and novel content, and they wanted to develop their own knowledge.	• Just the fact that participants receive messages may be motivating, but this motivation is not long-lived if the content is not informative. • To maintain participants' engagement, they need to receive evidence-based, state-of-the-art, engaging, and original content. • People do not want to be overloaded with the information.	• It is important that the participants learn something new that they did not know before: "I really liked it because the information provided was interesting and some of it was surprising for me, especially when you elaborated on different causes of stress. It was clear, it made me feel good, I simply learnt new information." [Participant 36, woman, aged 25 years, BMI 17] • People want to read evidence-based information: "Some of the messages were just too simple. I don't want to sound big-headed but for me that was just way too simple. I would add (to the emails) at least few lines describing some background evidence, at least something showing that it's actually based on scientific evidence." [Participant 26, man, aged 24 years, BMI 20] • The intervention should encourage them to learn more: "Maybe you could encourage people to be more conscious and to learn more: 'Check if what you think is healthy, is actually healthy and good for you?' [...] A while ago I went to the shops, I had some time and I saw minced meat. I usually don't buy that type of meat, and then I read what's on the label, and I couldn't believe it! [...] Maybe you could consider that people need to seek to educate themselves a bit more." [Participant 21, woman, aged 34 years, BMI 34] • The intervention should include valuable messages without sounding superficial: "I just have a general suggestion—for me messages that include phrases 'healthy food,' 'balanced diet,' 'balance' sound a bit superficial, as people don't really know what that means." [Participant 26, man, aged 24 years, BMI 20] • Explaining psychological and physiological mechanisms related to weight loss was always welcome, especially if communicated in a clear way (but only in emails as SMS text messages were perceived as too short to clearly communicate the meaning and dependencies): "I was positively surprised to read the email 'What stress actually is?' [...] This message had a lot of important, easy to digest info, stress is so common these days so I was glad to read more on this topic." [Participant 36, woman, aged 25 years, BMI 17] • Psychological evidence was expected, and the participants wanted to learn more about the mechanisms of action and behavior change techniques: "So where are all the psychological aspect here? You say monitor eating to not overdo it, but how am I meant to do that?!" [Participant 32, woman, aged 44 years, BMI 28]
Unambiguity of the provided information: messages should have a clear meaning and preferably cover only 1 topic at a time.	• When the message includes multiple topics, it is more difficult to understand, reflect on, and implement.	• The participants did not perceive it helpful when healthy eating, physical activity, education, and social support were all mentioned in one message: "For me it is problematic that you talk about healthy eating and physical activity. Someone may be concentrating hard on eating healthily but not really on improving physical activity. [...] I would probably just emphasize one or the other as tackling both at the same time is hard." [Participant 7, woman, aged 30 years, BMI 20]

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Theme and theme description	Lessons learned	Example quotes
Including direct actionable messages: participants did not appreciate idioms or references to literature, culture, or pop culture. The use of humor was controversial and had very diverse reception.	• Study participants preferred direct, clear, and actionable messages.	• Participants did not appreciate "mental shortcuts," and every change of topic in the message had to be clearly announced to them: "This message about feeling grateful—I completely don't get what's the relationship between feeling grateful and losing weight or improving health." [Participant 38, man, aged 65 years, BMI 30] • Idioms and messages including humor were negatively received. Losing weight and maintaining weight loss are often perceived as sensitive topics, and the use of humor is often considered inappropriate: "...again you are using an idiom here—and I'm fairly sure that not everyone is able to understand it in this context." [Participant 40, man, aged 65 years, BMI 32]

[a]Interview data were analyzed with the aim of improving intervention content and form (ie, look and feel, intensity, and sequence) so that the main themes were predefined before the analysis process. The subthemes emerged from the discussions and data analysis.

Discussion

Principal Findings

The overall aim of this Intervention Mapping study was to inform the *Choosing Health* weight loss program by applying existing theory, evidence, and principles of public engagement throughout the planning process. The Intervention Mapping protocol steps were closely followed to ensure that the intervention was useful, user-friendly, and designed with the users to ensure the clarity, attractiveness, and positive reception of the proposed program. The focus groups, expert consultations, and interviews showed that the program content and proposed format were rated highly, and the elements that did not meet a specific threshold (4.5 out of 10) were adjusted in line with feedback or omitted. Active involvement of individuals from the target group of the *Choosing Health* intervention—namely, people with overweight or obesity—enabled the specification of the key needs and wants of the recipients of the intervention. The materials were produced iteratively and sequentially, and the mode of delivery was thoroughly discussed with the potential users to ensure the feasibility of the proposed program.

In relation to the intervention content, the main results were that program participants need to be actively involved in the change process, which aligns with theory [49] and previous interventions [50]. The information provided needs to be inclusive and encourage the participants to actively problem solve while they are changing their behavior and maintaining it in the long term [51]. In terms of the format of the program, the key results were that it needs to be informative and unambiguous and include direct and actionable messages, aligning with other recommendations for the development of health behavior change programs [52,53]. Previous studies that also gathered EMA data on daily predictors of weight loss [16] did not use inferential tailoring to provide health behavior change advice and information. This will be the first study that uses longitudinal data to then provide tailored support.

This study has several strengths. The key strength is the use of the thorough and rigorous Intervention Mapping protocol that served as a tool and provided us with vocabulary to comprehensively map out and plan the proposed intervention [20]. Designing interventions iteratively with the users and using a variety of study methods ensures that the interventions have high ecological validity [54]. The intervention was designed by the core group (the study authors) in close collaboration with public representatives and field experts (eg, nutritionists and physical activity experts) to increase the ecological validity of the proposed program. Engaging the target audience in the intervention design ensures that the programs are suitable and useful and that they target relevant determinants [55]; it also ensures that we account for diversity in the participant population [56]. The intervention content was designed to be tailored to specific theoretical domains that were predictive of effects (that will be assessed by participants through EMA to define the strongest predictors of outcomes). We consulted the experts and asked them to allocate each element of the intervention content to a specific theoretical domain to ensure that the content fits the theoretical domains. This validation ensured that we targeted the correct determinants that are the strongest predictors of outcomes for each individual.

The study limitations include lack of involvement of some key stakeholders in the planning group. Namely, representative policy-makers from the local or national government and IT did not participate in the planning group. To ensure scalability and long-term maintenance of the proposed program, it would need to be integrated with existing intervention programs or policies operating within the health care system or local communities [57,58]. The planning group met with representatives from the Ministry of Health of Poland, who initially expressed support to promote the project and implement it at a national scale if proven effective through the nationwide health care and health promotion website [59]. However, following structural and personnel changes in the national government, the plan was no longer feasible to implement. Liaising with the Ministry of Health during the COVID-19 pandemic also proved difficult. Other studies and health promotion programs emphasize how valuable it is to engage policy-makers in the intervention development and implementation processes [57,58], and we are hoping to meaningfully engage with them in the future. To scale the

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intervention (if effective) and make it accessible to people in Poland, a national body (government and health care sector) needs to endorse the intervention and embed it within the existing support structures. The COVID-19 pandemic has emphasized the need for self-guided remote support to improve health.

The proposed intervention has specific components that combine different technology aspects—data harvesting via EMA, automated text messaging, automated emails, and book; therefore, this intervention could further benefit from the active involvement of technology developers, data scientists, and computer programmers. The researchers working on the project designed the technology interface using existing components (eg, automated messaging systems). However, to further enhance the scalability of the intervention, the engagement of computer scientists would allow us to implement more sophisticated data analytics and intervention setup methods. Future interventions need to include automated machine learning algorithms that would allow for the analysis of data in real time and automated setup of the intervention to improve efficiencies and reduce the resources needed [60,61]. Machine learning is a valuable and increasingly necessary tool for health promotion and for the modern health care system [62], and it should be applied in future personalized interventions.

In Poland, the prevalence of overweight and obesity is higher in men than in women (46.8% vs 32.2% for overweight, respectively, and 20.1% vs 18.1% for obesity, respectively); however, the sample recruited for the focus groups comprised predominantly women (31/40, 78%) and a predominantly normal weight BMI category (24/40, 60%). In the ideal scenario, most of the focus group participants would have been men, and most or all participants would have been overweight and obese. Specific challenges, including social stigma and stereotypes associated with dieting and weight loss programs, played a role in recruiting a more representative sample of the user population. However, we have explored whether there are any differences among the opinions and feedback given by men and women and also by people who fall into BMI categories below and above 25, and we have not found any pronounced differences.

The key take-home messages from our *Choosing Health* Intervention Mapping study were (1) involving several types of stakeholders as early as possible in the Intervention Mapping process, (2) iterating the intervention with various groups of stakeholders and learning from the incoming evaluation data, and (3) allowing for flexibility in health promotion programs. As the intervention was designed to be delivered on the web, the COVID-19 pandemic did not have an impact on the delivery of the intervention; however, it has affected study data collection that was initially intended to be conducted face-to-face. In addition, one of the focus groups had to be conducted on the web. Several research teams working worldwide are facing similar challenges, and specific technology solutions are being developed to support these teams in data collection during the pandemic [54,55]. Currently, developing health promotion programs that can be fully delivered on the web is important and needed.

Conclusions

We developed a comprehensive weight loss and maintenance intervention targeting important behavioral and contextual determinants. The development of the intervention followed comprehensive steps of the Intervention Mapping process and was grounded in theory and relevant literature. Future evaluation studies will investigate the program effectiveness, cost-effectiveness, and process and further analyze the relevance and utility of the specific program components. The findings from this study may be particularly useful for other intervention developers who are also planning to design and implement personalized digital health weight loss interventions targeting behavioral nutrition, physical activity, and health behavior change.

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Data Availability

The data sets generated and analyzed during this study are available in the Open Science Framework repository [35].

Authors' Contributions

DK, EQ, MSH, and FN conceived the project and obtained project funding. All authors (IPP, PI, DK, AL, MSH, EQ, SP, PV, SR, AJ, and FN) have made conceptual contributions to the project design and procedures. PV is a trial statistician who designed a data analysis plan together with FN and DK. SR is a trial health economist who designed an economic evaluation plan. SP and AJ provided practitioner insights. PI and IPP managed the day-to-day activities of the trial and executed the study. DK is the project lead. IPP, PI, and DK drafted the manuscript. All authors read, edited, and approved the final version.

Conflicts of Interest

None declared.

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Multimedia Appendix 1

The 6 steps of Intervention Mapping undertaken during the Choosing Health program development combining methodologies and results.
[DOCX File , 17 KB-Multimedia Appendix 1]

Multimedia Appendix 2

A logic model of the health problem.
[PNG File , 248 KB-Multimedia Appendix 2]

Multimedia Appendix 3

The logic model of change.
[PNG File , 134 KB-Multimedia Appendix 3]

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Abbreviations

BCT: behavior change technique
EMA: ecological momentary assessment
RCT: randomized controlled trial

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'A healthy lifestyle is a journey': exploring health perceptions and self-defined facilitators to health through photo-elicitation

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ABSTRACT

Objective: The aim of this study was to explore health perceptions and self-defined facilitators to health in general population. An additional aim of the study was to assess if these perceptions were connected with the context of the Covid-19 pandemic.

Design: We applied photo-elicitation method by gathering original photographs and narratives (captions) *via* social media and e-mails. Participants ($N = 50$) were asked to answer the question: 'What does it mean to be healthy?'. Data were collected online in Poland. We generated and interpreted the main themes associated with common perceptions of health and self-defined facilitators to health using polytextual thematic analysis.

Results: The health perception themes were, health as: a 'long journey'; keeping balance; and self-acceptance. The main facilitators to health were: enjoyment of activities that are part of a healthy lifestyle; planning time for rest; contact with nature, and supportive relationships. Participants' perceptions of how Covid-19 impacted on their health differed.

Conclusions: The findings provide evidence for individual health perceptions and self-defined facilitators to health and can support the development of future health interventions.

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Introduction

An abundance of sources providing health-related online advice may lead to diverse perceptions of what constitutes positive health behaviours (Ragusa & Crampton, 2019). The Internet has become a major source of health advice (Lu et al., 2018). In Poland, it is common to search for health information in the Internet (Płaciszewski et al., 2022), whereas overall trust in healthcare system is limited (Lewandowski et al., 2021). Considering the diversity of messages from mass media regarding health (Lignowska et al., 2016) and the variety of health perceptions, the definition of health is not set in general population, hence there is a need to better understand how individuals perceive health.

Individual health perceptions may be affected by many physical, emotional, and social factors (Cloninger & Zohar, 2011). It is possible that understanding of health may be also influenced by perceived health condition, especially in terms of mental health, chronic diseases, or ability to perform daily activities (Gumà, 2021). Moreover, current research provide diverse health perceptions in different age and gender groups (Borraccino et al., 2019; Deeks et al., 2009; Platzer et al., 2021). It would be interesting to explore if there are any common perceptions of what constitutes health and what facilitates healthy lifestyle in general population.

Recent scientific debate proposes several broad features to define health, and promotes inclusion of malaise and coping strategies as crucial aspects of the definition of health (Leonardi, 2018). It is suggested that the concept of health, well-being, individual ability, and quality of life, are interconnected (Tengland, 2006). Considering multifactorial, broad definitions of health, it is important to explore perceptions of health in the general population.

Stronger focus on health promotion is recommended in Poland, among other European countries (World Health Organization. Regional Office for Europe et al., 2019). Life expectancy in Poland is lower than average in the European Union, and Polish people report being in good health less often than other nationalities (OECD/European Observatory on Health Systems & Policies, 2021). The Polish health care system is classified as one of the least effective, among other European countries, which is mainly the result of limited financing (Smarżewska et al., 2022). There are health promotion programs in Poland usually organised at a national level by the government, although typically with no clear plans for implementation by local authorities (Arsenijevic & Groot, 2022). An exploration of the individual perceptions of health would support the development of effective and sustainable health promotion programs and interventions. Public engagement can facilitate intervention tailoring to participants' needs and their experiences (Crocker et al., 2018). Evidence-based, participatory process of health priority-setting supports effectiveness of health policies and increase health equity (McGregor et al., 2014). We observe mixed patterns in terms of patient involvement in Polish health system. Responsiveness and communication are rated high, but need for autonomy and receiving prompt care are still unmet (World Health Organization. Regional Office for Europe et al., 2019). Since health-related needs may be associated with individual experiences and health prospects (Dolan & Tsuchiya, 2005), potential participants of health interventions should be treated as important stakeholders in the process of setting health priorities.

Healthcare systems would benefit from community involvement (Batalden et al., 2016). However, health priorities are often affected by industrial or trade policies and do not reflect real healthcare needs of potential beneficiaries (Ollila, 2005). Many healthcare systems lack participatory public involvement to ensure alignment with actual health priorities within population (Farmakas et al., 2017; Sabik & Lie, 2008).

Perceived health priorities may be influenced by the Covid-19 pandemic, a major global health concern since 2020 (Ruetzler et al., 2020). Co-designing and co-implementation of health promotion programs were important for effective health interventions during the Covid-19 pandemic (Singh et al., 2020). Moreover, the pandemic has had an impact on health behaviours and perceptions of health (Naughton et al., 2021). The pandemic has affected overall trust in public health services, emphasising the importance of health and well-being (Jarynowski et al., 2020). Therefore, there is an urgent need to explore perceptions of health in general (Balanzá–Martínez et al., 2020), as new trends and new perceptions may have emerged in the common understanding of health.

Photo-elicitation method has potential to explore individuals' perceptions of health and perceived behaviours that facilitate healthy lifestyle. In this method, research questions are explored through photographs and narratives delivered by study participants (Bates et al., 2017). Qualitative studies, such as photo-elicitation, drive creativity among participants and enable them to explore the concealed understanding of well-known concepts and challenge the general perception of important social issues (Chamberlain et al., 2018). Nonverbal forms of expressing oneself help to explore topics that are too complex or vulnerable for verbal forms of data gathering. Photo-elicitation may have positive implications for participants, as they can deconstruct and re-evaluate their experiences by the act of photographing and presenting the meaning of their photographs (Harper, 2002).

Qualitative visual methods have delivered valuable narratives and provided meaningful research insights across a number of areas including: investigating eating behaviours (Patricia et al., 2017; Thompson et al., 2015); food preparation practices (Mills et al., 2017); family food choices (Johnson et al., 2010, 2011; Lachal et al., 2012; Ramalho et al., 2016; Sharma & Chapman, 2011) and health inequalities (Hodgetts et al., 2007). Visual methods have enabled a broader understanding of disease perception, e.g. for prostate cancer (Oliffe & Bottorff, 2007) and Alzheimer's disease (Shell, 2014). Photo-elicitation studies have been successfully conducted to explore attitudes towards physical activity with adolescents (Fernández-Prieto et al., 2019; Hill, 2015; Strachan & Davies, 2015), physical activity with women (Fleury et al., 2009), and in activity tracking (Gorm & Shklovski, 2017).

Photo-elicitation can shed light on social and cultural dimensions of health, as well as the internalised concepts of physical and mental well-being (Ortega-Alcázar & Dyck, 2012). Despite considerable research on various aspects of health-related behaviours, little is known about how people self-define what they mean by health and health-related behaviours. Defining what health means would facilitate the development of health promotion interventions as this would allow for better tailoring of further programs to the actual perceptions of health in general population. Knowing how people perceive health in general could support designing health interventions, and could improve communication with potential participants.

It would also enable to focus on health priorities reported by potential participants.

Current study

This study used the photo-elicitation method by gathering photographs with corresponding narratives (photograph captions). The overarching study aim was to capture individual perceptions of health, and to identify main facilitators to health in general population. An additional aim of the study was to assess if these understandings were affected by the context of the Covid-19 pandemic.

Method

The phenomena were investigated by asking participants to respond to the question 'What does it mean to you to be healthy?' by taking a photograph and writing a detailed caption. The study used a semi-structured, participant-driven format (Bates et al., 2017), meaning that participants could submit any original photographs, taken by them, which they considered relevant to the topic. The study was conducted online in Poland, with the photographs submitted *via* social media (chosen by the participants) or e-mail. Data were gathered between July and December, 2020.

Participants

Inclusion criteria for the study were: age above 18 years, consent to participate in the study and consent for the publication of photographs *via* social media (Twitter, Facebook, and Instagram), on the study website and in the subsequent study publications and presentations. To submit a photograph with a caption, participants needed to have an internet connection and social media account or email address. The participants needed to be able to read and understand Polish in order to read the study materials and consent.

Fifty participants took part in the current study (see Table 1 for complete demographics), and all provided full consent to participate in the study. Most participants ($n = 41$) submitted just one photograph; however, 9 people submitted 2–10 photographs. The length of the photo captions varied, on average the captions were 275 words long ($SD = 69.15$).

Procedure

The study advertisement was published on the website, and the social media channels of the 'Choosing Health program' (Instagram, Facebook, Twitter). It contained information about the study aim and participation requirements. Participants could post their response through social media channels or send them directly to the study coordinator (IPP) *via* e-mail. We instructed participants to take an original photograph which captures their answer to the question: 'What does it mean to you to be healthy?'. They had to caption every photograph with a complementary description (minimum

Table 1. Participant demographics.

Participant characteristics	Number (%)
Age (18-71, $M = 35.64$, $SD = 13.86$)	
18-29	20 (40%)
30-44	19 (38%)
45-59	7 (14%)
>60	4 (8%)
Gender	
Women	34 (68%)
Men	15 (30%)
Other	1 (2%)
Nationality	
Polish	46 (92%)
Ukrainian	4 (8%)
Employment	
Full-time or part-time	37 (74%)
Unemployed	10 (20%)
Retired	3 (6%)
Education	
Primary level	2 (4%)
Secondary level	14 (28%)
Bachelor's degree	6 (12%)
Master's degree	25 (50%)
Doctoral degree	1 (2%)
Other (unspecified)	1 (2%)
Place of living	
Big city (more than 500,000 inhabitants)	20 (40%)
Medium-size city (100,000–500,000 inhabitants)	3 (6%)
Small town (less than 100,000 inhabitants)	16 (32%)
Rural area	11 (22%)

200 words, no set maximum limit). Participants could access a study information sheet online including supporting questions helping to define the photograph's caption (Supplementary Material 1). We followed guidelines for participant-driven form of photo-elicitation interviewing (Bates et al., 2017), and provided participants with a series of open-ended questions, however the content of captions was guided by the participants' photographs. All participants delivered original photographs with accompanying captions. The main aim for the captions was to describe the photograph and to explain how the photograph is related to one's perception of health. Further, participants were asked to describe how they maintain health and what is important for them to achieve healthy lifestyle. Additional questions concerned perceived connection between the Covid-19 pandemic and potential depiction of it in the photograph. All captions were delivered in a written form.

All participants were instructed to follow copyright laws and they were advised against invading anyone's privacy, as well as capturing illegal or inappropriate content. Photographs had to capture participants themselves, or their surroundings. If participants wanted to capture other people, they were instructed to take their consent to appear in the photographs. We asked participants to be mindful of their own safety when taking photographs. All participants' information and study consents were gathered *via* a Qualtrics survey, no matter if the responses were published on social media, or sent directly to the study coordinator *via* e-mail. Therefore, we ensured that all study participants were familiarised with detailed rules of the study.

Data collection

The majority of participants (72%, $n = 36$) delivered their responses *via* e-mail, others posted their responses on Instagram (28%, $n = 14$). Participants who posted their photographs on social media were asked to tag the project account and they were encouraged to challenge their friends to participate by tagging them in the post. We identified responses posted *via* Instagram by linking them to the consent gathered simultaneously through the Qualtrics form. The incentive to participate was an opportunity to have the picture displayed at the virtual exhibition on the 'Choosing Health' website. The exhibition included all the photographs submitted. We obtained consent from each participant to publish their photographs.

Data analysis

Photographs with corresponding captions were analysed to generate and interpret the main themes connected with the participants' perceptions of health and self-defined facilitators to health. Visual and narrative data were analysed using thematic analysis (Braun & Clarke, 2006) and polytextual thematic analysis (Gleeson, 2020) approaches. Following guidelines of polytextual thematic analysis, we assumed that verbal and visual data were linked. After familiarisation with submitted photographs and complementary captions, the data were coded and grouped into the research categories: the perceptions of health, the facilitators to health, and Covid-19 effects, by the first coder (IPP). We followed iterative process of polytextual thematic analysis (Gleeson, 2020), moving back and forth from photographs to captions. Afterwards, the codes and categories were indexed in a preliminary thematic map. Next, 25% of the study data were independently coded by the second coder (DK), who also provided feedback on the themes. Disagreements between the two coders were further discussed until consensus was met. The narratives were then translated through systematic, iterative process, in line with recommendations for cross-language quotes in qualitative research (van Nes et al., 2010).

The final set of themes was formulated using an iterative approach and defined through discussion between the two lead coders (IPP and DK). Both coders read the full data set, familiarising themselves with all photographs and captions. The decision to stop data gathering was based on the agreement of both coders that no new topics and themes were noticeable in the photographs and captions, therefore the study was deemed to have reached sufficient data saturation (Saunders et al., 2018). We also conducted member-checking, following the guidelines of Synthesized Member Checking (Birt et al., 2016) to check for accuracy of the findings. The summaries of the generated themes were presented to study participants, who were asked to provide their feedback on the preliminary findings. We investigated if participants accepted generated research categories and themes, if they would like to change anything, what they agreed and disagreed with. Eight participants were included in this process (16%), they reemphasised the key study findings and further discussed the importance of health perceived as self-acceptance, ability to accept own life circumstances and possibilities. We integrated their feedback with existing codes. Analysis was conducted using the NVivo 12 software.

Ethics

All participants were provided with study information prior to giving consent and taking part. Ethical approval was granted by the Faculty of Psychology, SWPS University, Poland, approval number: 03/P/12/2019. General Data Protection Regulation (GDPR) issues were discussed and resolved with the data protection officer at the University, legal issues concerning copyrights were consulted with the law department at the first author's University. All participants gave permission for the publication of photographs where they were identifiable.

Results

The analytic process determined a range of themes, which were associated with each of the three main categories of the project: health perceptions, facilitators to health, and Covid-19 effects. Table 2 presents a summary of the themes identified under each category, and these are discussed in turn below under the category headings, with illustrative photographs and quotes from captions.

Health perceptions

Theme 1: Health as a 'long journey'

Health was frequently described as a 'long journey' with multiple choices or directions that can be taken. The participants mentioned how their effort in relation to health-related practices needs to be sustained and ongoing in order to achieve a healthy lifestyle.

The concept of 'journey' emphasises that staying healthy is a long-term and ongoing process. Participants often referred to perseverance as the way to maintain healthy behaviours. One participant submitted a narrative and photograph (Figure 1), literally illustrating health as a journey:

> 'A healthy lifestyle is a journey. You can't take shortcuts, you need to go step by step, following a trail. It's working on new habits and that is a process. You can't do it just like that. This process always requires time.'

Participants discussed the importance of daily minor decisions, based on their health goals. Following objectives on a daily basis was reported as crucial to achieve healthy lifestyle:

Table 2. Theme categories and generated themes.

Theme category	Themes
Health perceptions	• Health as a 'long journey' • Health as keeping balance • Health as self-acceptance
Facilitators to health	• Enjoyment of activities that are part of healthy lifestyle • Planning time for rest • Supportive relationships • Contact with nature
Covid-19 and health	• The Covid-19 pandemic as disruption in maintaining healthy behaviours • The Covid-19 pandemic as motivation to engage in health behaviours

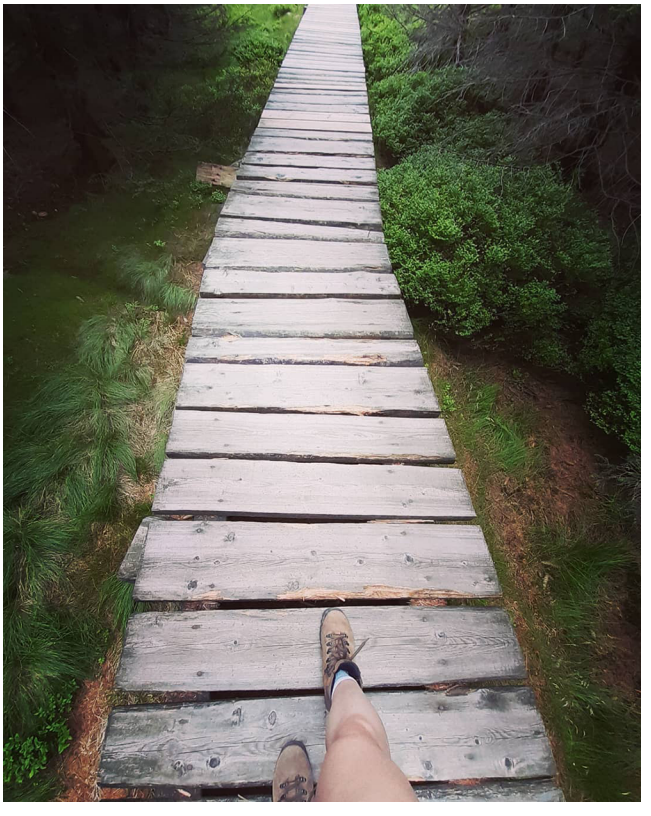

Figure 1. Legs on the forest trail.

> 'Choosing health always involves a large number of daily decisions, sometimes really hard ones. We don't even realise how many decisions we make every day.'

A lot of participants reported motivation as a key factor to continue the process of sustaining healthy habits. Motivation was often referred to as a main resource that empowered participants to achieve their intermediate goals and persevere in their efforts towards healthy lifestyle.

Theme 2: Health as keeping balance

Within this theme, study participants reflected on the need to achieve equilibrium in terms of what is important for them and what they can and want to do to be healthy. Diverging occasionally from eating healthily was mentioned as a part of well-balanced lifestyle. Participants emphasised that labelling food as 'healthy' and 'unhealthy' does not support good dietary choices:

> 'I intertwine healthy food choices with conscious 'sins' – I don't punish myself for eating pizza, tiramisu, or a piece of chocolate, but I treat this as an exception, not a part of my daily menu.'

Participants commented that a well-balanced, healthy diet is the one that includes their favourite food and does not cause feelings of guilt. Both photographs and

captions illustrated objections to strict, low-calorie, and monotonous diets. One participant described her attitude towards eating favourite sweets:

> 'It's not easy, because for a long time I used to easily give in to my cravings, however I don't want to go crazy, and I allow myself a moment of weakness without feeling guilty after eating, for instance marshmallows, that I really love.'

Participants often reported their efforts to sustain healthy behaviours as a search for an equilibrium. Both extremes—either an obsessively strict lifestyle or an explicitly unhealthy way of living—are contradictory to health. One participant submitted a photograph of a sculpture of an acrobat balancing on the rope (Figure 2) with the following caption:

> 'Our family believes that it's important to take care of the right balance. In order not to go to the extreme, one cannot go overboard in any way. Not taking care of your health – unhealthy diet, lack of physical activity, alcohol and smoking, lead to diseases. On the other hand, extreme lifestyle of taking care of one's health may also cause problems.'

Within this theme, study participants reflected on allowing for special occasions that are important part of life and often hinder the practices that society considers healthy. Keeping balance also meant not overusing unhealthy substances such as alcohol, avoiding smoking, avoiding excessive screen use (e.g. mobile phones, tablets), and getting enough sleep.

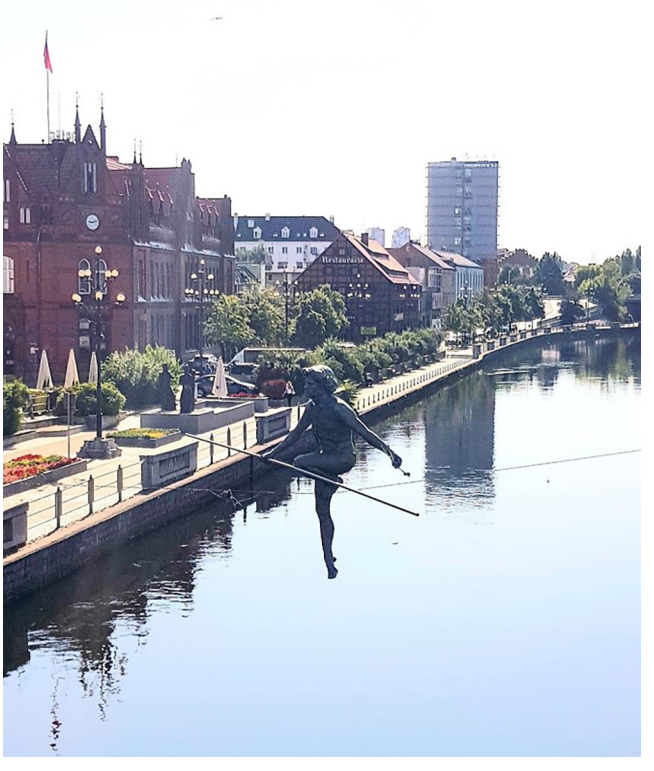

Figure 2. A sculpture of an acrobat balancing on the rope over the river.

Theme 3: Health as self-acceptance

This theme reflects the importance of acceptance in terms of own appearance, body type, and body imperfections. Self-acceptance also refers to acknowledgement of individual preferences that constitute a healthy lifestyle. Participants reported that being consistent with their own values and interests was the foundation of health behaviour change and maintenance.

The narratives and photographs in this theme opposed an idealistic vision of a healthy appearance. Participants commented that they tend to follow a holistic approach towards their health, and avoid focusing on getting a perfect, flawless body:

> 'Always striving for perfection, having everything tip-top. I'm trying to unlearn this. It's not about a perfect body, an exact body weight, but about health and overall fitness.'

For some participants, it was particularly important to accept body imperfections. Embracing things commonly considered as flaws supported participants in focusing on health:

> 'I don't strive for a flat belly, but for a healthy body. I've got cellulite as most women do, and I don't hide it.'

Self-acceptance was also described as a resource related to mindful living and gratitude. Positive acknowledgement of one's own life and self were associated with the ability to maintain a healthy lifestyle:

> 'I eat well, run, jump, go through life in harmony with myself, I just want to be Sarah (name changed). I'm grateful for what I have, and for good people, I met."

To stay healthy (both psychologically and physically), the participants indicated they needed to adjust, accept the situation and effectively adapt to it. Effective adaptation often defined whether health was maintained or not in the long term.

Facilitators to health

Theme 1: Enjoyment of activities that are part of healthy lifestyle

Having a positive attitude towards health behaviours was one of the main factors mentioned as supportive for long-term maintenance. If health behaviours evoke positive emotions, people are more likely to continue their pursuit for a healthy lifestyle (Fredrickson & Joiner, 2018). Those positive emotions are usually associated with personalising one's way to achieve a healthy lifestyle and making choices that are enjoyable.

Allowing oneself to cherish food experiences was often described as a health priority in the captions and captured in the photographs (Figure 3). One participant described food on two dimensions: as a source of pleasure, and as a source of energy to live. Personal satisfaction from healthy eating may be a part of healthy lifestyle:

> 'I LOVE EATING! Food gives me energy to work, energy for the whole day. Eating has always been a pleasure for me, since I was a kid. I can't imagine a healthy lifestyle without food. What is health to me? I answer simply – a plate full of food!'

Another aspect of health, commonly mentioned in the photos and captions, was physical activity. The participants always stressed that it should be an activity that is

Figure 3. Participant eating a waffle with whipped cream.

adjusted to personal abilities and preferences. Some participants mentioned physical activity as a part of their daily routine. It was perceived as a regular positive experience:

> 'Physical activity, especially walking, gives me an immense pleasure. I try to walk 5 km daily, however, lately I succeeded to increase the distance to 10 km daily.'

The ability to experience positive emotions and derive satisfaction from a healthy lifestyle was associated with a positive attitude towards healthy choices. One person commented that the appropriate perspective on health-related choices is a foundation of healthy lifestyle in her family:

> 'For me, healthy choices are not something I'm forced into, I actually enjoy making them.'

Participants also reflected on the satisfaction that they get from the process of pursuing a healthy lifestyle itself. Using personal resources to cope with difficulties and overcome individual barriers supported the maintenance of health behaviours.

Theme 2: Planning time for rest

This theme describes participants' need for finding time to rest and relax. We observed a consistent theme—the necessity to plan free time and allow oneself to renounce

overloading duties. According to participants' narratives, leisure activities should be planned in the same way as other activities (e.g. professional responsibilities) are planned.

Some participants referred to the stereotype that resting is for lazy or weak people. Both photographs and captions often broke this stereotype, emphasizing the importance of leisure activities and rest in sustaining a healthy lifestyle. Sometimes, the only photograph submitted by a participant was a photograph showing them resting (e.g. Figure 4). As modern society tends to force a fast-paced lifestyle, the participants had to change their perspective. Some of them mentioned that they are still learning to take time to rest:

> 'I learn to rest. In the past, I would say that resting is for the weak ones. Today I know that it's an extremely important part for maintaining health. One can't always be on the go, because sooner or later, the batteries will run out. Surprisingly, a lot of new ideas come to my mind when I'm lazing around.'

Appreciation of leisure time and resting was also reported as a skill that needs to be learned. Work-life balance was described as a skill that can be improved or as a behaviour that requires perseverance and planning. One person mentioned that it was not always obvious for her to plan time for rest:

Figure 4. Participant sitting on a giant chair in the mountains.

> 'Some days I allow myself to rest more, I don't check emails then, I don't work on anything in particular, I take up a book or a movie completely unrelated to my work. In the past, I didn't allow myself for that. Every minute spent this way was less valuable for me. Now, I appreciate this time, since I know that it lets me gather energy for new projects.'

Resting was presented in this theme as health-related behaviour. To build and sustain a regular resting routine, participants often committed to planned breaks and allowed themselves to be less productive during some period of their lives.

Theme 3: Supportive relationships

Maintaining supportive relationships with significant others was often presented as one of the participants' facilitators to health. The participants reported that social support is crucial to achieve healthy lifestyle. The narratives revealed an active and self-determined attitude towards building and maintaining relationships, not a passive expectation of support from the social environment.

The most common topic within this theme was respecting one's own personal boundaries. The captions delivered a strong sense of autonomy in relations with other people. Decisions about social life were perceived as healthy when they were based on their own interpersonal boundaries:

> 'It depends on ourselves, who we meet and which relationships we build. It depends on ourselves who we invite to our houses and our lives. It's defining our own boundaries and respecting them, it's caring for our privacy.'

Many participants described their regular physical activity as being in a group or with a friend. Being surrounded by people who are supportive and share the same hobbies helps to maintain health behaviours. There were several photographs of people being physically active in groups (Figure 5).

In line with the photographs and the captions, relationships that support a healthy lifestyle are always a result of personal choice. The participants presented a proactive attitude towards shaping their own social life and maintaining relations that are beneficial for their mental and physical health.

Theme 4: Contact with nature

Contact with nature was reported as one of the most important facilitators to health. Access to natural settings supported mental health. Moreover, outdoor activity was associated with a high level of satisfaction from a healthy lifestyle.

The narratives and photographs in this theme frequently related to the Covid-19 pandemic. The participants often described their need for contact with nature as a chance to escape from the threatening Covid-19 circumstances. Outdoor settings were often considered as safe places during the pandemic. Due to the fact that open spaces or forests are not as crowded as urban areas, the participants also appreciated a lack of Covid-19-related restrictions when spending time in natural settings. One participant described mountain trekking as a way to escape from the pandemic:

Figure 5. A group of cyclists.

> 'It's not without significance that, nowadays, during a worldwide pandemic, trekking is a form of spending free time without having contact with other people. It's only me and stunning, clean nature.'

Some participants, however, expressed their need for contact with nature regardless of the Covid-19 pandemic. The participants expressed that spending time in natural settings contributed to mental health in all circumstances. One participant commented that seeking a healthy lifestyle led him to outdoor physical activity, which is now his relaxation routine. He submitted a photograph of himself during outdoor physical activity (Figure 6):

> 'Thanks to the fact that I started to eat well and exercise, I can enjoy beautiful landscapes and the true beauty of nature!!! I found my hobby… My oasis of peace, that lets me wind down and recharge my batteries after a hard day.'

Contact with nature was perceived by the participants as a good way to build and maintain physical activity. Spending time in natural settings often meant stepping out of a stressful daily routine and taking time to rest and calm down. We observed a tendency to search for opportunities for outdoor activities during Covid-19 pandemic, as outdoor activity often meant the escape from the restrictions.

Figure 6. Participant expressing his enjoyment during outdoor activity.

Covid-19 and health

Individual differences in terms of links between health perceptions and Covid-19 were observed in participants' narratives. The only theme unambiguously related to the Covid-19 pandemic was need for contact with nature (described above). Natural settings were perceived as an escape from the pandemic restrictions and the risk of contracting Covid-19. Moreover, the participants emphasised that it was important for their health to avoid crowded areas. One person submitted a photograph of an empty main square as his perception of health during the Covid-19 pandemic (Figure 7).

Figure 7. Empty main square in Wroclaw, Poland.

In the narratives, we developed two themes related to the Covid-19 pandemic: (a) disruption in maintaining healthy habits, (b) motivation to engage in health behaviours. With regard to the perception of the Covid-19 pandemic as disruption in maintaining health behaviours, the participants often mentioned deterioration in their general health and well-being. Most of the narratives emphasised that problem-solving and a resource-based attitude supported the participants in overcoming health difficulties:

> 'This situation worsened my physical and mental health entirely which later influenced my constant bad mood. One may say that my general health deteriorated. My solution to improve my health were (and still are) multiple travels in the company of loved one to the accessible locations that are considered to be Polish natural wonders.'

There was a large number of participants who reported the Covid-19 pandemic as motivation to engage in health behaviours. The pandemic circumstances prompted the participants to focus on healthy eating habits, increasing physical activity, and overall care for their health and immune system. Setting new goals related to health and establishing eating routines were ways to cope with difficulties and mental challenges caused by the pandemic. One participant described eating a healthy breakfast as a steady routine that helped to endure fast-paced and uncertain circumstances. She submitted a photograph of a healthy meal as her perception of health during the pandemic (Figure 8):

> 'I chose this photo because, besides working at full capacity, in the constant madness of masks, hands' disinfecting, and stressful thoughts like: 'will I get infected from a client today?', I set a daily goal for myself to eat healthy, and nutritious breakfast. I didn't have

Figure 8. A bowl with fruit and walnuts.

> this routine before the pandemic, breakfasts consisted of what I found in the fridge, I often ate expensive bars or sandwiches in a hurry at school, but the Covid-19 era made me introduce at least the smallest change in my everyday life (since my whole reality got stuck still).'

For some participants, the Covid-19 pandemic was an opportunity to become aware of health and introduce health behaviours because the lockdowns were associated with less responsibilities and more free time. Therefore, some participants took time to reflect on their health behaviours and decided to act on them:

> 'Ironically, the pandemic influenced my health in a positive way, since the quarantine gave me more time for mindful figuring out healthy meals, looking for information, products, and experimenting with new dishes, it was also an opportunity for frequent bike rides, especially that the weather was good.'

It is worth adding that some participants did not mention Covid-19 in the submitted photographs and captions at all, and some wrote explicitly that Covid-19 was not related to their perception of health.

Discussion

The photographs with accompanying narratives delivered broad health perceptions and facilitators to health . Results focus on positive aspects of health, personal and contextual resources to maintain health, and describe behaviours that support healthy lifestyle. The results correspond with current definitions of health (Leonardi, 2018)

and included themes related to: health perceived as a process, searching for balance in life, and self-acceptance. Also, the connections between health, well-being, ability, and quality of life (Tengland, 2006) were prominent in our findings, as people reported that they value positive experiences and relationships, contact with nature, and time for rest, in terms of maintaining their own health. Perceptions of health and facilitators to health refer broadly to mental health from the perspective of human strength, not an absence of illness. This is in line with current definitions on mental health across different cultures (Kobau et al., 2011; Vaillant, 2012). Positive outlook on perceptions of health and facilitators to health may contribute to facing one of main challenges of Polish health system, which is deficiency in health promotion and disease prevention (World Health Organization. Regional Office for Europe et al., 2019). The presented themes advocate the need for promoting self-motivated behaviours that enable maintaining health, rather than focusing promotion on possible negative results of unhealthy lifestyles. At the same time, existing health promotion programs in Poland typically concern specific health conditions and their possible negative consequences, and fail to promote the benefits of a healthy lifestyle in general (Pataj, 2015). Knowledge of self-defined factors that constitute health and facilitate maintaining healthy lifestyle could support development of effective health promotion programs in Poland and other countries. Photo-elicitation provided an effective and suitable platform to gather data related to internalised perceptions of health.

Health perceptions

Sustaining health was perceived as a continuous process, which was expressed in the narratives from the theme: Health as a 'long journey' with multiple choices/directions. Achieving a healthy lifestyle and staying healthy requires sustained motivation to maintain health behaviours (Kwasnicka et al., 2019). Participants reported that maintenance of motivation is supported by the individual sense of responsibility for their actions, and daily efforts to make healthy choices. These perceptions are in line with the self-determination theory (Deci & Ryan, 2008), which promotes the sense of autonomy as one of the key factors influencing sustained behaviour.

The perception of health as a long journey also relates to the habit formation process (Gardner & Lally, 2018), referring to initial self-regulation and repetition of health behaviours in the same context as determinants of successful habit formation. The process of maintaining a healthy lifestyle also includes self-regulation skills to enable coping with lapses and relapses (Kwasnicka et al., 2013), which is particularly important for health behaviour maintenance (Kwasnicka et al., 2016). Being able to come back to healthy habits after a lapse or relapse was perceived as an inherent part of the 'health journey'(Bouton, 2000).

The findings suggest that health is also perceived as an ability to keep balance. The idea of a balanced lifestyle emphasises the need to look at health as a continuum, not a two-dimensional concept, where people can label things as 'healthy' or 'unhealthy'. The study results support the compensatory health beliefs model, that introduces the notion of beliefs about counterbalancing unhealthy behaviours with healthy ones (Rabia et al., 2006). Dietary restraint was described as demotivating and contradictory to health, in accordance with existing evidence (Herman & Mack, 1975; Ogden, 1993;

Putterman & Linden, 2004). Health perceived as a continuum and search for balance in life was previously reported in qualitative studies (Emami et al., 2000). Moreover, the concept of balance has been demonstrated to be effective in communication about general health, and may support the process of health behaviour change (Lipworth et al., 2011).

Another group of health perceptions related to positive acknowledgement of self and life circumstances. Participants emphasised that acceptance of one's own appearance and body imperfections was a foundation for further attempts to improve health. Self-acceptance was presented by participants as a factor supporting their mental health, and a foundation to cope with psychological crisis. This is in line with existing evidence, which suggests that self-acceptance may be beneficial for improving the sense of good health and well-being (Su et al., 2019; Tibubos et al., 2019).

Facilitators to health

The results of the study indicated that positive emotions connected to healthy lifestyle are an important health priority supporting long-term behavioural maintenance. The ability to experience positive emotions is connected with mental health (Vaillant, 2012). The sense of pleasure from health behaviours are the main influences on behaviour change maintenance here, in line with Regulatory Fit Theory (Higgins, 2005), which assumes that behaviour may be influenced by regulatory goals, as well as in line with the evidence (Landry et al., 2018; Sabatini et al., 2019). Participants reported that they tend to adjust physical activity to personal preferences when they build and maintain physical activity habits. This is in line with current evidence that satisfactory, repeated physical activity leads to long-term health behaviour change maintenance (Wild & Woodward, 2019). Moreover, the photographs and narratives provided descriptions of positive emotions being evoked by activities that are part of healthy lifestyle. Positive affect experienced during health behaviours may be beneficial for long-term behaviour change (Van Cappellen et al., 2018), and it is recommended that health interventions should assist personal attempts to enjoy a healthy lifestyle (Whitehead, 2005).

Prominent among the facilitators to health, participants reported their need for rest. Planning leisure activities was an inherent part of a healthy lifestyle. This relates broadly to the Ego Depletion Theory (Baumeister, 2003; Hagger et al., 2010), which presents self-regulation as a limited resource—rest and positive affect are required to restore personal resources. Planning to rest may be beneficial for holistic health interventions, as it supports overall stress management skills (Harris et al., 2021).

Another health-related priority reported in this study was maintaining relationships that support healthy lifestyle and mental health. Social support is one of the most important predictors of mental health (Kobau et al., 2011), also throughout the Covid-19 pandemic (Waters et al., 2022). Participants reported a self-determining attitude towards their social life, including setting interpersonal boundaries. This approach is in line with the framework for investigating dyadic relationship processes and health, implying that social support or control, relationship satisfaction and other social process variables are key determinants of physiological states, affect, health behaviours, and health (Pietromonaco & Collins, 2017; Uchino, 2009). Unsupportive

relationships were often described as contradictory to general health and the sense of well-being. Studies have shown that social relationships influence human health to great extent (Pietromonaco & Collins, 2017; Umberson & Karas Montez, 2010), and relationship distress may have negative effects on health (Kiecolt-Glaser & Wilson, 2017).

Participants described outdoor activities in natural settings as crucial for their health, which is in line with the evidence that contact with nature offers multiple health benefits (Frumkin et al., 2017). Participants reported that exposure to natural settings supports their mental health in a significant way, in accordance with previous studies (Triguero-Mas et al., 2015). Contact with nature facilitates emotional well-being, cognitive functioning, and a range of other mental health assets. Moreover, studies suggest that access to natural settings is crucial for public health (Baur & Tynon, 2010; Shanahan et al., 2015). Nature in the urban environment may also support resilience for maintaining health during the pandemic circumstances. Nature was perceived as a space to escape from Covid-19 safety measures and the risk of contracting Covid-19. This supports current evidence for contact with nature as a crucial factor to maintain health behaviours and to recover from mental health deterioration during the Covid-19 lockdowns (Buckley & Westaway, 2020; Pouso et al., 2021).

Covid-19 and health

The study provided descriptions of health behaviours related to the pandemic, that followed two main patterns: (a) the Covid-19 pandemic as disruption in maintaining health behaviours, (b) the Covid-19 pandemic as motivation to engage in health behaviours. The connections between the Covid-19 pandemic and health perceptions and facilitators to health were mixed. They were based on individual experiences, personal strategies to respond to health threatening situations, and to relieve psychological tension. Most of the participants reported a resource-based approach that helped them to overcome difficulties during the pandemic. The pandemic worsened the sense of well-being and mental health of many participants. The Covid-19 pandemic and lockdowns have been previously reported as disruptive to maintaining health behaviours (Naughton et al., 2021), with a strong focus on negative mental health outcomes (Arora & Grey, 2020; Cullen et al., 2020; Dawson & Golijani-Moghaddam, 2020; Lima et al., 2020; Zvolensky et al., 2020). Furthermore, participants often reported decreased physical activity during the pandemic, which is consistent with other studies (Castañeda-Babarro et al., 2020).

In contrast, the study also provided broad evidence for the Covid-19 pandemic as a source of motivation to engage in health behaviours. Psychological distress may be balanced by relaxation routines, and that became possible during the pandemic (Grandey et al., 2021). Other studies also suggested that the pandemic may have had some positive effects resulting from changes in daily life during the pandemic (Cornell et al., 2022), such as more time spent with family, or increased work flexibility. According to the evidence provided by this study, the pandemic increased personal focus on the field of eating behaviours, as it enabled people to prepare homemade meals, and to educate themselves about nutrition. The pandemic became a cue to raise personal awareness about health, and establish new, healthy routines.

Moreover, some participants reported no observed connections between the Covid-19 pandemic and their health behaviours. This emphasises the need to answer the question about the factors that differentiate people in terms of their degree of coping with the Covid-19 pandemic. This study delivered preliminary evidence for multiple factors that may influence the relationship between the pandemic and health behaviours. These may be pre-existing health conditions and health behaviours, overall mental health, individual differences and preferences, previous health-related habits, or life circumstances. Other studies also underline the role of demographic factors (such as age) as moderators of health behaviours during the pandemic (Anaki & Sergay, 2021; Bergman et al., 2020). Furthermore, the individuals' understandings and personal attitudes towards the pandemic-related challenges, may be significant when considering any forms of health promotion during or after the Covid-19 pandemic (Zhang et al., 2020).

Study strengths and limitations

The photo-elicitation method proved to be useful for exploring individual perceptions of health and facilitators to health, making it easier for them to express internalised topics that are usually hard to elaborate on. Participants presented their original photographs, which was valuable in terms of presenting real experiences and environment. We used open participant-driven format (Bates et al., 2017), which enabled participants to describe their own perceptions, without being influenced by any health definitions or health-related perspectives presented by researcher. It is one of the few studies to use photo-elicitation in a fully online context. The online form was effective in terms of recruitment. We were able to conduct qualitative research, following Covid-19 pandemic restrictions and safety measures. The study included good variation in terms of participants' backgrounds, SES, and age, and captured a wide variety of experiences and opinions. Moreover, the study gave voice to the target population that is often bombarded with 'healthy living' messages but rarely asked to clarify what health means to them.

This study differs in that we did not interview study participants as is typical for photo-elicitation studies. Such data-prompted interviews may have evoked further themes and narratives (Kwasnicka et al., 2015). If we had been able to use follow-up questions and probes in an interview context, we may have obtained more detailed information. However, we consider the present process of using photographs with complementary captions to be a cost-effective and wide-range alternative that can enable researchers to collect rich and diverse data. The online form of the study does not reach potential participants who do not use the Internet. The majority of participants (68%) had higher education, even though we have not observed differences between participants with different education levels. Moreover, we did not identify individual health conditions or illnesses that may have influenced personal perceptions of health. Data were published online, therefore openness to disclose personal information about health conditions may have been limited. There is also a possibility that some of participants produced answers that were perceived by them as socially desirable. Nonetheless, this study set an opportunity to explore health perceptions and facilitators to health in the extraordinary circumstances of the Covid-19 pandemic.

Implications for practice and future health interventions

Our findings may support development of future health promotion programs and health interventions. Knowledge of health perceptions and perceived facilitators to health may support in engaging potential participants, as well as defining form, process, and goals of health promotion programs and health interventions. Our recommendations, that refer to health perceptions, are: (1) providing support for long-term perspective, educating about resources to maintain health behaviours, and to cope with lapses or changing circumstances; (2) referring to balanced lifestyle and finding personal equilibrium in terms of own health to encourage potential participants; (3) emphasising the role of acceptance of life circumstances and own appearance as important elements of health behaviour change process. The key take-home messages for future health promotion programs and health interventions, in terms of self-defined facilitators to health, are (1) proposing health behaviours that evoke positive emotions and constitute pleasurable experiences on personal level, (2) promoting rest as health behaviour, (3) emphasising the role of meaningful relationships or enabling participants to build them throughout the program, (4) encouraging participants to spend time in nature and developing opportunities for outdoor activities within communities. Major health concerns, such as the COVID-19 pandemic, may have diverse implications and require further investigation. They may cause disruption in health and well-being or opposite—increase in motivation to focus on health and maintain health behaviours.

Conclusion

The study described broad and holistic perceptions of health. Participants emphasised looking at health as a process and searching for balance in life. Health was also defined as the act of self-acceptance—accepting one's body—and the ability to adapt to life circumstances, which facilitated health behaviours. The findings show that a sense of enjoyment was a basis for starting and maintaining healthy habits. They also show the importance of rest and leisure as a crucial health behaviour. The study emphasised the need for contact with nature—especially during the Covid-19 lockdowns. Health was also associated with building and maintaining supportive relationships. Although the study provided evidence for Covid-19 as a major difficulty for maintaining healthy habits, the pandemic was broadly perceived as a source of motivation to focus on health. Further research to explore cultural context of health perceptions and facilitators to health may be beneficial for better understanding of what constitutes health in general population. Future studies could also address particular segments of population to assess if there are unique perceptions of health across different groups. In terms of methodology, it could be valuable to conduct data-prompted interviews with participants after the phase of collecting photographs with accompanying captions. This participant-driven research, using photo-elicitation, can provide relevant health definition and a source of *know-how* for future health interventions.

Disclosure statement

The authors declare that they have no competing interests with respect to the research, authorship, and/or publication of this article.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, Iga Palacz-Poborczyk, upon reasonable request.

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Publikacja dotycząca Badania 3

Title: *Choosing Health*: Acceptability and feasibility of a theory-based, online-delivered, tailored weight loss and weight loss maintenance intervention

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Title: *Choosing Health*: Acceptability and feasibility of a theory-based, online-delivered, tailored weight loss and weight loss maintenance intervention

Abstract

Background: Few weight loss and weight loss maintenance interventions are tailored to include factors demonstrated to predict the user's behaviour. Establishing the feasibility and acceptability of such interventions is crucial.

Purpose: To assess the acceptability and feasibility of a theory-based, tailored, online-delivered weight loss and weight loss maintenance intervention *Choosing Health*.

Methods: A mixed methods process evaluation of the *Choosing Health* tailored intervention, nested in a randomised controlled trial (*N*=288) with an embedded N-of-1 study, investigating participants' and implementers' experiences related to intervention context, implementation, and mechanisms of impact. Measures included: (1) surveys, (2) data-prompted interviews (DPIs) with study participants, (3) semi-structured interviews with implementers, (4) intervention access and engagement data.

Results: Seven themes described the acceptability of the intervention to participants: (1) Ecological Momentary Assessment (EMA) recognised as a behaviour change monitoring technique, (2) crucial role of the personalised reports, based on the EMA data analysis, (3) usefullness of regular body composition analysis for understanding the weight management process, (4) working collaboratively with the intervention implementers to achieve participants' goals, (5) perceived benefits of non-judgmental and problem-solving tone of the intervention, (6) changes in personal perception of the weight management process due to intervention tailoring, (7) and insufficient intervention content tailoring. The intervention delivery was feasible, however, emails and text messages differed in terms of accessibility and resources required to deliver the content.

Conclusions: The study reports good practices and challenges to further develop tailored, theory-based interventions for health behaviour change.

Keywords*:* weight loss, overweight, obesity, digital health, process evaluation, ecological momentary assessment

Lay summary

People with overweight and obesity can benefit from participating in behaviour change programs that are individually adjusted to participants' psychological characteristics. It is important to provide knowledge of how to design acceptable and feasible, widely accessible, sustainable tailored interventions for weight loss and weight loss maintenance. We designed *Choosing Health* - a tailored intervention that matched intervention content to psychological factors that were demonstrated to influence each participant's behaviour. This study assessed whether the *Choosing Health* program was acceptable and feasible from the point of view of program participants and people who worked directly with the participants. The intervention tailoring supported participants in changing the way they thought about the weight loss process, and regular tailored messages served as a cue to maintain healthy habits. However, tailoring based on psychological characteristics was insufficient for many participants, as they would have preferred more personalised content. We provide guidance on good practices to gather data for tailored support, to monitor behaviour change progress, and for communicating with participants, to improve acceptability of tailored interventions. We also compare how acceptable participants found methods of the intervention delivery (SMS messages, emails, handbook) to advise which methods are the most acceptable and preferred by participants.

Introduction

Overweight and obesity are complex conditions (World Health Organization, 2019), with many possible etiological factors and contextual influences. To provide effective treatment for people living with overweight and obesity, there have been calls to move beyond one-size-fits-all solutions (Flint & Batterham, 2023; Kelsey & Pagidipati, 2021). Tailored interventions for weight management show promise as a method to effectively support this population to lose and maintain weight loss by changing health behaviours. Through tailoring, interventions can be customised on the basis of individual characteristics (Noar et al., 2011). Evidence-based digital interventions containing individually acceptable features may offer an efficient alternative to traditional face-to-face counselling (Beck et al., 2010).

We designed a tailored, theory-based intervention to support people in losing weight and maintaining it long term *(Choosing Health)*. We tested twelve, theory-based factors that are related to health behaviour change and maintenance (Kwasnicka et al., 2016). Personal factors that influence individual weight management were investigated using Ecological Momentary Assessment (EMA) to inform intervention tailoring. EMA involves regular, real-time sampling of participants' behaviours and experiences, performed in their natural environments (Perski et al., 2022; Shiffman et al., 2008). The intervention was evaluated in a two-group randomised controlled trial (RCT). In this article, we will report on the process evaluation of the *Choosing Health* intervention.

To advance and inform further tailored interventions for weight management, there is a need to identify and describe mechanisms of behaviour change, as well as feasibility and acceptability of tailored interventions in various contexts. Evaluation of feasibility and acceptability can provide insight into the implementation, mechanisms of impact, and contextual factors that shape each complex health intervention (Moore et al., 2015). Moreover, process evaluation can help identify how participants engage with the intervention, and factors that influence acceptability of particular elements of the intervention. A systematic approach to conducting process evaluation may facilitate a better understanding of the interdependencies that occur in the intervention. It enables assessment of feasibility of the intervention in the specific situational, economic, and geographical contexts.

Acceptability is defined as the perception among implementation stakeholders (including participants) that a given treatment, service, practice, or innovation is appropriate, agreeable, palatable, or satisfactory (Proctor et al., 2011; Sekhon et al., 2017). Programs considered acceptable by participants are more likely to induce behaviour change (Stok et al., 2016). To assess the level of acceptability in a complex intervention, intervention providers need to explore affective and cognitive attitudes, perceived effort and burden of the intervention, individual levels of self-efficacy, and perceived effectiveness of the intervention (Sekhon et al., 2017). Importantly, equitability of the interventions and thus reducing health inequalities are the function of acceptability and feasibility of the interventions (Proctor et al., 2023). *Feasibility* can be defined as the extent to which the delivery of the intervention may be successful, given the context and setting in which the intervention is conducted (Proctor et al., 2011). Feasibility may be also defined as the extent to which an implementation target (e.g., the breadth of the reach, attrition, equitability) can be successfully achieved.

The aims of this study were: (1) to assess the acceptability of the intervention, particularly regarding the use of a 3-month period to gather EMA data to then subsequently inform intervention tailoring; (2) to determine feasibility of the intervention delivery for the study participants and the intervention implementers.

Methods

Design of the *Choosing Health* trial

The *Choosing Health* study was a two-group RCT with embedded N-of-1 interrupted time series. The protocol of the trial is published elsewhere (Kwasnicka et al, 2020). Co-design of the intervention followed the Intervention Mapping approach and is published elsewhere (Palacz-Poborczyk et al., 2022). We recruited 288 study participants (16 % men, 84% women, age: 21-71, *M*= 36, *SD*= 9.89; BMI 25-50, *M*= 32, SD= 4.62) via social media advertising, partnering with local communities and not-for-profit organisations, and advertisements placed on the university website. Recruitment activities occurred between March and October 2020 and study measurements were collected between July 2020 and April 2022. The trial took place in Poland (Wrocław, Lower Silesia

voivodeship). All participants were from Lower Silesia or neighbouring regions, as objective measures were collected during face-to-face meetings with the intervention implementers.

Both groups (intervention and control) completed study measures at baseline, 3 months, 6 months and 12 months. Throughout the trial, each participant met four times with an implementer, who provided a body composition analysis (scale model: Tanita MC-780 S MA, Japan) in conjunction with a detailed printed report. Implementers explained to the study participants how to interpret body composition data measures. Before receiving treatment, intervention participants collected daily EMAs to identify the strongest predictors of their weight loss plan adherence. Participants from the intervention group were informed after baseline that the EMA was used as a data gathering method to build their personalised and tailored intervention afterwards. Every participant assigned to the intervention group could choose a convenient time of a day to receive a SMS reminder about the daily survey. The daily assessments were collected for 90 consecutive days. Each intervention participant's EMA data were then analysed using time series analysis to identify the strongest predictors of their self-reported weight loss plan adherence. The 12-week intervention was then tailored to the four strongest predictors and included daily SMS messages and weekly emails, containing the tailored evidence-based advice (Figure 1). All study materials, including the intervention content, were published in the Open Science Framework (https://osf.io/sf264/).

The trial measurements were taken by five implementers (all with Masters degrees in psychology). Two of the implementers were involved in the intervention content development, preparation of the detailed trial procedures, and recruitment. The other three implementers were then trained in study procedure, based on the standard operating procedures (SOPs).

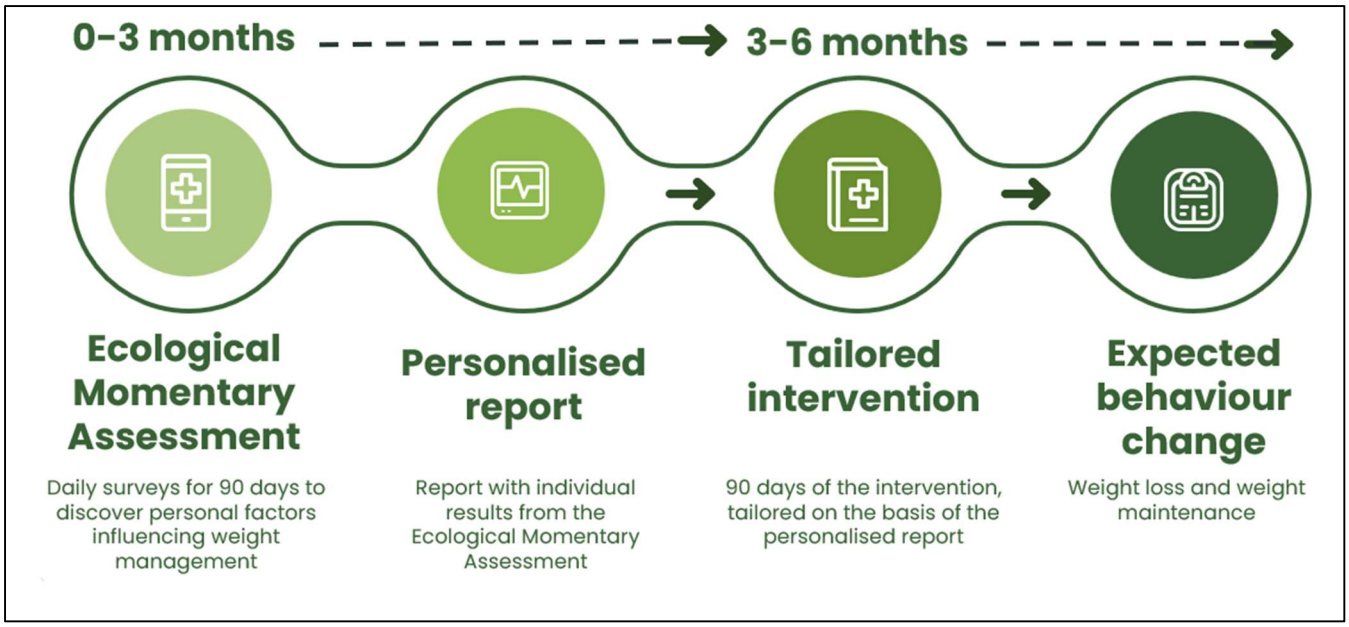

Figure 1. *An overview of the tailored intervention steps in the Choosing Health trial*

Design of the process evaluation

We investigated the acceptability and feasibility of the intervention, focusing on three key aspects of process evaluation: context, implementation, and mechanisms of impact, which follows the guidelines of the UK Medical Research Council (Moore et al., 2015). The process evaluation of the *Choosing Health* intervention included: (1) surveys completed by the study participants at 6- and 12-month post baseline follow-up meetings, (2) data-prompted interviews (DPIs) (Kwasnicka et al., 2015) conducted with participants at the conclusion of the trial, (3) semi-structured interviews with implementers, (4) and intervention access and engagement data.

Surveys from the intervention participants

Data from 6- and 12-month follow-up surveys were collected in advance of a measurement meeting and gathered anonymously. Structured survey items assessed participants perceptions of acceptability of the interventions' attractiveness, affective response, informational value, and acceptability of the online-delivered content of the intervention, all rated on a 1-100 scale (*1 – totally unacceptable, 100 – fully acceptable*). Open-ended items included questions about perceptions of health behaviour changes that occurred during the *Choosing Health* trial, personal experiences of taking part in the intervention, and suggestions for improvements.

Data-prompted interviews with the intervention participants

We conducted 26 semi-structured, data-prompted interviews (DPIs) with participants. Data-prompted interviews are based on personal data to stimulate discussion (Kwasnicka et al., 2015) and have been used to explore weight loss and weight maintenance experiences (Kwasnicka et al., 2019). Data-prompted interviews were designed to explore participants' experiences in the *Choosing Health* trial, perceived facilitators of, and barriers to behaviour change throughout the intervention. We also explored weight loss and weight loss maintenance strategies used during the intervention, and those planned to be continued after the conclusion of the trial.

During the interviews, we used body composition reports summarising data gathered throughout the study and the EMA data analysis reports summarising individual factors influencing weight loss and weight loss maintenance. The interviews were conducted face-to-face by the researcher (IPP), after the 12-month follow-up meetings, which were the final participant meetings in the *Choosing Health* trial.

The interview protocol was prepared by one researcher (IPP) and reviewed by another investigator (DK). The interviews took place between July 2021 and May 2022, and lasted between 18 and 43 minutes (M = 27 min; SD = 6 min).

Interviews with the intervention implementers

Implementers (N=4, all women) were asked to participate in semi-structured interviews to explore their experiences of delivering the *Choosing Health* intervention, their suggestions for future improvements, individual challenges, and intervention components that worked well and did not work well. Interviews were conducted face-to-face and lasted between 22 and 31 minutes (M = 24 min; SD =1 min).

Intervention access and engagement among intervention participants

Intervention delivery was automatised via dedicated software (*Redlink* for SMS messages delivery and *Mailerlite* for emails). We were able to assess how many participants opened each email and how they engaged with it (e.g., opened a link in the message, as we included the link in every email to the *Choosing Health* website and social media), using email tracking reports provided in the email delivery system. All participants received a study handbook at baseline (printed or e-book) and

we assessed which form was preferred. The handbook included generic information on healthy diet, weight loss process, and physical activity.

Data analysis

Qualitative data (open-ended survey comments, data-prompted interviews with the intervention participants, and semi-structured interviews with the intervention implementers) were analysed using principles of reflexive thematic analysis (Braun & Clarke, 2019). Data-prompted interviews with the intervention participants and interviews with the intervention implementers were recorded and transcribed verbatim. Afterwards, transcripts were checked for accuracy and data were coded by IPP according to the study aims, focusing on the intervention acceptability and feasibility of the intervention delivery. The codes were indexed in a preliminary thematic map, and then were reviewed by DK to ensure that they represent the meaning related to the study aims, as well as implementation, mechanisms of impact, and the contextual factors. Data were then systematically translated, according to recommendations for cross-language quotes (van Nes et al., 2010). Quantitative data from the structured questions in the feedback surveys for the intervention participants and the intervention delivery systems were analysed using descriptive statistics.

Results

Acceptability of the intervention

In order to assess intervention acceptability, we quantitatively assessed several key features. Affective response was assessed as positive (*M*=73.03, *SD*=25.24; 0-100 scale). Perceived attractiveness of the intervention was moderate (*M*=67.07, *SD*=29.38; 0-100 scale), as was the informational value of the intervention (*M*=61.38, *SD*=27.50; 0-100 scale). The participants rated the online form of the intervention as moderately valuable (M= 68.13, *SD*=29.67; 0-100 scale).

The qualitative findings relating to intervention acceptability are described through seven themes. Participants' quotes are derived from data-prompted interviews (DPI); including personal characteristics: participant number, BMI at baseline, gender), or are obtained from anonymous feedback surveys (marked below as: 'survey').

Theme 1: EMA recognised as a behaviour change monitoring technique

Many participants described EMA as a useful way to reflect on the day and a part of their behaviour change process:

> *"I treated the questions mainly as a monitoring technique, to understand how a day actually went. Mainly, because weight loss should not be treated as a separate thing, it should be embedded fully in my daily life."* (DPI, participant no. 235, BMI = 32.4, woman)

Some participants reported that the daily EMA surveys increased their motivation to adhere to their plans in terms of health behaviours (e.g., diet, physical activity, weight monitoring). Additionally, daily surveys were a form of 'staying in touch' with the implementers and that also facilitated motivation for health behaviour change:

> *"I felt satisfied, it was very motivating for me, even though the messages were sent out automatically, I had this feeling that I had a connection; a form of contact with people who are engaged with me and who care."* (DPI, participant no. 205, BMI = 31.6, man)

Even though the EMA helped some participants to monitor their health behaviours, some participants indicated that surveys were tiring or boring, especially during the final surveys after 90 days.

Theme 2: The crucial role of the personalised EMA reports

Personalised reports, prepared by the intervention implementers, based on the analysis of the EMA data for each intervention group participant, included information about individual factors that influence personal weight loss progress. Participants suggested that the report itself, and discussion with an intervention implementer, provided an opportunity to monitor their behaviours and health outcomes. Most participants agreed with the results of the report and stated that they had observed the reported individual factors for weight loss and weight loss maintenance before, although they felt it was often hard to understand or verbalise these connections.

> *"I was not surprised by the results, it was a confirmation of something I felt, but never been able to define. After reading the report, I was able to pinpoint it exactly, and it was also easier for me to spot specific situations, and potentially respond to them."* (DPI, participant no. 281, BMI = 30.5, woman)

The discussion of the personalised reports with the implementers, after 90 days of EMA, was perceived as an important element of the intervention. Participants had an opportunity to reflect on the factors that may influence their weight loss, and they often treated the results of the EMA as a guidance for formulating their further weight loss plan. The participants suggested that having an opportunity to monitor the results in real time (e.g., via mobile application) would increase engagement with the intervention.

Theme 3: Usability of regular body composition analysis for understanding the weight management process

Body composition data were provided at regular time intervals, and were perceived as reliable feedback on the weight loss progress. The participants said that the reports helped them maintain health behaviours aligned with their goals, and work on behaviours that needed improvements:

> "*Seeing actual progress has been motivating, and there is enough data to see a full picture of my health. It's not just weight, size, and BMI."* (DPI, participant no. 219, BMI = 29.4, woman)

Many participants stated that realising what weight loss involves from the body composition analysis (e.g., body fat reduction, fluctuation in muscle mass or water retention percentage) was a breakthrough in their understanding of the weight loss process. This process, that occurs during weight loss, enabled some participants to engage in and take ownership of their health behaviours:

> "*The results showed that it was high time to get interested in my own weight and to start to monitor my weight, and not let the weight take control."* (DPI, participant no. 27, BMI = 28.9, woman)

Theme 4: Working collaboratively with the intervention implementers to achieve participants' goals

The complexity of the intervention required ongoing support from implementers to help the participants understand the elements of the intervention and to engage in them. The implementers led in-person sessions, set up the automatised intervention content, and were at the disposal of participants throughout the trial, if they had any questions. It was reported that the opportunity to consult a trained psychologist every few months was an asset of the intervention. Participants stated that meetings with implementers added value to their experience of the online-delivered intervention, as it helped them orientate themselves towards the flow of the intervention, and understand the assumptions and goals of

the intervention. It also helped to reflect on their progress and receive a clear overview of the next steps. Implementers were often perceived as partners in the process of behaviour change, even though the meetings were held in a non-prescriptive manner, as the implementers did not suggest specific weight loss goals for the participants. Many participants described how the meetings motivated them to adhere to their weight loss plan:

> *"The meetings were important to me, I liked that there was a conversation, that there was an analysis, and there was support explaining what's next. It motivated me that someone is taking care of me and we work together to achieve my goals."* (survey participant, anonymous)

The intervention took place during the COVID-19 pandemic. Several participants reported that an opportunity to consult a psychologist during a face-to-face meeting was a valuable experience, when all other forms of human contact and human interactions were restricted.

Theme 5: Perceived benefits of a non-judgmental and problem-solving tone of the intervention

Both text messages and emails were written with the intention to avoid a negative or judgemental tone, aiming to foster participants' internal motivation (Palacz-Poborczyk et al, 2022). This approach meant that participants were able to choose behaviour change techniques that were the most appropriate and aligned with their preferences:

> *"Something I really liked, was that the messages had such a friendly and non-judgmental tone. It was like: "Hey, we want to show you this. Check it out! Do what you want, but at least look at this and maybe you'll want to live in another way."* (DPI, participant no. = 235, BMI = 32.4, woman)

A non-judgemental tone was particularly appreciated by participants who experienced any forms of discrimination due to living with overweight or obesity:

> *"The open-mindedness of people that I met was great, I never heard anything negative about myself here, only words of support. I usually receive negative and judgemental comments when it comes to my weight."* (survey participant, anonymous)

The intervention contained messages that referred to obstacles, lapses and relapses in the process of health behaviour change. Considering difficulties as a common factor in a weight loss process was helpful for participants. It was particularly important that the intervention emphasised

problem-solving based on individual resources. Focusing on personal resources used for coping with obstacles, was often mentioned by participants at the final stage of the trial as something that supported long-term weight loss maintenance:

> *"The program taught me that obstacles are a natural part of life, and that there is no need to give up. Some minor setbacks are not the end of the world, and despite them, I can continue and just go on."* (survey participant, anonymous)

Theme 6: Changes in personal perception of the weight management process due to intervention tailoring

Regular SMS and email content, tailored on the basis of EMA data, served as a reminder, or a cue, to maintain healthy behaviours. Even though many participants reported that SMS messages were relatively basic in terms of their informative value (limited to a maximum of 160 characters), this form of support was perceived as helpful to maintain health behaviours, especially after a lapse or relapse. The tailored intervention was perceived as something new, an alternative to the weight loss programs the participants had experienced before. The participants said that tailored content encouraged them to reflect on their own behaviours, and helped them to change previous beliefs about dieting and healthy lifestyle. The tailored intervention motivated participants to focus on their own needs, and, therefore, changed their perception of the weight loss process. It was common that the ultimate goal, set by participants during the intervention, was not only weight loss, but change in their attitudes towards weight and health, focused on their own preferences and lifestyle:

> *"Honestly, it was very nice that nothing was really imposed in the program. We were able to adjust everything, adjust it to our needs, and to our thoughts and everything else. It does not work like a typical diet, just for the sake of losing weight, but it changes your way of thinking about weight loss, taking care of the body and health in general."* (DPI, participant no. = 176, BMI = 34.3, woman)

Participants described having had a chance become aware of many psychological or environmental factors that influence their weight management. Some participants reported changing their perspective on the process of weight management – from thinking only about diet and physical activity, to perceiving weight management as a broader process, that is influenced by many factors,

that differ on a personal level. The tailored intervention encouraged participants to explore individual reasons underpinning health behaviours:

> *"I saw things as if they were under the microscope, because – as I said – you focus on losing weight in a wider sense. Not losing weight, eating less, eating more, but you don't think about the reasons, where all these things come from, and there are a lot of these factors at play."* (DPI, participant no. = 219, BMI = 29.4, woman)

Theme 7: Insufficient intervention content tailoring

Some participants reported that the tailored intervention was not perceived by them as sufficiently personalised. The intervention was based on the domain (or a mix of domains) that, according to the EMA, were the most predictive for the participants (e.g., habit formation, self-regulation) of their weight loss plan adherence, rather than tailored to individual characteristics. Participants were aware that the intervention content was prepared before the start of the trial, and would be programmed by implementers and automated. Some participants reported that they would expect support that is directed specifically to them to maintain motivation for health behaviour change:

> *"I would need these text messages to be more personalised, so that it works like a coach – I need more direct messages to motivate me.* (survey participant, anonymous)"

Some participants criticised automatisation as a factor that decreased their engagement in the intervention. One person commented that it was hard to relate to messages that were sent automatically as the relevance of the messages and message specificity to the contextual circumstances and preferences was limited:

> *"They were sent out automatically, so I did not treat them as something relevant to me."* (survey participant, anonymous)

There were several aspects that participants suggested should be included to improve personalisation of the intervention. The most common ones were individual lifestyle, and their personal situation. Several participants reported that they would expect that the intervention would align with their current mood, family situation, preferred forms of physical activity, their job, or their social environment. Some participants indicated that poorly tailored messages did not only decrease their motivation, but caused negative reactions. Participants proposed also that they would like to have

an opportunity to adjust some parameters during the course of the intervention, as their personal situation may have changed during the 12-months when participating in the intervention. The COVID-19 pandemic was also likely to have increased the need for better personalisation, as it caused unexpected changes in participants' lives (e.g., job change, relocation, limited physical activity options, changes in eating patterns).

Feasibility of the tailored intervention delivery

At baseline, every participant in the intervention group received a book that included evidence-based information about nutrition, physical activity, and other health behaviours related to weight management. Participants could choose between a printed version or an e-book. The content of the printed and digital versions did not differ. Most participants chose the printed version (n=266, 92.4%), with the remaining choosing the e-book (N=22, 7.6%). Participants, especially those who chose the printed version, reported that the intervention book would be helpful for them in a long-term weight loss maintenance:

> *One thing that I promised myself, and it will definitely help me, is to leave the book out, and go back to it. Even though I studied it thoroughly, it will be something, that I will come back to, to remind me, to make sure that this knowledge is still here.* (DPI, participant no. = 205, BMI = 31.6, man)

Text messages were considered as an easily accessible form of regular contact. All participants used their own mobile phones to receive intervention content via text messages. When deciding on a convenient time to receive the daily SMS, participants usually chose the time just after they woke up. From the point of view of the intervention implementers, automatization of the distribution of the text messages was resource intensive, as it required extensive training, and then programming the database of text messages separately for each participant.

The intervention emails were reported by participants as less accessible than text messages during data-prompted interviews and in the surveys. It was often mentioned that intervention emails got lost in their inboxes. The participants reported that this form of the intervention delivery served them in a different way – the text messages were perceived as cues to action or reminders, whereas the emails were longer, and required some time to process and reflect on the content. The majority of the

emails were opened on personal computers (95.36%), and only a few participants used their mobile phones to open and read them (4.64%). When defining the convenient day to receive the emails, participants usually chose a day when they knew they would have more time to look through their emails. Overall, 60% of the intervention emails were opened, and 11.7% of participants clicked on the message hyperlinks.

Discussion

This study investigated the acceptability and feasibility of a theory-based, online-delivered, tailored weight loss and weight loss maintenance intervention.

Implementation

Although the tailored intervention was delivered automatically (via SMS and email), regular follow-up meetings with implementers were important for participants to understand and follow the intervention. It has been previously reported that face-to-face meetings and reminders from implementers improve adherence to digital health interventions (Bennett-Levy et al., 2010; Burke et al., 2017), and they were crucial to maintain engagement with the *ChoosingHealth* trial. It is possible that the need for personal contact was influenced by the COVID-19 pandemic (Matias et al., 2020), as participants frequently mentioned that follow-up meetings with the intervention implementers were unique, especially considering that all implementers were trained psychologists.

Mechanisms of impact

The main goal of the *Choosing Health* trial was to test the efficacy of a tailored intervention, in terms of its influence on weight loss and its maintenance. The element of tailoring was perceived as impactful for weight loss and weight maintenance on individual level. Participants reported that tailored support resulted in personal reflection on own health behaviours and redefining individual values in relation to health and well-being. Changes that occur on cognitive level may result in long-term health behaviour change and behaviour maintenance and are important when facing the challenge of overweight and obesity (Montesi et al., 2016). The delivery of tailored content through SMS was more feasible than through emails, although the acceptability of both forms was similar. Regular, tailored SMS content was also reported as desirable in previous research (Nguyen et al., 2015).

We applied twelve theory-based domains for behaviour change and behaviour maintenance (Kwasnicka et al., 2016) as the main components on which we tailored the intervention. Although participants reported that the tailored intervention was more beneficial for them than the potential generic support would have been, they also indicated that the procedures still lacked more personal and context-adjusted content.

The intervention tailoring would benefit from incorporating these factors, as well as demographics (Noar et al., 2011) or gender, as there is evidence for effectiveness and acceptability of gender-sensitive interventions (Kwasnicka et al., 2021; Young et al., 2017). Another way to improve the experiences with the intervention would be providing just-in-time adaptive intervention which provide support based on factors that change in real time (Goldstein et al., 2017; Hardeman et al., 2019; Wang et al., 2014). As the intervention lasted 90 days, and the whole trial lasted 12 months for each participant, the context, personal situation, and preferences may have changed during the process of behaviour change and behaviour maintenance.

It was common for participants to interact with the EMA surveys on two levels: as daily surveys to provide data for further intervention, and as a monitoring tool, which enabled real-time reflection on trajectories of behaviours that were surveyed. Participants had the opportunity to provide data for the tailored intervention and to work on their health behaviour change simultaneously. This mechanism is usually employed in EMA interventions based on feedback provided on an individual level (Heron & Smyth, 2010).

Moreover, personalised reports, based on EMA data, were perceived as a crucial point in the behaviour change process. An opportunity to discuss personal factors that influence weight loss was often described as a breakthrough in thinking about health behaviours on individual level. Sense of relatedness was crucial for participants to sustain motivation, which is in line with the Self-Determination Theory (Ryan & Deci, 2000) that promotes relatedness as one of the main factors that drive intrinsic motivation.

Context

Access to weight loss advice, delivered by digital means and by certified health specialists, is limited in Poland (Bieńkowski et al., 2018). Therefore, the *Choosing Health* intervention was an opportunity to receive evidence-based, free of charge support in weight management. We observed that the non-judgemental, and resource-based tone of the intervention was perceived as a valuable counterbalance to programs or campaigns that tend to stigmatise people with overweight and obesity (Kite et al., 2022). In Poland, almost a half of people with obesity experience feelings of discrimination or social exclusion (Hoffmann et al., 2022), which is similar to prevalence of obesity stigma in the US (Brown et al., 2022). Experiences of weight stigma, are often counterproductive for successful weight management (Major et al., 2012, 2014; Schvey et al., 2011). The perceived non-judgemental tone of the intervention supported participants in facing challenges associated with weight stigma. Positive emotional experience, and emphasis on user autonomy and competence, are important to facilitate engagement in health behaviour change interventions (Yardley et al., 2016), and can also result in sustainable changes in physical health (Kok et al., 2013). The supportive approach is often mentioned as more effective intervention style than the instructive style (Karfopoulou et al., 2016). Participants of the *Choosing Health* intervention set their own goals, based on personal resources and preferences. This approach was well received, being one of the main facilitators of the acceptability of the intervention.

The trial took place throughout the COVID-19 pandemic, which was challenging in terms of adjusting the procedures and following relevant safety measures. As recommended restrictions were changing during the pandemic (Bolesławska et al., 2021), we had to adjust the communication and focus on unexpected priorities, such as: limited physical activity during lockdown, increased sedentary behaviours, new nutrition patterns, or need for psychological support in coping with challenges of the pandemic.

Strengths and limitations

Using a systematic approach, based on process evaluation guidelines (Moore et al., 2015), enabled us to explore interconnected dimensions of the intervention context, implementation, and

mechanism of impact. We used mixed methods to evaluate the intervention, including participants and implementers in the process evaluation. The results are based on measurements collected at 6-month follow-ups (conclusion of the weight loss phase) and at 12-month follow-ups (conclusion of the weight maintenance phase). We documented participants' attendance and engagement in various aspects of support delivered during the intervention.

Limitations included being unable to track delivery of and engagement with SMS content, which would be beneficial to explore how people interact with the messages. All intervention implementers followed the procedure to handle potential attrition, which improved our understanding of the reasons for attrition. However, since we were unable to reach participants who dropped out from the intervention, insights into the reasons for attrition are limited.

Future directions

In the future, complex, highly personalised interventions can be supported by machine learning. However, it may be a future challenge to replace elements of direct contact with the intervention implementer, regular feedback on progress through body composition analysis, and through explanation of the personal factors used for tailoring. Adjusting the intervention to personal preferences, changing environment, or individual preferences of participants would complement tailoring based on evidence-based domains. Apart from tailoring, the intervention content in weight loss and weight loss maintenance interventions should be rigorously designed to avoid stigmatisation of participants and focus on their personal resources for maintaining behaviour change. Health behaviour change monitoring during health interventions would benefit from combining self-reported progress monitoring with objective measures collected passively.

Conclusions

This process evaluation aimed to determine the acceptability and feasibility of an online-delivered, theory-based, tailored intervention for weight loss and weight management *(Choosing Health)*. The use of EMA as a technique to gather personal data for further tailoring was acceptable, and facilitated behaviour change monitoring. It was particularly important to present and discuss the

results of the EMA data analysis with participants, who often mentioned this element of the trial as a key support in their weight loss process. Engagement in the intervention was promoted by the intervention implementers being a source of support for participants, and the regular body composition analysis, treated by many participants as a reliable source of information about individual progress. Participants appreciated non-judgemental tone of the intervention, focused on problem-solving. Regular, tailored messages were treated as a cue or reminder to maintain motivation, and often induced changes in personal perceptions of weight management process. However, domain-based tailoring was usually insufficient for participants, as they would expect highly personalised intervention content. Our findings can support the development and evaluation of other health interventions, as we refer broadly to the processes of health behaviour change and health behaviour maintenance evaluated by the trial participants and implementers.

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