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W OLSZTYNIE

WYDZIAŁ NAUK SPOŁECZNYCH
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EMILIA MARIA KORSAK

Metoda pracy z ciałem jako program profilaktyki zaburzeń odżywiania dla dziewcząt i młodych kobiet

A Body-Oriented Method to Preventing Eating Disorders Among Girls and Young Women

Katedra Psychologii Klinicznej, Rozwoju i Edukacji

Promotor: dr hab. Beata Krzywosz-Rynkiewicz, prof. UWM

Katedra Psychologii Klinicznej, Rozwoju i Edukacji, Wydział Nauk Społecznych,
Uniwersytet Warmińsko- Mazurski w Olsztynie

Promotor pomocniczy: dr Ewa Ratajczak

Katedra Psychologii Klinicznej i Neuropsychologii, Instytut Psychologii,
Wydział Filozofii i Nauk Społecznych, Uniwersytet Mikołaja Kopernika w Toruniu

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Dziewczynom: G i Z,

bez których ta praca powstałaby dwa razy szybciej,

ale za to wszystko straciłoby połowę sensu.

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Wykaz skrótów stosowanych w autoreferacie

AN – Anorexia Nervosa (Anoreksja, Jadłowstręt Psychiczny)

BN – Bulimia Nervosa (Bulimia, Żarłoczność Psychiczna)

DALY – Disability-Adjusted Life Years (Lata życia skorygowane o niepełnosprawność)

ED – Eating Disorders (Zaburzenia Odżywania)

HR – Heart rate (Tętno)

HRV – Heart rate variability (Zmienność rytmu serca)

SGA – Syndrom Gotowości Anorektycznej

YLD – Years Lived with Disability (Liczby lat przeżytych z niepełnosprawnością)

Streszczenie i słowa kluczowe

Współczesne wyzwania zdrowotne, wynikające z rosnącej liczby przypadków chorób cywilizacyjnych, w tym zaburzeń odżywiania, stanowią istotny problem społeczny. Jednak wzrost świadomości w zakresie zdrowia nie idzie w parze z adekwatnym dostępem do odpowiednich form leczenia i wsparcia. Pedagogika zdrowia, jako subdyscyplina pedagogiki, koncentrując się na diagnozowaniu potrzeb zdrowotnych, podejmowaniu działań profilaktycznych oraz opracowywaniu programów edukacyjnych, które mają na celu minimalizowanie ryzyka wystąpienia chorób, w tym zaburzeń odżywiania, może odgrywać fundamentalną rolę w kształtowaniu świadomych i prozdrowotnych postaw społecznych.

Celem niniejszej rozprawy doktorskiej było opracowanie i empiryczna weryfikacja skuteczności programu psychoedukacyjnego zapobiegającego anoreksji, który może być wdrażany w środowisku szkolnym oraz placówkach opiekuńczo-wychowawczych. Program ten, bazując na metodach pracy z ciałem, został zaprojektowany zgodnie z modelem planowania programów edukacji zdrowotnej PRECEDE-PROCEED. Szczególny nacisk położono na analizę skuteczności zarówno na poziomie subiektywnym (m.in. redukcja niezadowolenia z własnego ciała, poprawa samooceny i umiejętności radzenia sobie ze stresem), jak i obiektywnym (zmiany w parametrach psychofizjologicznych, takich jak tętno i zmienność rytmu serca).

W ramach badań przeprowadzono systematyczny przegląd literatury dotyczący skuteczności metod pracy z ciałem w redukcji czynników ryzyka oraz wzmacnianiu czynników ochronnych w kontekście zaburzeń odżywiania. Ponadto dokonano analizy istniejących programów profilaktycznych anoreksji, identyfikując ich kluczowe komponenty i teoretyczne podstawy. Empiryczna część badań obejmowała ocenę subiektywnych i psychofizjologicznych efektów kluczowych komponentów metody wśród młodych kobiet znajdujących się w grupie ryzyka rozwoju anoreksji. Uzyskane wyniki umożliwiły weryfikację skuteczności interwencji oraz dopracowanie finalnej wersji programu.

Opracowany program psychoedukacyjny stanowi wkład w rozwój edukacji zdrowotnej i profilaktyki anoreksji. Jego interdyscyplinarny charakter, łączący pedagogikę, psychologię i nauki o zdrowiu, podkreśla znaczenie kompleksowego podejścia do edukacji zdrowotnej. Wskazane jest dalsze rozwijanie podobnych inicjatyw, aby skutecznie wspierać zdrowie i rozwój psychospołeczny młodych ludzi, dostosowując działania edukacyjne do ich potrzeb oraz realiów społecznych i kulturowych.

Słowa kluczowe: pedagogika zdrowia, edukacja zdrowotna, profilaktyka, program edukacyjny, zaburzenia odżywiania, anoreksja

Streszczenie i słowa kluczowe w języku angielskim

Contemporary health challenges arising from the increasing prevalence of lifestyle-related diseases, including eating disorders, represent a significant societal issue. However, the rising awareness of health is not matched by sufficient access to appropriate treatment and support services. Health pedagogy, as a subdiscipline within the educational sciences, emphasizes the diagnosis of health needs, the implementation of preventive measures, and the development of educational programs aimed at mitigating disease risk, including that of eating disorders. Within this framework, health pedagogy may play a critical role in fostering informed, health-promoting social attitudes.

The objective of this doctoral dissertation was to design and empirically assess the effectiveness of a psychoeducational program for the prevention of anorexia, suitable for implementation in school environments and other educational and caregiving institutions. This program, grounded in body-oriented methodologies, was developed in alignment with the PRECEDE–PROCEED model of health education program planning. A particular focus was placed on evaluating effectiveness at both subjective (e.g., reduction of body dissatisfaction, enhancement of self-esteem, and improvement of stress-coping skills) and objective levels (e.g., alterations in psychophysiological parameters such as heart rate and heart rate variability).

The research process included a systematic literature review regarding the efficacy of body-oriented methods in mitigating risk factors and enhancing protective factors in the context of eating disorders. Additionally, an analysis of existing anorexia prevention programs was undertaken to identify their essential components and theoretical underpinnings. The empirical phase of the research involved assessing the subjective and psychophysiological impacts of the method's key components among young women at risk for developing anorexia. The findings facilitated the verification of the intervention's effectiveness and the refinement of the program's final iteration.

The developed psychoeducational program advances health education and anorexia prevention. Its interdisciplinary nature, which integrates pedagogy, psychology, and health sciences, underscores the importance of a holistic approach to health education. The continued development of similar initiatives is recommended to effectively support the health and psychosocial development of young individuals by tailoring educational interventions to their specific needs and the prevailing social and cultural contexts.

Keywords: health pedagogy, health education, prevention, educational program, eating disorders, anorexia

Omówienie celu naukowego wyżej wymienionych prac i osiągniętych wyników wraz z omówieniem ich ewentualnego wykorzystania

Aktualny stan wiedzy

Współcześnie nasilające się zagrożenia zdrowotne, wynikające z dynamicznego wzrostu śmiertelności związanej z chorobami cywilizacyjnymi, stanowią istotny problem społeczny. Zaburzenia fizyczne i psychiczne często skutkują nieprawidłowościami w myśleniu, postrzeganiu, emocjach, zachowaniach i interakcjach społecznych, co negatywnie wpływa na produktywność i długość życia jednostki (World Health Organization, 2022). Ostatnie wyzwania, takie jak pandemia COVID-19, kryzys klimatyczny oraz napięcia geopolityczne, przyczyniły się do wzrostu występowania lęku, depresji, zaburzeń odżywiania i samobójstw, co skutkowało bezprecedensowym zapotrzebowaniem na usługi w zakresie zdrowia psychicznego na całym świecie (Cianconi i in., 2020; Devoe i in., 2023; Persaud i in., 2018; Torales i in., 2020). Pomimo rosnącej świadomości na temat znaczenia zdrowia psychicznego, dostęp do odpowiednich usług i leczenia pozostaje ograniczony. Szacuje się, że w krajach o niskim i średnim dochodzie około 80% osób z poważnymi zaburzeniami psychicznymi nie otrzymuje odpowiedniego leczenia, a w krajach o wysokim dochodzie odsetek ten wynosi około 50% (Evans-Lacko i in., 2018; Rathod i in., 2017). Eskalacja ta wymaga intensywnych poszukiwań skutecznych metod przeciwdziałania fali zachorowań oraz działań mających na celu utrzymanie zdrowia populacji. W związku w tym niezbędne jest przekazywanie wiedzy dotyczącej źródeł istniejących zagrożeń, a także wiedzy i sposobów promowania zdrowia.

Jednym z najpoważniejszych cywilizacyjnych zagrożeń zdrowotnych XXI wieku są zaburzenia odżywania (eating disorders, ED). Do najczęściej występujących należy anoreksja (anorexia nervosa, AN), charakteryzująca się upośledzeniem funkcjonowania psychospołecznego, przewlekłym przebiegiem oraz skłonnością do nawrotów, a także może prowadzić do innych zaburzeń psychicznych, co dodatkowo komplikuje obraz kliniczny i proces leczenia (Dakanalis i in., 2019). Szacuje się, że rocznie ponad 3,3 miliona lat zdrowego życia jest traconych z powodu tych zaburzeń. W przeciwieństwie do innych chorób psychicznych, w przypadku AN i bulimii (bulimia nervosa, BN) obserwuje się wzrost liczby lat przeżytych z niepełnosprawnością (years lived with disability, YLD). Pomimo postępów w

leczeniu, wskaźniki umieralności pozostają bardzo wysokie – osoby, które przeszły leczenie szpitalne z powodu AN, nadal mają ponad pięciokrotnie zwiększone ryzyko zgonu w porównaniu z populacją ogólną (van Hoeken & Hoek, 2020). Warto również podkreślić, że pacjenci z rozpoznaniem AN mają osiemnastokrotnie wyższe ryzyko samobójstwa (Smith i in., 2018). Dodatkowo, osoby cierpiące na zaburzenia odżywiania doświadczają istotnego obniżenia jakości życia, a roczne koszty związane z opieką zdrowotną w ich przypadku są aż o 48% wyższe niż w populacji ogólnej (van Hoeken & Hoek, 2020).

Wpływ problemów związanych ze zdrowiem psychicznym na ogólny stan zdrowia, mierzony wskaźnikiem DALY (Disability-Adjusted Life Years), oznaczającym lata życia utracone w wyniku przedwczesnej śmierci oraz lata życia z niepełnosprawnością, skorygowanych o stopień tej niepełnosprawności, jest najbardziej znaczący w grupie wiekowej od 14 do 24 lat. Z perspektywy zdrowia populacji inwestycje skierowane bezpośrednio do tej grupy wiekowej byłyby szczególnie skuteczne (Global Psychology Alliance, 2024). Systematyczny przegląd literatury dotyczący rozpowszechnienia zaburzeń odżywiania wykazał, że średnie występowanie ich w ciągu całego życia wynosi 8,4% wśród kobiet oraz 2,2% wśród mężczyzn (Galmiche i in., 2019). W Polsce, po przemianach demokratycznych w 1989 roku, AN i BN stały się jednymi z najczęściej diagnozowanych zaburzeń psychicznych wśród nastolatek (Pilecki i in., 2009).

Rozważania te podkreślają pilną potrzebę refleksji nad strategiami interwencji zapobiegawczych. W celu osiągnięcia znaczącej poprawy stanu zdrowia współczesnych społeczeństw, konieczne są wielokierunkowe działania, które wykraczają poza rozwój nowych metod leczenia. Priorytetem powinno być opracowanie kompleksowych strategii prewencyjnych oraz ustanowienie programów wczesnej interwencji. Takie inicjatywy mogą potencjalnie zmniejszyć obciążenie związane z AN i pokrewnymi zaburzeniami, skupiając się zarówno na identyfikacji i zwalczaniu ich podstawowych przyczyn, jak i na łagodzeniu ich głębokiego wpływu na jednostki oraz społeczeństwo jako całość.

Podstawy naukowe praktyki pedagogicznej skoncentrowanej na ochronie i poprawie zdrowia wywodzą się z klasycznej pedagogiki społecznej, w ramach której można dostrzec początki kształtowania się pedagogiki zdrowia (Gaweł, 2021). W ujęciu współczesnym, pedagogika zdrowia jest uznawana za odrębną subdyscyplinę w ramach pedagogiki, a jej obszar badawczy obejmuje szeroki zakres zagadnień, takich jak: diagnozowanie potrzeb zdrowotnych jednostek i grup społecznych, podejmowanie działań środowiskowych na rzecz zdrowia oraz badanie i ewaluację edukacji zdrowotnej. Celem tych działań jest doskonalenie zdrowia fizycznego, psychicznego i społecznego oraz rozwijanie umiejętności życiowych, które

sprzyjają zdrowemu stylowi życia i poprawie jakości życia człowieka na każdym jego etapie. Działania te polegają na projektowaniu i wdrażaniu pedagogicznych interwencji kompensacyjnych, zarówno w odniesieniu do jednostki, jak i środowiska (Syrek, 2008; Woynarowska, 2023).

Edukacja zdrowotna jest koncepcją praktycznego działania (funkcja prakseologiczna pedagogiki społecznej) w środowisku życia człowieka (Syrek, 2019). Należy jednak zwrócić uwagę, iż nie można edukacji zdrowotnej sprowadzać tylko do przekazywania wiedzy o zdrowiu i jego zagrożeniach. Polega ona przede wszystkim na tworzeniu warunków sprzyjających wprowadzaniu zmian związanych z podejmowaniem wysiłków na rzecz wzmacniania kompetencji jednostek i społeczności w zakresie samodzielnego działania na rzecz zdrowia na różnych poziomach organizacji społecznej. Jest to zgodne z modelem edukacji zorientowanym na zdrowie (ang. *health-oriented health education*), w którym główny kierunek działań koncentruje się na opracowywaniu i wdrażaniu kompleksowych programów edukacji zdrowotnej skoncentrowanych na zagadnieniach dotyczących zwiększania potencjału zdrowia rozumianego u ujęciu holistycznym (Woynarowska, 2023).

W większości krajów systemy opieki zdrowotnej, zarówno w zakresie zdrowia fizycznego, jak i psychicznego, są oparte na tradycyjnym modelu medycznym, który kładzie nacisk na opiekę w nagłych przypadkach. Tego rodzaju podejście w istotny sposób zaburza równowagę pomiędzy zapotrzebowaniem na usługi zdrowotne a ich dostępnością (Carbonell i in., 2020). W związku z tym coraz częściej pojawiają się inicjatywy zmierzające do zmiany paradygmatu w zakresie wsparcia zdrowia. Model zdrowia populacji oferuje alternatywne rozwiązanie, które pozwala na lepsze zrównoważenie procesu leczenia oraz odpowiadanie na potrzeby zdrowotne szerokich grup społecznych. Podejście to skupia się nie tylko na zarządzaniu istniejącymi problemami zdrowotnymi, ale również na analizie determinantów zdrowia, takich jak styl życia i czynniki społeczne, profilaktyce, monitorowaniu czynników ryzyka oraz realizacji działań prewencyjnych zmierzających do ograniczenia występowania problemów zdrowotnych (Samet & Hussein, 2024). Takie podejście pozwala na bardziej kompleksowe i zrównoważone zarządzanie zdrowiem populacji, uwzględniając zarówno aspekty medyczne, jak i społeczne, co może prowadzić do poprawy ogólnego stanu zdrowia społeczeństwa.

W koncepcję zdrowia populacyjnego wpisuje się edukacja zdrowotna, w tym przygotowanie programów profilaktycznych, które mogę powstrzymać ryzyko wystąpienia choroby, a tym samym zminimalizować koszty społeczne i ekonomiczne, które obciążają jednostki oraz państwowe budżety. Poprzez ustrukturyzowane programy, edukacja zdrowotna

ma na celu zwiększenie świadomości społecznej w zakresie związku między zachowaniami a wynikami zdrowotnymi. Wyposażając jednostki w wiedzę i umiejętności potrzebne do dokonywania świadomych wyborów, inicjatywy te mają na celu zmniejszenie częstości występowania chorób, którym można zapobiec. Ponadto edukacja zdrowotna sprzyja zaangażowaniu społeczności, tworząc efekt falowania (ang. *ripple effect*), w którym zdrowsze zachowania są rozprzestrzeniane, normalizowane i przyjmowane na poziomie społecznym.

Dla prowadzenia skutecznej edukacji kluczowe jest zidentyfikowanie momentu, w którym problem może zostać objęty oddziaływaniami edukacyjnym, zanim rozwinie się na tyle, by wymagać leczenia. Konieczna jest również identyfikacja zagrożeń wystąpienia choroby oraz czynników ryzyka. W przypadku zaburzeń odżywiania o charakterze anorektycznym, obiecującym konstruktem jest opracowany przez Ziółkowską Syndrom Gotowości Anorektycznej (SGA), który opisuje zespół objawów nasuwających podejrzenie nieprawidłowości w zakresie realizowania potrzeby pokarmowej oraz stosunku do własnego ciała (Ziółkowska, 2001). SGA uwzględnia także czynniki ryzyka, które mogą stać się podstawą do interwencji edukacyjnych. Skłonność do wystąpienia zaburzenia wyraża się poprzez konkretne wskaźniki dotyczące sfery psychologicznej (psyche), fizjologicznej (soma) i społecznej (polis) człowieka.

Syndrom gotowości anorektycznej nie jest tożsamy ze specyficznymi zaburzeniami odżywiania takimi jak anoreksja i bulimia. Nie klasyfikuje się go też jako niespecyficzne zaburzenia jedzenia lub odżywiania. Warto podkreślić, że SGA nie musi determinować wystąpienia anoreksji, ale może stanowić jeden z czynników ryzyka (Ziółkowska, 2001).

Podstawy teoretyczne

Analizy przedstawione w niniejszej pracy zostały osadzone w interdyscyplinarnej perspektywie badawczej, przy czym pedagogika stanowi dyscyplinę wiodącą, porządkującą i integrującą dorobek psychologii oraz nauk o zdrowiu. Takie usytuowanie pracy wynika z założenia, że zaburzenia odżywiania o charakterze anorektycznym – mimo swojej klasyfikacji klinicznej – rozwijają się w przestrzeni codziennych doświadczeń jednostki, podlegającej oddziaływaniom wychowawczym, edukacyjnym i społeczno-kulturowym, a tym samym pozostają w bezpośrednim obszarze zainteresowania pedagogiki.

Centralne miejsce w strukturze teoretycznej pracy zajmuje paradygmat interpretatywno-konstruktywistycznym, który zakłada, że proces uczenia się i zmiany zachowań zdrowotnych dokonuje się poprzez aktywne konstruowanie znaczeń przez jednostkę w interakcji z

otoczeniem społecznym i kulturowym. W tym ujęciu kluczowe znaczenie przypisuje się stymulowaniu aktywności uczących się oraz tworzeniu warunków sprzyjających samodzielnej, refleksyjnej pracy, co stanowi podstawowy warunek skuteczności oddziaływań edukacyjnych i profilaktycznych. Przyjęcie tej perspektywy stanowiło punkt odniesienia dla doboru pedagogicznych modeli teoretycznych wykorzystanych w pracy.

Teoretyczne ramy pracy zostały oparte na pedagogicznych modelach edukacji zdrowotnej, profilaktyki oraz uczenia się, które umożliwiają projektowanie działań ukierunkowanych na wczesne rozpoznawanie ryzyka oraz wzmacnianie zasobów jednostek. Szczególne znaczenie przypisano pedagogice zdrowia, rozumianej jako subdyscyplina pedagogiki koncentrująca się na kształtowaniu kompetencji sprzyjających zdrowiu, wspieraniu refleksyjności oraz rozwijaniu sprawczości w zakresie troski o własne funkcjonowanie psychosomatyczne. W tym ujęciu edukacja zdrowotna ma charakter procesu wychowawczego, a nie wyłącznie informacyjnego, i obejmuje tworzenie warunków sprzyjających trwałej zmianie postaw oraz zachowań.

W warstwie dydaktyczno-wychowawczej praca odwołuje się do humanistycznego paradygmatu edukacji, akcentującego holistyczne rozumienie człowieka jako jedności sfery poznawczej, emocjonalnej i cielesnej (Hannaford, 1998), a także do koncepcji uczenia się przez doświadczenie Davida A. Kolba, w której proces uczenia się ma charakter cykliczny i obejmuje bezpośrednie doświadczenie, refleksję, konceptualizację oraz aktywne eksperymentowanie (Kolb & Kolb, 2017). Modele te stanowią podstawę doboru metod pracy psychoedukacyjnej, w tym metod zorientowanych na ciało, uważność i doświadczenie somatyczne. Istotnym odniesieniem teoretycznym jest również teoria uczenia się transformacyjnego Jacka Mezirowa, podkreślająca rolę krytycznej refleksji nad własnymi przekonaniami, normami i doświadczeniami (Pleskot-Makulska, 2007). W kontekście profilaktyki anoreksji umożliwia ona analizę i dekonstrukcję internalizowanych wzorców kulturowych dotyczących obrazu ciała oraz kobiecości, sprzyjając kształtowaniu bardziej adaptacyjnych postaw wobec własnego ciała i tożsamości.

Ważnym kontekstem dla przyjętych rozwiązań pedagogicznych jest model zdrowia populacyjnego, który uzasadnia lokowanie oddziaływań profilaktycznych w środowiskach edukacyjnych oraz podkreśla znaczenie programów ukierunkowanych na całe populacje młodzieży. Model ten pełni jednak w pracy funkcję wspierającą wobec zasadniczych ram pedagogicznych, stanowiąc uzasadnienie dla szerokiego zasięgu i systemowego charakteru podejmowanych działań edukacyjnych.

Istotnym elementem struktury teoretycznej pracy jest Syndrom Gotowości Anorektycznej autorstwa Ziółkowskiej (Ziółkowska, 2001), który został wykorzystany jako koncepcja opisująca wczesne psychospołeczne i behawioralne uwarunkowania ryzyka anoreksji, a zarazem jako rama konceptualna umożliwiająca pedagogiczne rozpoznanie obszarów wymagających oddziaływań profilaktycznych. Ujęcie to, obejmujące sferę psychiczną (psyche), fizjologiczną (soma) oraz społeczną (polis), pozostaje spójne z holistycznym i humanistycznym rozumieniem wychowania oraz z pedagogicznymi teoriami uczenia się, w których kluczowe znaczenie przypisuje się doświadczeniu, refleksji i aktywnemu zaangażowaniu jednostki.

Przyjęte ramy teoretyczne znajdują konsekwentne odzwierciedlenie w całym cyklu publikacji składających się na rozprawę doktorską: od analiz istniejących programów profilaktyki zaburzeń odżywiania, poprzez badania empiryczne dotyczące czynników ryzyka, aż po opracowanie i empiryczną weryfikację autorskiego programu psychoedukacyjnego *Nalu. Mindful Movement*, stanowiącego praktyczną realizację założeń pedagogiki zdrowia w obszarze wczesnej profilaktyki anoreksji wśród młodzieży.

Tabela 1. Podstawy teoretyczne

Model / Koncepcja	**Funkcja w pracy**
Pedagogika zdrowia	Nadrzędna rama teoretyczna dla projektowania edukacji zdrowotnej i wczesnej profilaktyki
Paradygmat interpretatywno-konstruktywistyczny	Podstawa doboru modeli pedagogicznych
Model zdrowia populacyjnego	Kontekst systemowy i uzasadnienie działań profilaktycznych o szerokim zasięgu
Syndrom Gotowości Anorektycznej (SGA)	Rama konceptualna identyfikacji wczesnych uwarunkowań ryzyka i planowania oddziaływań pedagogicznych

Przedmiot i cel rozprawy doktorskiej

Przedmiotem rozprawy doktorskiej jest profilaktyka anoreksji wśród dziewcząt i młodych kobiet, rozumiana jako obszar oddziaływań psychoedukacyjnych realizowanych w środowisku wychowawczym, z wykorzystaniem metod pracy z ciałem.

Celem rozprawy doktorskiej było opracowanie oraz empiryczna weryfikacja skuteczności autorskiego programu psychoedukacyjnego *Nalu. Mindful Movement*, ukierunkowanego na zapobieganie anoreksji, który może być wdrażany przez nauczycieli i wychowawców w szkołach oraz innych placówkach opiekuńczo-wychowawczych. Program

został zaprojektowany z myślą o dziewczętach i młodych kobietach znajdujących się w grupie ryzyka rozwoju zaburzeń odżywiania.

Osiągnięcie tak sformułowanego celu wymagało wcześniejszego rozpoznania teoretycznych i empirycznych podstaw skutecznych oddziaływań profilaktycznych. W związku z tym pierwsze etapy pracy obejmowały systematyczne analizy metod pracy z ciałem oraz istniejących programów profilaktycznych, stosowanych w zapobieganiu anoreksji, których wyniki stanowiły podstawę do zaprojektowania autorskiego programu psychoedukacyjnego.

W celu zapewnienia wysokiej jakości metodologicznej, program *Nalu. Mindful Movement* został opracowany zgodnie z wytycznymi modelu planowania programów edukacji zdrowotnej PRECEDE–PROCEED (Green & Kreuter, 2005), który umożliwia ustrukturyzowane podejście do diagnozy potrzeb, planowania interwencji oraz oceny skuteczności działań edukacyjnych i profilaktycznych.

Tak określony cel rozprawy implikował główny problem badawczy, sformułowany następująco: *W jakim stopniu autorski program psychoedukacyjny Nalu. Mindful Movement, oparty na metodach pracy z ciałem, jest skuteczny jako narzędzie profilaktyki anoreksji wśród dziewcząt i młodych kobiet?*

Skuteczność programu analizowano na dwóch poziomach: subiektywnym i obiektywnym. Poziom subiektywny skuteczności odnosił się do redukcji niezadowolenia z własnego ciała, deficytów świadomości interoceptywnej, niskiej samooceny oraz lęku (rozumianego zarówno jako stan, jak i cecha). Obejmował również wzrost kompetencji w zakresie radzenia sobie w sytuacjach stresowych oraz poprawę aspektów nastroju związanych z doświadczaniem ciała, takich jak napięcie, pobudzenie energetyczne i ton hedonistyczny. Z kolei poziom obiektywny skuteczności rozumiany był jako zmiany parametrów psychofizjologicznych, takich jak tętno (HR) i zmienność rytmu serca (HRV).

Na podstawie głównego problemu badawczego sformułowano pytania badawcze szczegółowe:

1. *Jakie metody pracy z ciałem są wykorzystywane w profilaktyce zaburzeń odżywiania?;*
2. *Które z tych metod wykazują empirycznie potwierdzoną skuteczność na poziomie subiektywnym i obiektywnym?*
3. *Z jakich paradygmatów korzystają skuteczne programy edukacyjne, służące zapobieganiu zaburzeń odżywiania oraz jaka jest struktura tych programów*
4. *Jakie zmiany na poziomie subiektywnym i obiektywnym zachodzą u uczestniczek programu Nalu. Mindful Movement w wyniku jego realizacji?*

Omówienie przedmiotu rozprawy doktorskiej

Rozprawa doktorska została zaprojektowana jako spójny, wieloetapowy projekt badawczo-aplikacyjny, którego celem było opracowanie i empiryczna weryfikacja programu psychoedukacyjnego zapobiegającego anoreksji w środowisku edukacyjnym. Kolejne publikacje tworzą logiczną sekwencję działań: od analizy istniejących metod i programów profilaktycznych, poprzez empiryczną ocenę wybranych komponentów interwencyjnych, aż po opracowanie i walidację autorskiego programu *Nalu. Mindful Movement*. Każda z publikacji pełni odrębną, jasno określoną funkcję metodologiczną i merytoryczną, przyczyniając się do realizacji głównego celu rozprawy.

Tabela 2. Struktura cyklu publikacji i logika projektu badawczego

Etap	**Publikacja**	**Cel etapu**	**Znaczenie dla rozprawy**
Krok 1	Publikacja 1 (2022) – przegląd metod pracy z ciałem	Identyfikacja empirycznie weryfikowanych metod pracy z ciałem w profilaktyce i terapii AN	Wyłonienie skutecznych komponentów interwencji
Krok 2	Publikacja 2 (2023) – przegląd programów prewencji AN	Analiza struktury i paradygmatów programów profilaktycznych opartych na dowodach	Określenie luk i zasad projektowania programu autorskiego
Krok 3	Publikacja 3 (2025) – badanie empiryczne	Empiryczna weryfikacja fragmentów autorskiej metody *Nalu. Mindful Movement*	Ocena mechanizmów skuteczności
Krok 4	Publikacja 4 (2026) – program Nalu	Opracowanie i walidacja programu psychoedukacyjnego	Realizacja głównego celu rozprawy doktorskiej

1. **Publikacja 1**: Korsak, E. (2022). Body-oriented therapy in the prevention of eating disorders. A systematic review. *Przegląd Psychologiczny*, *65*(1), 177–195. https://doi.org/10.31648/przegldpsychologiczny.8545

Udział autorów w powstaniu publikacji:
Korsak, E. – 100%
(opracowanie koncepcji i metodologii badania, realizacja badania, analiza i interpretacja wyników, przygotowanie manuskryptu oraz jego redakcja i korekta)

Pierwsza publikacja z cyklu stanowi kompleksowy przegląd badań naukowych dotyczących skuteczności psychoterapii zorientowanej na ciało (ang. *body-oriented psychotherapy*, BOP) w profilaktyce i terapii AN. Wychodzi naprzeciw lukom w literaturze

dotyczącej systematycznych analiz naukowych w obszarze skuteczności tych metod w kontekście zaburzeń obrazu ciała, które są kluczowym elementem w rozwoju i leczeniu anoreksji. Zaburzenia obrazu ciała, będące wielowymiarowym konstruktem, na który składają się komponenty poznawcze, afektywne i behawioralne, znacząco korelują z negatywnym stanem psychicznym i utrudniają proces zdrowienia, będąc również predyktorem nawrotów. Praca podejmuje próbę systematycznej analizy empirycznych dowodów dotyczących stosowania metod pracy z ciałem, z uwzględnieniem ich wpływu na redukcję czynników ryzyka oraz promowanie czynników ochronnych, takich jak pozytywny obraz ciała.

Celem pracy było dokonanie systematycznego przeglądu badań nad skutecznością różnych metod psychoterapii zorientowanej na ciało w zakresie: (1) Analizy metod terapeutycznych stosowanych w leczeniu i profilaktyce AN; (2) Oceny skuteczności tych metod w redukcji czynników ryzyka i wzmacnianiu czynników ochronnych, takich jak pozytywny obraz ciała.

Przegląd przeprowadzono zgodnie z wytycznymi PRISMA, analizując wyniki randomizowanych badań kontrolnych (RCT). Przeszukano sześć baz danych (ProQuest, PsychINFO, PubMed, ScienceDirect, Scopus, Web of Science). Spośród 425 wyników wstępnie wyselekcjonowanych pozycji, 69 pełnotekstowych artykułów poddano krytycznej ocenie, z czego 15 spełniło wszystkie kryteria włączenia i zostało uwzględnionych w przeglądzie.

Przegląd badań wykazał, że interwencje zorientowane na ciało obejmowały osiem różnych technik terapeutycznych, takich jak protokoły mindfulness, joga (samodzielnie lub jako dodatek do standardowej opieki szpitalnej), terapia tańcem i ruchem (ang. *dance movement therapy,* DMT), metoda Feldenkraisa, terapia poznawczo-behawioralna obrazu ciała z zastosowaniem protokołu Body Perception Treatment, program „Basic Body Awareness Therapy", techniki relaksacyjne oraz ćwiczenia aerobowe.

Analiza skuteczności interwencji ujawniła, że aż 87% badanych programów (13 z 15) wykazało pozytywne efekty w zakresie poprawy przynajmniej jednego czynnika ochronnego lub redukcji przynajmniej jednego czynnika ryzyka anoreksji. Najczęściej obserwowanymi efektami były: (1) redukcja zaburzeń obrazu ciała: metody pracy z ciałem przyczyniły się do zmniejszenia poziomu niezadowolenia z ciała oraz zaabsorbowania wyglądem, a także do poprawy akceptacji własnego ciała i wzrostu jego pozytywnego postrzegania; (2) poprawa stanu psychicznego: uczestnicy badanych programów doświadczyli obniżenia poziomu lęku, stresu i negatywnego afektu. Jednocześnie zaobserwowano wzrost poczucia własnej wartości oraz poczucia skuteczności; (3) redukcja zachowań związanych z zaburzeniami odżywiania:

badania wykazały, że interwencje zorientowane na ciało mogą prowadzić do zmniejszenia nasilenia objawów anoreksji, takich jak obsesyjna kontrola masy ciała czy unikanie ciała.

Programy oparte na metodach pracy z ciałem okazały się skuteczne zarówno jako samodzielne interwencje, jak i w połączeniu z innymi formami terapii (np. poznawczo-behawioralnej czy farmakologicznej). Interwencje te nie tylko redukowały czynniki ryzyka, takie jak negatywne myśli o ciele czy niski poziom akceptacji ciała, ale także promowały czynniki ochronne, takie jak docenianie ciała i rozwijanie zdrowego obrazu siebie.

Praca ta stanowi fundamentalny element cyklu publikacji doktoratu, dostarczając zarówno teoretycznego, jak i praktycznego kontekstu dla dalszych badań. Po pierwsze, przegląd systematyczny dostarcza dowodów na skuteczność metod pracy z ciałem w redukcji zaburzeń obrazu ciała i ich potencjalnej roli w procesie zdrowienia osób z anoreksją. Wyniki te podkreślają znaczenie uwzględniania podejścia zorientowanego na ciało w praktyce terapeutycznej i profilaktyce oraz wskazują na konieczność dalszego rozwijania i standaryzacji tych metod.

Po drugie, publikacja ta wyznacza kierunek dla kolejnych etapów badań, które mogą obejmować bardziej szczegółową analizę mechanizmów działania poszczególnych technik oraz ich porównanie pod względem efektywności. Wyniki przeglądu wskazują na potencjał integracji metod pracy z ciałem z innymi formami terapii i profilaktyki, co może stanowić inspirację do tworzenia programów psychoedukacyjnych.

Po trzecie, praca wnosi istotny wkład w rozwój profilaktyki zaburzeń odżywiania – zwracając uwagę na znaczenie zmiany podejścia w programach profilaktycznych z redukcji czynników ryzyka na wzmacnianie czynników ochronnych, takich jak pozytywny obraz ciała. Takie podejście może stać się przełomowym elementem w strategiach profilaktyki zdrowotnej i edukacji prozdrowotnej.

2. **Publikacja 2:** Korsak, E. (2023). Characteristics of Anorexia Prevention Programmes. A Systematic Review. *Kultura I Edukacja, 140(2),* 23–48. https://doi.org/10.15804/kie.2023.02.02

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(opracowanie koncepcji i metodologii badania, realizacja badania, analiza i interpretacja wyników, przygotowanie manuskryptu oraz jego redakcja i korekta)

Celem drugiej publikacji, wchodzącej w skład cyklu, było zidentyfikowanie programów edukacyjnych prewencji AN, które są przedmiotem badań opartych na dowodach naukowych oraz znalezienie luk w literaturze dotyczącej tych interwencji. Dzięki szczegółowej analizie możliwe było określenie elementów, które wymagają szczególnej uwagi w trakcie konstruowania efektywnego programu profilaktyki AN. Publikacja ta wypełnia zatem kluczową lukę, dostarczając podstaw do dalszych działań badawczych i praktycznych.

Dotychczas żaden przegląd systematyczny nie dotyczył programów prewencji anoreksji z uwzględnieniem profilaktyki uniwersalnej, selektywnej i wskazującej. Dodatkowo, w żadnym badaniu nie uwzględniono charakterystyki wyłonionych programów. Celem badania było dokonanie systematycznego przeglądu literatury w zakresie programów profilaktycznych stosowanych w anoreksji. Skupiono się na identyfikacji programów opartych na dowodach naukowych oraz analizie ich charakterystyki, uwzględniając różne poziomy profilaktyki: uniwersalną, selektywną i wskazującą. Postawiono dwa kluczowe pytania badawcze: (1) Jakie programy stosowane w profilaktyce anoreksji są przedmiotem badań opartych na dowodach naukowych? oraz (2) Jaka jest charakterystyka owych programów?

Badanie przeprowadzono zgodnie z wytycznymi PRISMA, obejmując przeszukanie pięciu elektronicznych baz danych: PsychINFO, PubMed, ScienceDirect, Scopus oraz Web of Science. Z początkowych 412 pozycji wyselekcjonowano 92 pełnotekstowe artykuły, z których 14 spełniło wszystkie kryteria włączenia. Wybrane badania poddano krytycznej analizie, koncentrując się na skuteczności programów oraz ich komponentach, takich jak treści, modalności, populacja docelowa oraz czas trwania interwencji.

Przeprowadzony przegląd pozwolił na zidentyfikowanie 14 programów profilaktycznych, które były przedmiotem badań opartych na dowodach naukowych. Większość interwencji skierowana była do młodzieży i młodych dorosłych, przy czym dominowały programy ukierunkowane na dziewczęta i młode kobiety, co odzwierciedla epidemiologię anoreksji jako zaburzenia występującego częściej w tej grupie. Spośród wyodrębnionych programów najczęściej stosowano podejścia profilaktyki uniwersalnej i selektywnej. Programy cechowało duże zróżnicowanie pod względem treści, formy, czasu trwania oraz populacji docelowej. Wszystkie uwzględnione badania zostały opublikowane w ciągu ostatnich 18 lat, co wskazuje na rosnące zainteresowanie tym obszarem badawczym w kontekście zdrowia publicznego. Wyróżniono cztery dominujące podejścia teoretyczne: dysonans poznawczy, nurt poznawczo-behawioralny, edukację medialną oraz nurt integracyjny. Największe nadzieje wiązano z podejściem integracyjnym, które łączy elementy psychoterapii humanistycznej, poznawczo-behawioralnej oraz metod zorientowanych na ciało.

Skuteczność analizowanych programów była zróżnicowana. Wiele z nich wykazało obiecujące wyniki w redukcji czynników ryzyka anoreksji, takich jak internalizacja ideału szczupłej sylwetki, niski poziom samooceny w obszarze obrazu ciała oraz negatywny afekt. Jednakże, brak długoterminowej obserwacji w wielu badaniach utrudniał ocenę trwałości efektów interwencji. Stwierdzono również, że choć większość programów skupiała się na poprawie obrazu ciała, wciąż istnieje potrzeba uwzględnienia innych czynników ryzyka, takich jak strategie radzenia sobie z trudnościami czy regulacja emocji.

Przegląd literatury wykazał, że istnieje ograniczona liczba programów profilaktycznych o udokumentowanej skuteczności, które jednocześnie spełniają kryteria długoterminowego oddziaływania. Kluczowym wyzwaniem pozostaje opracowanie i wdrażanie programów, które uwzględniają szerokie spektrum czynników ryzyka i ochronnych, takich jak promowanie pozytywnego doświadczania własnego ciała, rozwijanie świadomości interoceptywnej czy redukcja poziomu samouprzedmiotowienia. Metody oparte na pracy z ciałem, takie jak joga czy uważność, wydają się szczególnie obiecujące, ale wymagają dalszych badań nad ich skutecznością. Ponadto, konieczne jest rozwijanie metod rozpowszechniania programów, aby mogły być z powodzeniem stosowane w różnych populacjach, nie tylko tych najbardziej zagrożonych.

Druga publikacja odgrywa kluczową rolę w budowaniu podstaw teoretycznych całego cyklu. Przeprowadzona analiza istniejących programów prewencji anoreksji umożliwia nie tylko ocenę skuteczności dotychczas podejmowanych działań, lecz także identyfikację istotnych luk w literaturze oraz praktyce edukacyjnej. Ponadto, pozwala na wyodrębnienie obszarów wymagających szczególnej uwagi podczas opracowywania nowego programu edukacyjnego. Tym samym badanie to stanowi fundament dla dalszych działań badawczych, wspierając zrozumienie skutecznych metod profilaktyki anoreksji oraz projektowanie interwencji bardziej dopasowanych do specyficznych potrzeb grup docelowych.

Wyniki uzyskane w pierwszych dwóch etapach projektu badawczego stanowiły bezpośrednią podstawę do opracowania autorskiego programu psychoedukacyjnego *Nalu. Mindful Movement*, który następnie został poddany empirycznej weryfikacji w kolejnych etapach cyklu.

3. **Publikacja 3**: Korsak, E., & Ratajczak, E. (2025). Movement as Preventive Education for Females at Risk of Anorexia Nervosa: Effects of Physical-Cognitive Interventions on Psychophysiological Markers. *Journal of Kinesiology and Exercise Sciences*. https://doi.org/10.5604/01.3001.0055.4509

Udział autorów w powstaniu publikacji:
Korsak, E. – 75%
(opracowanie koncepcji i metodologii badania, zarządzanie projektem, realizacja części eksperymentalnej, przeprowadzenie analiz statystycznych, opracowanie i interpretacja wyników, przygotowanie pierwotnej wersji manuskryptu oraz jego redakcja i korekta)
Ratajczak, E. – 25%
(przeprowadzenie analiz statystycznych, opracowanie wizualizacji wyników, współudział w przygotowaniu manuskryptu oraz jego redakcji i korekcie)

Trzecia publikacja w cyklu stanowi opis badania pilotażowego, którego celem była empiryczna weryfikacja elementów metody pracy z ciałem Nalu. Mindful Movement jako innowacyjnego narzędzia w obszarze profilaktyki zaburzeń odżywiania u dziewcząt i młodych kobiet. Badanie to zajmuje kluczowe miejsce w całym cyklu badawczym, ponieważ umożliwia przejście od refleksji teoretycznej do empirycznej oceny skuteczności zaprojektowanych oddziaływań edukacyjnych.

Celem badania była ocena potencjału ustrukturyzowanych interwencji zorientowanych na ciało, realizowanych w formule zajęć edukacyjno-rozwojowych, poprzez porównanie ich skuteczności w zakresie kształtowania dobrostanu psychofizycznego oraz kompetencji samoregulacyjnych u młodych kobiet znajdujących się w grupie ryzyka rozwoju anoreksji. Szczególną uwagę poświęcono świadomości interoceptywnej jako kompetencji możliwej do rozwijania w procesie edukacyjnym, warunkującej zdolność rozpoznawania sygnałów cielesnych, emocjonalnych i potrzeb zdrowotnych.

Interwencje zastosowane w badaniu zostały opracowane jako elementy autorskiej metody Nalu. Mindful Movement, zaprojektowanej na podstawie wyników dwóch wcześniejszych publikacji tworzących zaplecze teoretyczne rozprawy. Dobór metod pracy z ciałem – Terapii Tańcem i Ruchem, Jogi oraz Mindfulness – wynikał z ich potencjału edukacyjnego w zakresie rozwijania uczenia się przez doświadczenie, świadomości ciała, regulacji emocji oraz refleksyjnego stosunku do własnego funkcjonowania somatycznego, co ma kluczowe znaczenie w profilaktyce zaburzeń odżywiania.

W badaniu uczestniczyły 42 młode kobiety wykazujące objawy Syndromu Gotowości Anorektycznej, które losowo przypisano do trzech grup realizujących różne warianty programu Nalu. Mindful Movement. Kryteria włączenia zostały skonstruowane tak, aby objąć osoby znajdujące się w grupie podwyższonego ryzyka, co podkreśla profilaktyczny, wychowawczy i edukacyjny charakter badania, zgodny z paradygmatem pedagogiki zdrowia.

Protokół badania obejmował czterotygodniowy okres kontrolny, po którym następował czterotygodniowy okres eksperymentalny. Punktem wyjścia była rejestracja wyników bazowych, które stanowiły punkt odniesienia do oceny zmian w czasie. W okresie kontrolnym nie prowadzono żadnych interwencji, co pozwoliło na obserwację naturalnego przebiegu objawów SGA. Okres ten pełnił kluczową rolę referencyjną w ocenie skuteczności interwencji. W kolejnym etapie uczestniczki realizowały przypisane programy interwencyjne w kontrolowanych i ujednoliconych warunkach.

Zbierane dane obejmowały zarówno wskaźniki subiektywne, jak i obiektywne, co pozwoliło na kompleksową ocenę dobrostanu uczestniczek. Subiektywne wskaźniki dobrostanu oceniano za pomocą zweryfikowanych narzędzi psychometrycznych mierzących poziom stresu, lęku, nastroju oraz objawy zaburzeń odżywiania. Obiektywne dane obejmowały parametry tętna (HR) oraz zmienności rytmu serca (HRV), które są fizjologicznymi wskaźnikami stresu i funkcjonowania autonomicznego układu nerwowego. Uwzględnienie zarówno wskaźników psychometrycznych, jak i fizjologicznych odzwierciedla dwuwymiarowe podejście badania, ukierunkowane na psychiczne i somatyczne aspekty SGA, zgodnie z szerszymi założeniami badawczymi dotyczącymi procesów interoceptywnych.

Analizy statystyczne przeprowadzono przy użyciu analizy wariancji ANOVA w modelu mieszanym, co umożliwiło ocenę zmian wewnątrzgrupowych w okresach: kontrolnym i eksperymentalnym oraz porównanie różnic międzygrupowych, wynikających z zastosowania trzech rodzajów interwencji. W okresie kontrolnym odnotowano spadek funkcjonowania fizjologicznego charakterystyczny dla reakcji na stres, przy braku istotnych zmian w pomiarach psychometrycznych. W okresie eksperymentalnym wszystkie trzy interwencje doprowadziły do istotnej poprawy subiektywnego dobrostanu. Poprawa funkcji fizjologicznych została zaobserwowana w grupie Jogi i Mindfulness.

Istotnym elementem badania była analiza świadomości interoceptywnej jako mediatora skuteczności interwencji. Analiza regresji liniowej wielokrotnej wykazała, że wynik SGA był przewidywany przez niezadowolenie z ciała i niską samoocenę, które były wyjaśniane przez deficyt interoceptywny związany z lękiem. Ponadto, zmiany w niezadowoleniu z ciała i samoocenie, wywołane interwencjami, były przewidywane przez zmiany w świadomości interoceptywnej, powiązane z wyjściowym poziomem SGA. Wyniki te podkreślają kluczową rolę procesów interoceptywnych zarówno w etiologii SGA, jak i mechanizmach skuteczności interwencji profilaktycznych.

Znaczenie niniejszego badania wykracza poza bezpośrednie wyniki, stanowiąc fundament dla opracowania metodologii programu psychoedukacyjnego profilaktyki AN.

Weryfikując skuteczność metod pracy z ciałem oraz wyjaśniając rolę świadomości interoceptywnej, badanie dostarcza empirycznych podstaw do integrowania aktywności fizycznej z praktykami kognitywnymi w programach profilaktyki anoreksji. Jako trzeci etap szerszego cyklu badawczego, badanie rozwija teoretyczne i empiryczne podstawy wypracowane we wcześniejszych etapach, oferując zweryfikowane ramy dla kolejnych działań w ramach projektu doktorskiego. Uzyskane wyniki służą projektowaniu kompleksowego, opartego na dowodach, programu edukacyjnego profilaktyki AN, który wypełni istotną lukę w obszarze badań nad edukacją zdrowotną.

4. **Publikacja 4**: Korsak, E. (2026) Nalu. Mindful Movement: Development and Validation of a Psychoeducational Programme for the Prevention of Anorexia in Educational Settings. *Colloquium*.

Udział autorów w powstaniu publikacji:
Korsak, E. – 100%
(opracowanie koncepcji i metodologii badania, realizacja badania, analiza i interpretacja wyników, przygotowanie manuskryptu oraz jego redakcja i korekta)

Ostatnia, czwarta praca w cyklu stanowi zwieńczenie całego przedsięwzięcia naukowego i jednocześnie syntezę badań oraz refleksji teoretycznych podejmowanych w poprzednich etapach. Przedstawia program psychoedukacyjny „Nalu. Mindful Movement", którego celem jest profilaktyka anoreksji. Interwencja ta została zaprojektowana jako odpowiedź na rosnące wyzwania związane z eskalacją zaburzeń odżywiania. Wartość pracy polega na opracowaniu i empirycznej walidacji kompleksowego programu, który może być stosowany w szkołach i innych placówkach wychowawczych. Tym samym, praca nie tylko wpisuje się w nurt badań nad zdrowiem i edukacją, lecz także wnosi istotny wkład w rozwój współczesnej pedagogiki zdrowia jako subdyscypliny.

Program „Nalu. Mindful Movement" został opracowany zgodnie z modelem PRECEDE-PROCEED, który oferuje usystematyzowane podejście do diagnozowania potrzeb, planowania interwencji oraz oceny skuteczności. Fundamentem programu jest zaproponowany przez Ziółkowską naukowy konstrukt Syndromu Gotowości Anorektycznej, który umożliwia precyzyjne określenie grupy ryzyka. Program ten uwzględnia najnowsze wytyczne dotyczące edukacji zdrowotnej oraz integruje interwencje obejmujące zarówno aspekty psychologiczne, jak i fizjologiczne. Oparty na holistycznym podejściu do zdrowia, program wykorzystuje

sprawdzone metody psychoedukacyjne, takie jak trening uważności, terapia ruchowa oraz elementy terapii poznawczo-behawioralnej, co czyni go kompleksowym narzędziem profilaktycznym.

Istotą programu jego edukacyjny charakter. W odróżnieniu od podejść stricte terapeutycznych, „Nalu. Mindful Movement" skupia się na dostarczaniu wiedzy, rozwijaniu umiejętności oraz wzmacnianiu kompetencji uczestników w zakresie samoświadomości i samoregulacji. U podstaw programu leżą zasady uczenia się przez doświadczenie, które podkreślają znaczenie refleksyjnego zaangażowania w proces edukacyjny. Praca zwraca uwagę na to, że skuteczna edukacja zdrowotna wymaga łączenia procesów oddolnych, takich jak wrażliwość na sygnały płynące z ciała, z procesami odgórnymi, obejmującymi regulację myśli, emocji i przekonań. Takie podejście sprzyja nie tylko lepszemu rozumieniu własnego ciała i emocji, ale także krytycznemu myśleniu o normach społecznych i kulturowych, które mogą przyczyniać się do rozwoju zaburzeń odżywiania.

W wymiarze pedagogicznym program stanowi odpowiedź na wyzwania związane z rosnącą częstością zaburzeń odżywiania, które stanowią poważne zagrożenie zarówno dla zdrowia fizycznego, jak i psychicznego młodzieży. Program ten został opracowany w sposób, który umożliwia jego implementację przez nauczycieli i wychowawców w różnych kontekstach edukacyjnych, co podkreśla jego praktyczne zastosowanie w profilaktyce zdrowotnej. Składa się z czterech modułów (jedna sesja tygodniowo przez cztery tygodnie). Każdy moduł łączy komponent psychoedukacyjny, skoncentrowany na edukacji zdrowotnej, z komponentem ruchowym, opartym na treningu uważności i zwiększaniu świadomości interoceptywnej. Edukacyjna wartość programu polega na tym, że uczestnicy zdobywają umiejętności rozpoznawania i modyfikowania niewłaściwych przekonań, co prowadzi do bardziej świadomego i zdrowego funkcjonowania w codziennym życiu.

Badanie efektywności programu „Nalu. Mindful Movement" wykazało znaczące korzyści edukacyjne i psychospołeczne. Uczestnicy programu poprawili swoją wiedzę na temat anoreksji, jej czynników ryzyka oraz strategii profilaktycznych. Dzięki zastosowaniu metod aktywnego uczenia się, opartych na cyklu doświadczenia, obserwacji, konceptualizacji i eksperymentowania, program wpłynął na rozwój refleksyjnego myślenia, a także na poprawę umiejętności regulacji emocji i budowanie pozytywnego obrazu siebie. Program wspierał również krytyczne podejście do presji kulturowych i norm społecznych, umożliwiając uczestnikom podejmowanie świadomych decyzji dotyczących własnego zdrowia i dobrostanu.

W kontekście pedagogiki zdrowia program ten stanowi cenne narzędzie, które wspiera proces edukacji w kierunku promowania zdrowego stylu życia oraz przeciwdziałania

zachowaniom ryzykownym. Kluczowym aspektem jest wielowymiarowość programu, który integruje komponenty psychologiczne, somatyczne i społeczne, co umożliwia holistyczne podejście do profilaktyki zdrowotnej. Wartość programu wynika także z jego empirycznej walidacji, która potwierdziła skuteczność interwencji na poziomie subiektywnym i fizjologicznym. Wykorzystanie zaawansowanych narzędzi biofeedbacku pozwoliło na precyzyjną ocenę zmian w zakresie parametrów fizjologicznych, takich jak zmienność rytmu serca, co dodatkowo wzmacnia naukową wartość programu. „Nalu. Mindful Movement" jest przykładem interdyscyplinarnego podejścia do problemów zdrowotnych, łączącego osiągnięcia pedagogiki, psychologii i medycyny.

Podsumowanie

Skuteczne zapobieganie chorobom, aktywne uczestniczenie w procesie leczenia i kontrolowanie własnego zdrowia wymaga zarówno zwiększenia poziomu świadomości zdrowotnej, jak i rozwijania umiejętności psychospołecznych. Biorąc pod uwagę zwiększenie ryzyka zachorowań na choroby przewlekłe, w tym anoreksję, warto podejmować działania mające na celu kształtowanie stylu życia i środowiska sprzyjającego zdrowiu, nabywanie wiedzy dotyczącej chorób i czynników ich ryzyka, a także podejmować i wzmacniać aktywności na rzecz zdrowia własnego i innych, by tworzyć zdolne do działań społeczności. Edukacja osoby zagrożonej zaburzeniami odżywiania może przyczynić się do przejęcia współodpowiedzialności za proces leczenia i opieki. Dlatego celem pracy doktorskiej było opracowanie oraz empiryczna weryfikacja skuteczności autorskiego programu psychoedukacyjnego Nalu. Mindful Movement, ukierunkowanego na zapobieganie anoreksji w środowisku edukacyjnym, możliwego do wdrażania przez nauczycieli i wychowawców w szkołach oraz innych placówkach opiekuńczo-wychowawczych.

W odniesieniu do głównego problemu badawczego dotyczącego skuteczności programu wykazano, że zastosowana interwencja psychoedukacyjna integrująca metody pracy z ciałem wiąże się z korzystnymi zmianami zarówno na poziomie subiektywnym (m.in. w obszarze dobrostanu psychicznego, funkcjonowania emocjonalnego oraz relacji z własnym ciałem), jak i na poziomie obiektywnym, mierzonym wybranymi wskaźnikami psychofizjologicznymi (HR, HRV). Uzyskane wyniki potwierdzają, że profilaktyka anoreksji może być skutecznie realizowana jako oddziaływanie pedagogiczne, ukierunkowane na rozwijanie kompetencji samoregulacyjnych, refleksyjności oraz sprawczości zdrowotnej uczestniczek.

Realizacja szczegółowych pytań badawczych przebiegała etapowo. Dwa pierwsze etapy projektu, obejmujące przeglądy systematyczne, pozwoliły na identyfikację metod pracy z ciałem stosowanych w profilaktyce i terapii anoreksji oraz określenie zakresu ich empirycznego potwierdzenia, a także na charakterystykę programów profilaktycznych opartych na dowodach naukowych. Trzeci etap badań miał charakter pilotażowy i służył empirycznemu testowaniu wybranych komponentów stworzonego programu, umożliwiając analizę mechanizmów zmiany oraz roli procesów interoceptywnych w oddziaływaniach profilaktycznych. Etap czwarty – opracowanie i walidacja pełnej wersji programu *Nalu. Mindful Movement* – stanowił realizację celu zasadniczego rozprawy i domknięcie całego cyklu publikacji.

Oryginalność rozprawy doktorskiej polega zarówno na zaproponowanym rozwiązaniu, jak i na procesie empirycznej weryfikacji. Opracowany program odpowiada na potrzeby społeczne i edukacyjne, związane z narastającą skalą zaburzeń odżywiania wśród młodzieży oraz deficytem wczesnych oddziaływań profilaktycznych w środowisku szkolnym. W tym sensie wpisuje się w najnowsze trendy zdrowia populacyjnego i edukacji zdrowotnej, akcentujące znaczenie działań prewencyjnych, wzmacniania zasobów jednostki oraz kształtowania kompetencji sprzyjających zdrowiu. Program został osadzony w uznanym i opisanym modelu Syndromu Gotowości Anorektycznej (SGA), co umożliwiło precyzyjne określenie grupy ryzyka oraz ukierunkowanie oddziaływań profilaktycznych na kluczowe obszary funkcjonowania psychosomatycznego. Program został zweryfikowany w cyklu badawczym obejmującym przeglądy systematyczne literatury, badania empiryczne oraz modelowe projektowanie programu edukacyjnego. Jego skuteczność została potwierdzona empirycznie zarówno na poziomie subiektywnym, jak i fizjologicznym, co znacząco wzmacnia jego wartość naukową oraz aplikacyjną.

Rezultat rozprawy, w postaci gotowego do wdrożenia w praktyce edukacyjnej programu, może stanowić punkt odniesienia dla dalszych badań nad edukacyjną profilaktyką anoreksji. W dalszych badaniach zasadne jest rozszerzenie próby (z uwzględnieniem zróżnicowania płci i kontekstów społeczno-kulturowych), wprowadzenie pomiarów podłużnych (typu *follow-up*) oraz pogłębienie analiz, w tym o komponent jakościowy, pozwalający lepiej uchwycić doświadczenia uczestniczek i mechanizmy zmiany.

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Body-oriented therapy in the prevention of eating disorders

A systematic review

Emilia Korsak*
Department of Clinical, Developmental and Educational Psychology, University of Warmia and Mazury in Olsztyn
0000–0002–9677–3731

ABSTRACT

Aim

Despite the growing significance of body-oriented therapy and the broad applicability of psychotherapeutic methods that focus on the body, there is a general scarcity of systematic reviews analyzing the effectiveness of this therapeutic approach in addressing body image problems in persons with anorexia or at risk of anorexia. The above constitutes a barrier for practitioners, theoreticians who investigate the mechanisms underpinning therapeutic interventions, as well as educators who implement health promotion programs. The aim of this article was to review research studies analyzing the effects of different body-oriented interventions on body image perception in persons suffering from or at risk of eating disorders such as anorexia.

Methods

The review was conducted according to the PRISMA guidelines. Digital databases (ProQuest, PsychINFO, PubMed, ScienceDirect, Scopus, Web of Science) were searched for randomized control trials (RCT). A total of 425 records, including 69 full-length research articles, were critically analyzed. Fifteen trials that met all inclusion criteria were ultimately included in the analysis.

Results

The review revealed that body-oriented therapeutic programs are more effective in reducing risk factors and reinforcing protective factors in comparison with the control groups, and that the inclusion of body-oriented therapy in standard therapeutic practice could substantially minimize the symptoms of eating disorders.

* Correspondence address: Emilia Korsak, Department of Clinical, Developmental and Educational Psychology, Faculty of Social Sciences, University of Warmia and Mazury in Olsztyn, Prawocheńskiego Street 13, 10-447 Olsztyn. E-mail: emilia.korsak@gmail.com.

Conclusions
Further research is needed to directly compare the effects of different types of interventions on risk factors and protective factors.

Keywords: body-oriented therapy, body image, eating disorders, anorexia, prevention

Introduction

Body-Oriented Psychotherapy

Physical exercise and body-oriented therapy are important attributes of health and well-being, both physical (explored by health and medical sciences) and psychological (explored by psychology and pedagogy). Somatic symptoms and experiences have been long considered an important part of psychotherapy, and the founders of psychoanalysis regarded somatic tension as a sign of psychological conflict (Freud, Kempnerówna, & Zaniewicki, 2017). At present, the popularity of body-oriented techniques, including mindfulness, yoga, and progressive muscle relaxation, stems from the awareness that body-mind integration plays a key role in wellness (Leitan & Murray, 2014). According to research, most patients with psychological issues also experience somatic symptoms (Katon, Sullivan, & Walker, 2001).

Body-oriented psychotherapy is highly effective. Despite the above, psychotherapeutic techniques that focus on the body are still disregarded in the scientific discourse (Röhricht, 2009). A clear definition of body-oriented psychotherapy has not been proposed to date. This is because body-oriented psychotherapy is a very diverse field (Young, 2008), despite the fact that the common theme is the connection between body and mind, and the assumption that attitudes towards the self and others are rooted not only in the mind, but also in the body (Röhricht, 2009). One of the few existing definitions of this therapeutic approach has been proposed by Michael Heller who argued that "body-oriented psychotherapy interventions" is an umbrella term for all psychotherapies that "explicitly use body techniques in order to enhance the developing dialogue between patient and psycho-therapist about what is being experienced as well as perceived […]. In most schools of body psychotherapy, the body is considered a means of communication and exploration" (Heller, 2012).

Body-oriented therapeutic methods play an important role in the treatment of many psychological problems, but they are particularly useful in resolving psychosomatic issues, including eating disorders.

Body Image in Eating Disorders

Eating disorders are severe psychological and somatic disorders that affect 4.95% of the female population and 2.24% of the male population (Duncan, Ziobrowski, & Nicol, 2017). Anorexia nervosa (AN) is the most prevalent eating disorder with

serious and often life-threatening somatic consequences (Fichter & Quadflieg, 2016), often accompanied by psychosocial dysfunctions (Zipfel, Giel, Bulik, Hay, & Schmidt, 2015). The main symptoms of AN include underweight, fear of weight gain, and body image disturbance (BID) (Carey & Preston, 2019). The characteristic features and the mechanisms underlying BID have not been fully explained to date, in particular in the context of sensory processing disorders and cognitive-affective disorders (Dakanalis et al., 2016). Anorexic individuals' perceptions of the physical self need to be explored to improve the quality of therapy.

The body image is a multi-dimensional construct with cognitive, affective, and behavioral components (Thompson, 2004). Dysfunctions involving one or several components can lead to the overestimation of the size of body features (Farrell, Lee, & Shafran, 2005), negative feelings and thoughts about the body (Rekkers, Scheffers, van Busschbach, & van Elburg, 2021; Troisi, 2020), body checking and body avoidance (Shafran, Fairburn, Robinson, & Lask, 2004). Research has demonstrated that BID is positively correlated with negative psychological well-being, including low self-esteem, depression, and anxiety (Cruz-Sáez, Pascual, Wlodarczyk, & Echeburúa, 2020; Junne et al., 2019), higher risk of suicide (Naivar Sen, Gurleyik, & Psouni, 2020), and anhedonia (Wang et al., 2018), which often persist after recovery (Bachner-Melman, Zohar, & Ebstein, 2006). These dysfunctions are also predictors of an AN relapse (Carter, Blackmore, Sutandar-Pinnock, & Woodside, 2004), which is why the body-oriented approach should be prioritized in therapeutic interventions to support recovery (Glashouwer, van der Veer, Adipatria, Jong, & Vocks, 2019).

Therapeutic Programs and Prevention of Eating Disorders

Cognitive-behavioral therapy is the most popular therapeutic intervention in the treatment of BID (Lewis-Smith, Diedrichs, & Halliwell, 2019). Cognitive-behavioral therapy involves efforts to change thinking patterns and behaviors such as body checking, and to restructure cognitive processes (Alleva, Sheeran, Webb, Martijn, & Miles, 2015). However, the efficacy of CBT is limited, and more than 25% of the patients continue to suffer from eating disorders after therapy (Omiwole, Richardson, Huniewicz, Dettmer, & Paslakis, 2019). Other popular intervention methods include psychological education and fitness training which promote a sense of self-worth through the acquisition of new competencies, recognition of one's strengths and potential, and modification of behaviors relating to body image (Alleva et al., 2015).

Treatment programs targeting AN are expensive, and they lead to an improvement in the patient's health, but not to a full remission (Schmidt et al., 2016; Westmoreland, Krantz, & Mehler, 2016). This is because most therapeutic methods are not highly effective (Bulik, Berkman, Brownley, Sedway, & Lohr, 2007), relapse and chronic relapse rates are high (Berkman, Lohr, & Bulik, 2007; Keel, Dorer, Franko, Jackson, & Herzog, 2005), and many patients drop out of treatment (Fassino, Pierò, Tomba, & Abbate-Daga, 2009). For this reason, programs aiming to prevent eating disorders should be developed based on scientific

evidence. There are three types of eating disorder prevention programs: (1) universal psychological education programs, (2) universal prevention campaigns in the mass media, and (3) interactive selective prevention programs. Their efficacy in minimizing the risk of eating disorders has been estimated at 51% (Stice, Shaw, & Marti, 2007). Most programs aim to reduce risk factors, although research has demonstrated that the effectiveness of preventive measures can be significantly improved by modifying the theoretical framework and shifting the focus to protective factors, such as shaping a positive body image (Levine & Smolak, 2016; Piran, 2015). A meta-analysis of the effectiveness of eating disorder prevention programs revealed a significant reduction in the risk of disease (54–77%) (Stice, Onipede, & Marti, 2021).

Scientific Evidence and Research Aim

Research has demonstrated that body-oriented therapy is an effective approach (Allmer, Ventegodt, Kandel, & Merrick, 2009) because it offers additional psychotherapeutic tools in areas where talk therapy is insufficient (Röhricht, 2009). There is numerous, but dispersed scientific evidence to indicate that body-oriented therapy is effective in resolving various psychological problems, including eating disorders. However, there is a general scarcity of systematic reviews analyzing the efficiency of body-oriented therapy in overcoming body image issues in patients suffering from or at risk of anorexia. The above constitutes a serious barrier for practitioners, theoreticians who investigate the mechanisms underpinning therapeutic interventions, as well as educators who implement health promotion programs. Therapeutic approaches whose positive impact has been empirically validated play an important role in therapeutic practice and should be a part of a professional therapist's toolkit. Solutions that are based on scientific evidence should be promoted by both theoreticians and practitioners. This article contributes to meeting these challenges.

The aim of this article was to review research studies analyzing the effects of different body-oriented interventions on body image perception in persons suffering from or at risk of eating disorders such as anorexia. Two research questions were formulated:

1. Which body-oriented therapeutic methods for AN prevention and treatment are based on scientific evidence?
2. How effective are body-oriented therapeutic methods in preventing and treating AN?

Method

A systematic literature review requires transparent procedures for reporting the results of the search process. The PRISMA guidelines, which are most widely used to report systematic reviews (Moher, Liberati, Tetzlaff, & Altman, 2009),

rely on the following types of information in database search: keywords, number of identified records, number of excluded records, the applied inclusion/exclusion criteria, and the screening process.

Identification of Records

Scientific studies were identified by screening ProQuest, PsychINFO, PubMed, ScienceDirect, Scopus, and Web of Science databases on 4 April 2022. The keywords relating to body image and eating disorders were combined with the keywords relating to body-oriented therapy and used in database search according to specific requirements. The resulting keywords were: "body image" AND ("eating disorders" OR "anorexia nervosa") AND ("body-oriented therapy" OR "body-oriented psychotherapy" OR "body psychotherapy" OR "mind-body therapy" OR "body-mind therapy"). In addition, the reference lists in the identified review articles and of the European Body Psychotherapy Association were screened to include further studies.

Inclusion and Exclusion Criteria

Studies that met the following criteria were included in the review: (1) randomized controlled clinical trials (RCT) with two factors, where the participants were randomly assigned to groups; (2) interventions with components based on body-oriented therapy; (3) interventions aiming to promote protective factors and/or reduce risk factors associated with eating disorders; (4) interventions focusing on body image/body perception; (5) studies involving at least one standardized psychological measure in the experimental group and the control group; (6) original peer-reviewed articles; (7) papers written in English or Polish. Potential effect measures included protective factors, such as body satisfaction, self-esteem, and self-compassion, as well as risk factors such as body dissatisfaction, thin-ideal internalization, and subclinical eating disorder traits. The reviewed articles were not screened for the place of treatment (outpatient clinic, hospital, out of hospital) or the measures applied in the control group. The inclusion criteria involved serious psychological or somatic disorders affecting eating behaviors.

Results

Selection of Research Articles for Review

The literature search yielded 421 publications in the indicated databases. Four papers were additionally identified based on reference lists. A total of 425 articles were identified, whereof 342 remained after duplicates were removed. During a preliminary screening of titles and abstracts, 273 publications that lacked

abstracts or where titles and abstracts did not meet the inclusion criteria were eliminated. Sixty-nine full-length research articles were critically evaluated, and 54 of those failed to meet all inclusion criteria. Subjectivity should be controlled during the selection of empirical research sources for a systematic review. The databases were searched by the author, and the procedure was performed twice to ensure objectivity. The first search was conducted to assess the scope of the literature available in the analyzed databases. In the second stage, the literature was explored in detail based on the specified inclusion/exclusion criteria, and specific records/articles were selected for analysis. Body-oriented therapy is a relatively new topic of scientific inquiry, and the number of peer-reviewed articles dedicated to this subject is limited. Finally, 15 RCTs that met all inclusion criteria were chosen for a systematic review. The PRISMA flowchart describing the selection process and reasons for exclusion is presented in Figure 1 (Moher et al., 2009).

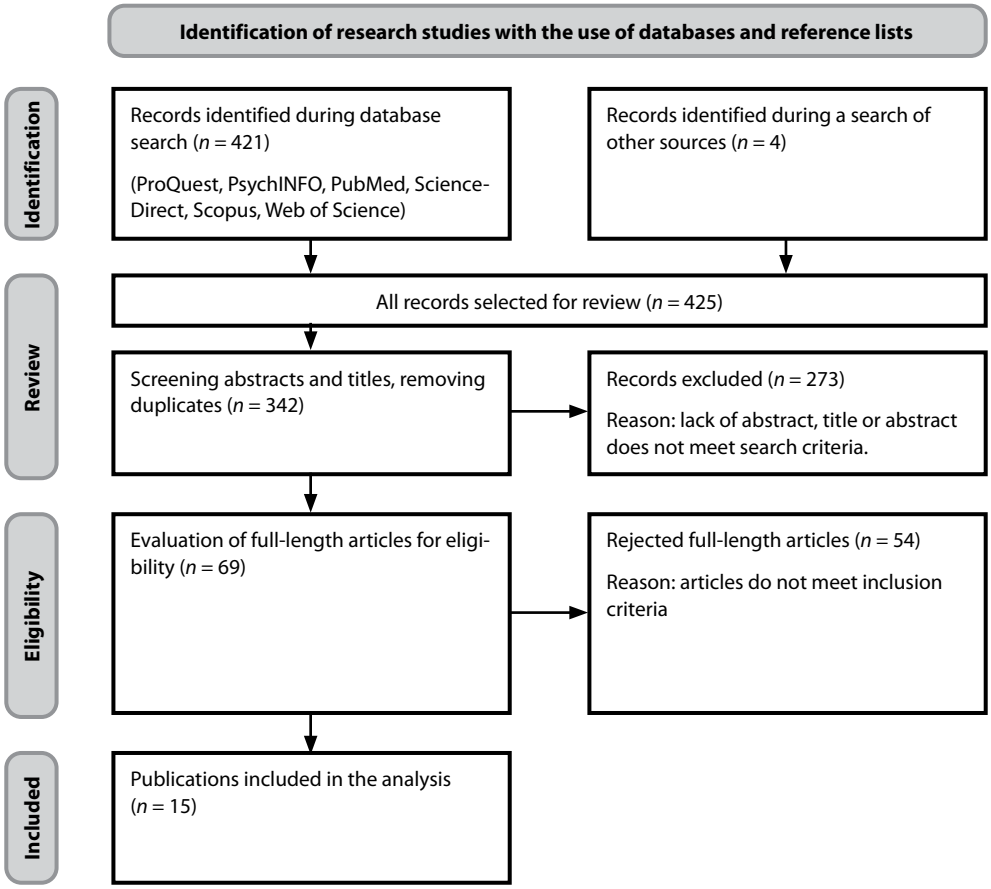


Figure 1. Flow of information through different stages of a systematic review (Moher et al., 2009).

Description of Research Studies Selected for Review

Most of the reviewed studies focused on prevention programs targeting youths or young adults. Three studies evaluated universal prevention programs (items 1, 7, and 10 in Table 1); five studies explored selective prevention programs (items 3, 4, 12, 14, and 15 in Table 1); and seven studies analyzed indicated prevention programs (items 2, 5, 6, 8, 9, 11, and 13 in Table 1, pp. 186–188).

The evaluated studies differed significantly in sample size which ranged from 12 to 347 participants. Considerable variations were also noted in study duration and the content of preventive programs. Group programs comprised 1 to 72 sessions. All papers were published in the previous 24 years (1997–2021), and 60% were published in the last 10 years (n = 9) (Table 1).

Description of Interventions in the Reviewed Research Studies

Eight different intervention techniques were evaluated in 15 studies. A protocol based on mindfulness was applied in six studies (items 1, 3, 4, 7, 14, and 15 in Table 1), and a protocol based on yoga was used in two studies (items 8 and 12 in Table 1). In one study, yoga was implemented in addition to standard hospital care (item 5 in Table 1); one study examined Dance Movement Therapy in combination with the previous treatment (item 13 in Table 1); one study analyzed a multimodal treatment program based on the Feldenkrais method (item 9 in Table 1); one study explored cognitive-behavioral body image therapy and the Body Perception Treatment protocol (item 2 in Table 1); one study investigated a standard outpatient treatment program in combination with the Basic Body Awareness Therapy (item 6 in Table 1); one study analyzed relaxation techniques (item 11 in Table 1); and one study involved aerobic exercise (item 10 in Table 1).

Description of Measurement Tools in the Reviewed Research Studies

Twenty-eight different measurement tools were used in the analyzed research studies.

Eating disorders were evaluated with eight different research tools (Table 1), where the Eating Disorder Inventory (EDI, EDI-2, EDI-3) (N = 7) and the Eating Disorder Examination Questionnaire (EDE-Q) (N = 5) were most frequently used.

The EDI consists of 64 items divided into eight subscales. Mean scores are not computed for the entire scale. The eight subscales measure behavioral and psychological factors in an eating disorder: (1) Drive for thinness, (2) Bulimia, (3) Body dissatisfaction, (4) Ineffectiveness, (5) Perfectionism, (6) Interpersonal distrust, (7) Interoceptive awareness, and (8) Maturity fears (Żechowski, 2008).

The Eating Disorder Examination Questionnaire (EDE-Q) is a 28-item self-reported questionnaire adapted from the semi-structured Eating Disorder Examination (EDE) interview, which has been designed to assess the range and severity of eating disorder symptoms. The EDE-Q consists of four subscales: (1) Restraint, (2) Eating concern, (3) Weight concern, and (4) Shape concern (Carey et al., 2019).

Table 1

Description of research studies included in the systematic review

Item	Authors	Population	Intervention	Control group	Assessment methods	Results
1.	Albertson, Neff, Dill--Shackleford, 2014	Adult women (N = 228): experimental group (N = 98), control group (N = 130)	One 20-minute mindfulness podcast per day over a period of 3 weeks	Waiting list	BSQ, BAS, SCS	↑ self-compassion ↑ body appreciation ↑ self-esteem and self-efficacy ↓ body dissatisfaction ↓ shame ↓ self-esteem based on body image
2.	Artoni et al., 2021	Patients with eating disorders (N = 182): experimental group (N = 91), control group (N = 91)	A therapeutic and rehabilitation program involving a 60-minute Cognitive-Behavioral Body Image group therapy session per week + participation in the Body Perception Treatment protocol	A therapeutic and rehabilitation program involving a 60-minute Cognitive-Behavioral Body Image group therapy session per week (observations of body sensations, breathing control)	SCL-90, EDI-3, BUT	↑ general psychological well-being ↓ body-related anxiety
3.	Atkinson, Wade, 2015	Adolescent girls (N = 347): experimental group 1 (N = 138), experimental group 2 (N = 108), control group (N = 97)	The Body Project developed by Stice, including the key features of mindfulness and acceptance-based therapy, in particular with regard to body image. Some exercises were adapted from the MBCT	Standard school class	EDE-Q, DEBQ-R, SATAQ–3, PANAS-X	↓ preoccupation with body weight and shape ↓ symptoms leading to eating disorders

continuation of Table 1

Item	Authors	Population	Intervention	Control group	Assessment methods	Results
4.	Atkinson, Wade, 2016	Adolescent girls (N = 50): experimental group 1 (N = 17), experimental group 2 (N = 16), control group (N = 17)	The Body Project developed by Stice et al., including the key features of mindfulness and acceptance-based therapy, in particular with regard to body image. Some exercises were adapted from the MBCT	Standard school class	EDE-Q, DEBQ-R, SATAQ–3, PANAS-X	↓ preoccupation with body weight and shape ↓ symptoms leading to eating disorders ↓ social anxiety
5.	Carei, Fyfe-Johnson, Breuner, Brown, 2010	Patients with eating disorders (N = 53): experimental group (N = 26), control group (N = 27)	Standard hospital care + yoga twice a week for 8 weeks	Standard hospital care	EDE, BMI, BDI, STAI Food Preoccupation Questionnaire	↓ behaviors associated with eating disorders ↓ fear of eating after a yoga session
6.	Catalan-Matamoros, Helvik-Skjaerven, Labajos-Manzanares, Martínez-de-Salazar-Arboleas, Sánchez-Guerrero, 2011	Female patients with eating disorders in an outpatient clinic (N = 28): experimental group (N = 14), control group (N = 14)	Standard outpatient treatment + 12 Basic Body Awareness Therapy sessions over a period of 7 weeks (the program involved simple exercises to improve postural balance and coordination by grounding the body and freeing the breathing)	Standard outpatient treatment	EDI-2 IA, BAT, EAT-40	↓ body dissatisfaction ↓ negative perception of body size

continuation of Table 1

Item	Authors	Population	Intervention	Control group	Assessment methods	Results
7.	Johnson, Burke, Brinkman, Wade, 2016	School students (N = 308): experimental group (N = 132), control group (N = 176)	8 mindfulness sessions over a period of 8 weeks	Standard school class	EDE-Q, DASS−21, SCS	no significant improvement in any parameter after the intervention or at the end of the observation period
8.	Karlsen, Vrabel, Bratland-Sanda, Ulleberg, Benum, 2018	Persons with diagnosed BN or EDNOS (N = 38): experimental group (N = 18), control group (N = 12)	Yoga sessions twice a week over a period of 11 weeks	Group sessions involving nutrition advice, physical exercise, and ED	EDE, EDI-2	↑ general psychological well-being
9.	Laumer, Bauer, Fichter, Milz, 1997	Patients of an eating disorder clinic (N = 30): experimental group (N = 15), control group (N = 15)	9 Awareness Through Movement therapeutic sessions based on the Feldenkrais method over a period of 5 weeks + a multimodal therapy program in a psychosomatic clinic	Multimodal therapy program in a psychosomatic clinic	BCS, BPSS, FKE, EMI-B, ANIS, EDI	↑ satisfaction with body areas that are particularly problematic in eating disorders (e.g. hips/thighs, buttocks) ↑ experiencing movement and body acceptance ↑ positive attitudes towards own body and health ↑ mature behavior and taking responsibility ↓ regression to dependent behavior from childhood
10.	Maurer et al., 2020	Healthy subjects (N = 26): experimental group (N = 16), control group (N = 10)	Aerobic exercise 3 times a week over a period of 6 months	No regular aerobic exercise, evaluation only	FKKS, PANAS, WPT, HPT, PTol	↑ physical fitness ↑ mood ↑ pain threshold ↑ positive body image

continuation of Table 1

Item	Authors	Population	Intervention	Control group	Assessment methods	Results
11.	McComb, Clopton, 2003	Bulimic women (N = 12): experimental group (N = 6), control group (N = 6)	8 weekly 90-minute group therapy sessions involving exercise, relaxation techniques, and autogenic training	No therapy, evaluation only	EDI-BD, EDI-DT, STAI, CSEI	↓ anxiety
12.	Mitchell, Mazzeo, Rausch, Cooke, 2007	Women with a distorted body image (N = 93): experimental group 1 (N = 33), experimental group 2 (N = 30), control group (N = 30)	6 weekly 45-minute sessions: dissonance-based interventions or yoga and meditation	No therapy, evaluation only	EDDS, BES, EDI-BD, EDI-DT, STAI	no significant differences between the yoga group and the control group; significant reduction in eating disorders, drive for thinness, body dissatisfaction, and anxiety in the dissonance group relative to the yoga group and the control group
13.	Savidaki, Demirtoka, Rodríguez--Jiménez, 2020	Female patients with eating disorders (N = 14): experimental group (N = 7), control group (N = 7)	Dance Movement Therapy + previous therapy	Previous therapy	TAS-20, MBSRQ	↑ positive body image ↑ body awareness ↑ building a healthy body image ↓ preoccupation with body image ↑ self-esteem and self-efficacy ↓ anxiety ↓ stress

continuation of Table 1

Item	Authors	Population	Intervention	Control group	Assessment methods	Results
14.	Toole, Craighead, 2016	Women with a distorted body image (N = 80): experimental group (N = 40), control group (N = 40)	Daily 25-minute meditation for 1 week	No meditation, evaluation only	BSQ, BAS, SCS	↑ positive body image
15.	Wade, George, Atkinson, 2009	Female university students (N = 100): experimental group (N = 20), control group 1 (N = 20), control group 2 (N = 20), control group 3 (N = 20), control group 4 (N = 20)	One 5-minute mindfulness session	(1) evaluation only, (2) ruminative attention control, (3) cognitive dissonance, (4) distraction	EDI-BD	↑ appearance satisfaction

Legend. Measurement methods: ANIS = Anorexia Nervosa Inventory for Self-Rating; BAS = Body Appreciation Scale; BAT = Body Attitude Test; BES = Body Esteem Scale; BDI = Beck Depression Inventory; BMI = Body Mass Index; BPSS = Body Parts Satisfaction Scale; BSQ = Body Shape Questionnaire; BUT = Body Uneasiness Test; CSEI = Coopersmith Self-Esteem Inventory; DASS−21 = Depression Anxiety Stress Scale; DEBQ-R = Dutch Eating Behavior Questionnaire – Restraint; EAT-40 = Eating Attitude Test-40; EDDS = Eating Disorder Diagnostic Scale; EDE-Q = Eating Disorder Examination Questionnaire; EDI, EDI-2, EDI-3 = Eating Disorder Inventory; EDI-2 IA Eating Disorder Inventory – Interoceptive Awareness; EDI-BD = Eating Disorder Inventory III – Body Dissatisfaction; EDI-DT = Eating Disorder Inventory III – Drive for Thinness; EMI-B = Emotionalitätsinventar; FKE = Fragebogen zum Körperleben; HPT-WPT = warmth and heat pain thresholds; MBSRQ = Multidimensional Body-Self Relations Questionnaire; PANAS = Positive and Negative Affect Schedule; PANAS-X = Positive and Negative Affect Schedule – Expanded; PTol = pain tolerance; SATAQ−3 = Socio-cultural Attitudes Toward Appearance Scale; SCL-90 = Symptom Checklist-90; SCS = Self-compassion Scale; STAI = Spielberger's State-Trait Anxiety Inventory; TAS-20 = Toronto Alexithymia Scale.

In the analyzed studies, BID was evaluated with the use of 12 different tools (Table 1). The Eating Disorder Inventory – Body Dissatisfaction (EDI-BD) subscale was most widely used ($N = 3$). The EDI-BD consists of 10 items for assessing dissatisfaction with the shape and size of body parts that are particularly important for patients with an eating disorder (stomach, hips, thighs, buttocks) (Castellano et al., 2021).

The associated emotional and mood disorders were evaluated with 10 different research tools (Table 1). The Spielberger State-Trait Anxiety Inventory (STAI) ($N = 3$) was most frequently used in the analyzed studies. This tool consists of two subscales that evaluate a person's state anxiety (X-1) and trait anxiety (X-2). Each subscale contains 20 separate questions (Julian, 2011).

Two research tools were also used to measure the intensity of sensory input: heat pain threshold and warmth perception threshold (HPT-WPT), and pain tolerance detection threshold (PTol).

Effectiveness of Body-Oriented Therapeutic Methods in the Analyzed Research Studies

In the group of the analyzed papers, 87% (13 out of 15) demonstrated a considerable reduction in at least one risk factor associated with an eating disorder or an improvement in at least one protective factor.

Personality traits and behaviors correlated with eating disorders. The evaluated studies reported changes in the participants' psychological state relative to their personality traits. The most frequently described changes involved a reduction in dysfunctional eating behaviors, improvement in self-esteem and self-efficacy, and a decrease in anxiety and stress levels. These change trends are presented in detail in Table 1.

Body image – body acceptance. The most frequently reported changes concerned a healthy body image, manifested by improved body awareness and body acceptance. The analyzed studies demonstrated that body-oriented therapy is effective in reducing body dissatisfaction and body image preoccupation. These change trends are presented in detail in Table 1.

Discussion

General Conclusions

The aim of the present review was to evaluate the effectiveness of body-oriented therapeutic methods in treating eating disorders, reducing risk factors and enhancing protective factors. Universal prevention programs, selective prevention

programs, and indicated prevention programs were considered in the analysis, and their efficacy was compared with the control groups.

The evaluated interventions featured a body image component which influences therapeutic efficacy and the risk of relapse in patients with eating disorders. The analyzed studies involved the following therapeutic methods and protocols: mindfulness, yoga, Dance Movement Therapy, Feldenkrais method, Body Perception Treatment protocol, Basic Body Awareness Therapy, relaxation techniques, and aerobic exercise.

The review demonstrated that body-oriented therapy was effective in reducing risk factors (negative body image and negative affect) and promoting protective factors (body appreciation) relative to the control groups. The reviewed studies indicate that the incorporation of body-oriented methods into standard therapeutic programs (cognitive-behavioral therapy and/or pharmacotherapy) or the use of body-oriented therapy as a stand-alone therapeutic or preventive method can substantially reduce symptoms of eating disorders. However, further research is needed to explore the underlying mechanisms.

Limitations

Different body-oriented techniques have been proposed to date, and this type of intervention is relatively new in the prevention and treatment of eating disorders. Therefore, this preliminary review involved a limited number of research studies, and the results should be interpreted with caution.

Body-oriented psychotherapy involves various approaches and protocols whose efficacy is difficult to compare. As a result, the offered therapies cannot be easily standardized. The compared intervention programs differ in content, duration, population size, and research tools for measuring the same parameters. Many of these interventions are also implemented and conducted in a different manner, which has significant implications for the form of the applied therapeutic programs. In addition, scientific evidence supporting the efficacy of the analyzed interventions was provided by individual studies which have not been replicated. It should also be noted that the efficacy of the assessed therapies was evaluated after the intervention, and it was not validated by long-term observations. A larger number of high-quality research studies are needed to better understand the way in which body-oriented therapeutic methods can be effectively used in the prevention and treatment of eating disorders.

Directions for Further Research

According to Röhricht (Röhricht, 2009), the effectiveness of popular therapeutic methods should be supported by empirical evidence, regardless of the practitioners' preferences. Further research is needed to expand our understanding of body-oriented therapy and to implement this approach in a clinical setting on par with recognized modalities such as psychodynamic psychotherapy and cognitive-behavioral therapy.

In the future, the influence of specific interventions on risk factors and protective factors should be directly compared. In addition, the rising popularity of integrated therapies (such as CBT + body-oriented therapy) suggests that future studies should evaluate the efficacy of these types of programs. Such studies should assess the long-term efficacy of integrated therapy programs. Most importantly, research on body-oriented therapy should rely on knowledge from both social and medical sciences because studies based on research concepts and tools that are derived from a single scientific discipline disregard the methodological contributions made by other disciplines.

Conclusions

This literature review provides evidence for the efficacy of body-oriented therapeutic methods in the prevention and treatment of eating disorders. Only limited conclusions can be drawn due to a general scarcity of published studies, but the reviewed papers suggest that body-oriented therapeutic programs can reduce risk factors and enhance protective factors in the treatment of eating disorders. Further research is needed to identify interventions that are most effective for treating specific patient groups, and to describe the mechanisms underlying the efficacy of these therapies.

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Emilia Korsak*

Characteristics of Anorexia Prevention Programmes. A Systematic Review

Abstract
Aim: This study aimed to review the literature on anorexia prevention programmes targeting the general population and populations at risk and to describe the programmes selected for the review. Methods: The review was conducted under the PRISMA guidelines. The following digital databases were explored: PsychINFO, PubMed, ScienceDirect, Scopus, and Web of Science. 412 records, including 92 full-length research articles, were critically analysed. Fourteen studies that met all inclusion criteria were ultimately included in the analysis. Results: Most studies described prevention programmes for adolescents or young adults. The majority of the reviewed programmes targeted girls and young women. General and selective prevention programmes were the predominant types of interventions. The evaluated programmes differed considerably in content, modality, and duration. All of the reviewed studies have been published in the last 18 years. Conclusions: Further research is needed to develop anorexia prevention programmes that are more effective, deliver more lasting outcomes, and can be applied in various populations. Methods supporting the broad implementation of such programmes should also be identified.

Keywords:
psychoeducation, body image, eating disorders, prevention, anorexia, educational programme

* Department of Clinical, Developmental and Educational Psychology, University of Warmia and Mazury in Olsztyn, Poland, https://orcid.org/0000-0002-9677-3731, e-mail: emilia.korsak@gmail.com.

1. INTRODUCTION

1.1. ANOREXIA NERVOSA AS A LIFESTYLE DISEASE AND A SOCIAL PROBLEM

Eating disorders (ED) are severe mental and somatic disorders. According to a recent study, 13% of women and 6% of men meet the diagnostic criteria for full--syndrome or subthreshold ED during adolescence (Stice et al., 2021). Anorexia nervosa (AN) is the most prevalent ED, which is a chronic and recurrent disease that can lead to impaired psychological and social functioning, as well as other mental disorders (Dakanalis et al., 2019). Anorexia nervosa has the highest mortality rate of all psychiatric disorders (Glashouwer et al., 2019). The disease has an alarming number of somatic complications, including electrolyte imbalance (such as hypokalemia), bone mass loss (osteopenia and osteoporosis), cardiovascular disorders (bradycardia, orthostatic hypotension), gastrointestinal problems (gastroparesis), and endocrine problems (Pisetsky et al., 2016).

Although AN affects both genders, with an estimated 3:1 female-to-male ratio (Lepe-Salazar & Salgado-Torres, 2023), adolescent girls and young women are at the most significant risk, and the peak incidence is reported during adolescence and early adulthood (Galmiche et al., 2019; Glashouwer et al., 2019).

The aetiology of AN has not been fully elucidated, but researchers agree that the disease is caused by the interplay between genetic and biological factors, social and cultural influences, and personality traits (Le et al., 2017). Although the mechanisms responsible for the development and persistence of anorexia remain largely unknown, research has shown that body weight and shape concerns, including body dissatisfaction, are the strongest and most extensively studied predictors of the disease (Le et al., 2017). Negative affect, perfectionism, and thin-ideal internalisation have also been identified as AN's fundamental risk factors (Stice et al., 2021).

Body image disturbance (BID) is a characteristic feature of AN, manifested in cognitive, affective, perceptive and behavioural components. The DSM-5 classification (American Psychiatric Association, 2013) lists two aspects of BID as part of diagnostic criteria: (1) altered perception of body shape and size, and (2) significant distress caused by perceptions of body shape and size. In addition to clinical AN, many women experience subclinical ED presenting with body misperception. Some researchers regard BID as a symptom of AN (Munro et al., 2017), whereas others have argued that BID contributes to the development, persistence, and recurrence of AN, which is why BID should be targeted by prevention and therapeutic programmes (Phillipou et al., 2018).

Anorexia is a complex and chronic disease that is difficult to treat, particularly if treatment is not initiated within three years after the first symptoms have been observed (Treasure & Russell, 2011). Therapeutic methods have limited efficacy – only 30-40% of patients achieve remission, relapse is common (Stice et al., 2021), and more than 80% never receive treatment (Dakanalis et al., 2019). The availability of specialist care is low, waiting lists are long, and treatment is expensive. According to experts, not all anorexia sufferers are willing to receive professional help. Some of them may be reluctant to attend any type of psychotherapy, whereas others fear the stigma associated with participation in a mental health programme (Lepe-Salazar & Salgado-Torres, 2023). Social isolation during the COVID-19 pandemic has increased AN incidence among younger adolescents, including children (Solmi et al., 2021). However, the number of specialists and ED clinics has not increased at the same rate, which is why the "diagnose and treat" approach is unlikely to stop the rising tide of AN (Cooper & Bailey-Straebler, 2015).

Therefore, effective interventions that can prevent the onset of AN should be identified, and the main goals of health education research should be to develop and broadly implement effective prevention programmes and to identify individuals at risk of AN before disease symptoms lead to adverse changes in their mental and physical health. It is an essential approach for decreasing the prevalence of ED in the general population.

1.2. PREVENTION AS A TYPE OF MENTAL HEALTH INTERVENTION

There are four types of mental health interventions: promotion, prevention, treatment, and maintenance. Promotional measures increase public awareness about a specific health problem. Preventive measures involve interventions to reduce the negative effects of exposure to risk factors and to reinforce protective factors. Treatment focuses on specific therapeutic measures initiated after diagnosis to arrest the progression of the disease's physical, cognitive, and behavioural aspects. Maintenance involves all measures to reduce disease recurrence (Lepe-Salazar & Salgado-Torres, 2023).

According to the 2009 report of the Committee on the Prevention of Mental Disorders and Substance Abuse Among Children, Youth, and Young Adults, preventive measures can be classified into (1) universal, (2) selective, and (3) indicated, which is consistent with the typology proposed by Gordon (1983). Universal prevention targets the general population and addresses individuals in all risk categories. Selective prevention focuses on subpopulations with above-average risk. In turn, indicated prevention is addressed to individuals from high-risk groups

with early, subclinical disease symptoms (Gordon, 1983). However, this three-level classification becomes ambiguous when applied to real population samples. For example, age or gender can be regarded as risk factors, and interventions implemented in the school environment meet universal and selective prevention criteria.

1.3. RESEARCH EVIDENCE AND RESEARCH OBJECTIVE

Health education for the prevention of ED has been long neglected, and the round-table meeting convened at the National Institute of Mental Health revealed that prevention programmes had not significantly reduced the symptoms or recurrence of ED (Pearson et al., 2002). Since then, progress has been made in translating the language of research on ED development into effective intervention methods that reinforce protective factors, reduce risk factors, or even arrest disease progression.

A meta-analysis conducted by Stice, Shaw, and Marti (2007) demonstrated that 51% of the reviewed ED prevention programmes had significantly reduced at least one ED risk factor, and 29% had reduced current or future ED. They concluded that selective, multi-session, and interactive programmes offered solely to women older than 15 years and delivered by professional interventionists were more effective (Stice et al., 2007). A meta-analysis focusing on the studies done between 2006 and 2013 revealed that more research was needed on universal prevention (Wilksch, 2014). Yager, Diedrichs, Ricciardelli, and Halliwell (2013) systematically reviewed classroom-based body image programmes. They found that only half of the 16 reviewed intervention programmes effectively improved body image, but effect sizes were small (Yager et al., 2013). In turn, Eisenmann, Fröschl, and Stürzlinger (2017) reviewed the effectiveness of prevention programmes and evaluated the sociocultural risk factors associated with ED. However, their study was limited to programmes that could be implemented in Germany (Eisenmann et al., 2017). Watson et al. (2016) and Le et al. (2017) reviewed only randomised controlled trials, whereas the latest systematic review conducted by Schwartz et al. (2019) involved all studies on universal prevention of ED intending to update the meta-analysis conducted by Stice et al. (2007).

None of the published systematic reviews analysed universal, selective, and indicated prevention measures in AN prevention programmes. Moreover, the programmes selected for review were not comprehensively described. Thus, the problem for researchers and clinicians is the lack of systematised knowledge.

This article aimed to systematically review the literature on AN prevention programmes targeting the general population and populations at risk of developing ED. Furthermore, this review also serves particular purposes: identifying evidence-

-based mechanisms on which programmes are based, comparing the effectiveness of programmes, and identifying gaps in preventive actions. The following research questions were formulated:

Which AN prevention programmes are based on scientific evidence? What are the characteristic features of these programmes?

2. METHODOLOGY

A systematic literature review requires a transparent procedure for reporting search results. Systematic reviews are generally reported based on the PRISMA guidelines (Moher et al., 2009) that account for the following types of information in database search: keywords, number of identified articles, number of excluded articles, the applied inclusion/exclusion criteria, and the screening process.

2.1. IDENTIFICATION OF RESEARCH STUDIES

Research studies were identified by searching PsychINFO, PubMed, ScienceDirect, Scopus, and Web of Science databases on February 14, 2023. The keywords relating to body image and ED were combined with those relating to psychoeducation, prevention, and health education programmes, and they were used in database search according to specific requirements.

The following keywords were used in the database search: "body image" AND "anorexia nervosa" AND ("intervention" OR "program" OR "programme") AND "prevention" AND ("psychoeducation" OR "health education"). The reference lists in the identified review articles were additionally analysed.

2.2. INCLUSION AND EXCLUSION CRITERIA

The following inclusion criteria were applied to select studies for the review: (1) anorexia prevention programmes; (2) interventions involving comprehensive programmes composed of several modules, various methods, or a single method that was applied sequentially over time; (3) programmes aiming to promote protective factors and/or reduce risk factors associated with AN; (4) programmes focusing on body image/body perception; (5) studies involving at least one standardised psychological measure; (6) studies published as peer-reviewed original research articles; (7) papers written in English or Polish. Standardised measures included

protective factors, such as body satisfaction, self-esteem, and self-compassion, and risk factors, such as body dissatisfaction, thin-ideal internalisation, and subclinical pathological eating behaviours.

Interventions involving incidental measures based on a single technique or method without a structured methodology (such as yoga practice once a week) were excluded from the review.

2.3. SELECTION OF RESEARCH ARTICLES FOR THE REVIEW

The literature search yielded 412 papers in the indicated databases. Another four records were additionally identified based on the reference lists of selected articles. A total of 416 publications were identified, and 351 articles remained after duplicates were removed. Titles and abstracts were screened, and 259 records were eliminated because they lacked abstracts or because titles and/or abstracts did not meet the inclusion criteria. Ninety-two full-length research articles were critically examined, and 78 failed to meet the inclusion criteria. In systematic reviews, bias should be controlled in selecting empirical sources. The author searched the databases, and the procedure was conducted twice to guarantee the highest level of objectivity. The scope of the literature in selected databases was evaluated in the first stage of the study. A detailed literature search based on the indicated inclusion/exclusion criteria was performed in the second stage, and articles were selected for review. Anorexia prevention programmes constitute a novel field of study, and the literature on the subject is scarce. Ultimately, 14 papers that met all inclusion criteria were selected for review. The PRISMA flowchart describing the selection process and reasons for exclusion is presented in Figure 1 (Moher et al., 2009).

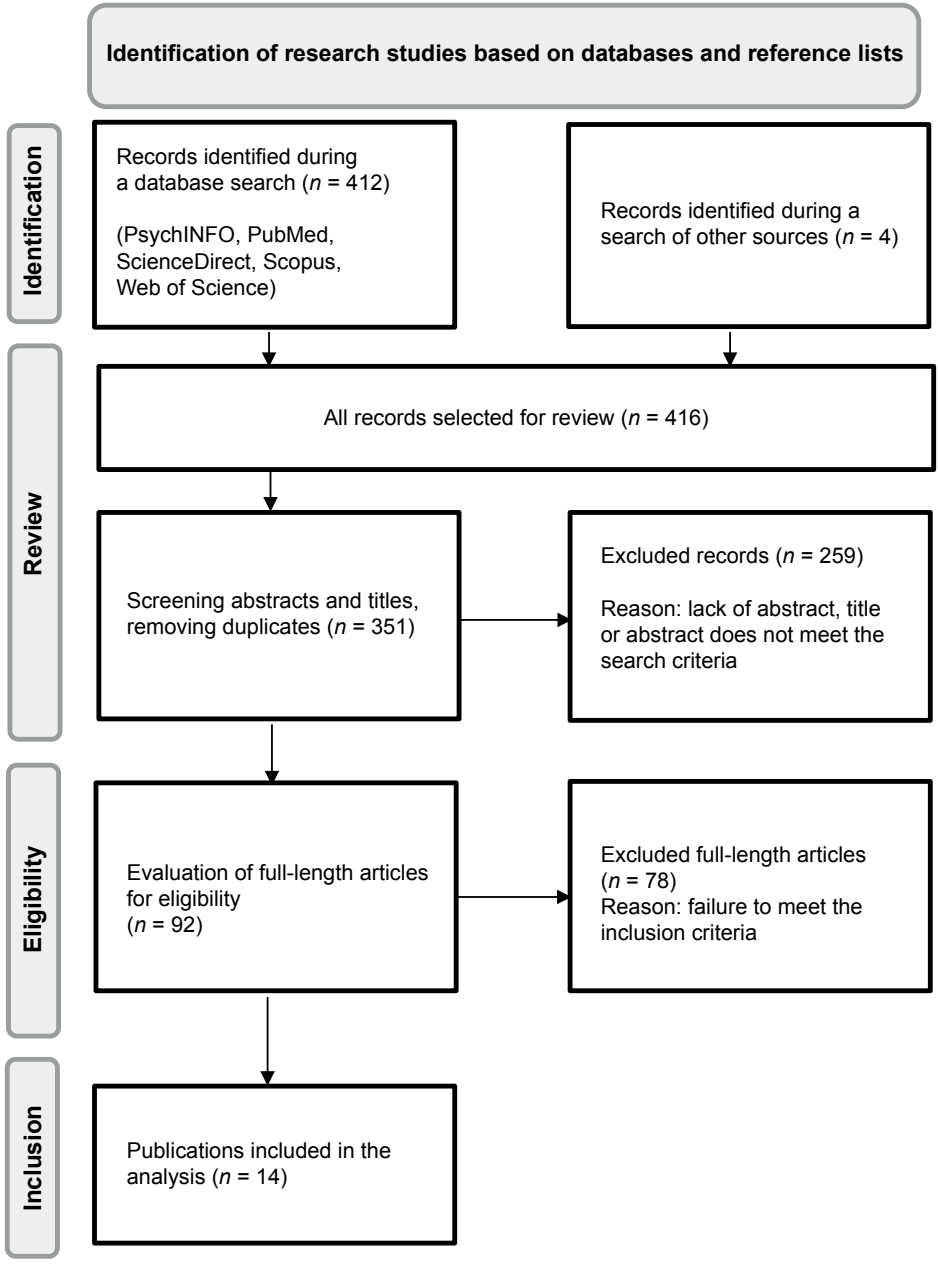


Figure 1. Information flow in each stage of the review process (Moher et al., 2009)

3. RESULTS

3.1. DESCRIPTION OF RESEARCH ARTICLES SELECTED FOR THE REVIEW

Most articles selected for review focused on prevention programmes for adolescents and young adults. The majority of these programmes targeted girls and young women (items 1, 3, 4, 5, 6, 7, 9, 12, 13, and 14 in Table1), and only four programmes were designed for both genders (items 2, 8, 10, and 11 in Table 1). Six articles described universal prevention programmes (items 2, 6, 8, 10, 11, and 13 in Table 1); six studies characterised selective prevention programmes (items 1, 3, 4, 5, 7, and 14 in Table 1); and two papers focused on indicated prevention programmes (items 9 and 12 in Table 1). The analysed interventions differed in content. Three programmes were based on the cognitive dissonance theory (items 1, 3, and 13 in Table 1); four programmes relied on the cognitive-behavioural framework (items 5, 7, 9, and 14 in Table 1); four programmes involved media literacy education (items 8, 11, and 12 in Table 1), whereas four programmes were based on an integrative approach combining cognitive therapy with body-oriented therapy (items 2, 4, 6, and 10 in Table 1). The reviewed interventions lasted from one to ten weeks. The examined programmes also differed in modality. Seven programmes involved stationary group therapy (items 1, 2, 6, 8, 10, 11, and 13 in Table 1); five programmes consisted of individual online therapy (items 3, 4, 5, 7, and 12 in Table 1), and two programmes involved individual online therapy combined with a discussion group (items 9 and 14 in Table 1). Most of the selected programmes were conducted in the US (items 1, 2, 3, 5, 6, 9, 14 in Table 1), two programmes in the UK (items 4, 8 in Table 1), two programmes in Germany (items 10, 13 in Table 1), two programmes in Australia (items 11, 12 in Table 1), and one in Mexico (item 7 in Table 1). Polish programmes were also included in the analysis. Unfortunately, due to the study, no programmes implemented in Poland were identified**.** All articles were published in the last 18 years (2005–2023).

Table 1. Description of research studies included in the systematic review

Item	Authors/ Study	Program	Theoretical framework	Prevention category	Duration	Modality	Population	Results/ Measurement tools	Country
1.	(Stice et al., 2008)	Body Project	Cognitive dissonance	Selective	3 sessions → 4 sessions	Group	Girls and young women. Age: 14-19 years	↑Body satisfaction (BPS); ↓Thin-ideal internalization (IBSS-R); ↓Negative affect (PANAS-X); ↓Eating disorder symptoms (EDDI)	USA
2.	(Estey et al., 2022)	Eat Breathe Thrive	Integrative	Universal	7 weeks, one session per week	Group	Women - 93.3%. Age: 18-65 years. Mean age: 24.73 years	↓Diet preoccupation (EDE-Q); ↓Low mood (BDI-2); ↓Difficulties in emotion regulation (DERS); ↑Interoceptive awareness (MAIA); ↑Mindful eating (MEQ); ↑Mindful self-care (MSCS-S)	USA
3.	(Stice et al., 2020)	eBody Project	Cognitive dissonance	Selective	Six 40-minute modules	Online, individual	Female college students. Mean age: 22.2 years	↓Thin-ideal internalization (TIIS); ↑Body satisfaction (BPS); ↑Eating behaviours (DRES); ↓Negative affect (PANAS-X); ↓Eating disorder symptoms (EDDI)	USA

Item	Authors/ Study	Program	Theoretical framework	Prevention category	Duration	Modality	Population	Results/ Measurement tools	Country
4.	(Alleva et al., 2015)	Expand Your Horizon	Integrative	Selective	3 written assignments per week	Online, individual	Women. Age: 18-30 years. Mean age: 22.77 years	↑Body satisfaction (MBSRQ-AS); ↑Body functionality appreciation (BES); ↑Body appreciation (BAS); ↓Self-objectification (SOQ); X Self-objectification (OBC)	UK
5.	(Franko et al., 2005)	Food, Mood and Attitude	Cognitive--behavioural	Selective	2-hour program, two weeks	Computer program, individual	Female college students. Age: 18-22 years. Mean age: 18.2 years	↓Eating disorder (EDE--Q); ↓Thin-ideal internalization (SATAQ);	USA
6.	(Scime et al., 2006)	Girls' Group	Integrative	Universal	10 weeks, one session per week	Group	School-age girls. Mean age = 10.2 years	↓Body dissatisfaction (EDI-BD); ↓Drive for thinness (EDI-DT)	USA
7.	(Lepe--Salazar & Salgado--Torres, 2023)	Guardians of the Crystal	Cognitive--behavioural	Selective	3 sessions	Online, individual	Adolescent girls. Age: 14 - 19 years. Mean age: 15.83 years	↓Drive for thinness (EDI-3); ↓Body dissatisfaction (EDI-3)	Mexico

Item	Authors/ Study	Program	Theoretical framework	Prevention category	Duration	Modality	Population	Results/ Measurement tools	Country
8.	(Bird et al., 2013)	Happy being me	Media literacy	Universal	3 weeks, one meeting per week	Group	School students, girls - 47.7%. Age: 10-11 years	↑Body satisfaction (BSVAS); ↑Eating behaviours (TFEQ – DR; TFEQ - EA); ↓Thin-ideal internalization (SATAQ-3)	UK
9.	(Taylor et al., 2016)	Image and Mood	Cognitive--behavioural	Indicated	10 weeks, one session per week	Online – individual work + discussion group	Young women. Age: 18-25 years. Mean age: 20 years	↓Drive for thinness (EDI); ↓Behaviours associated with eating disorders (EDE-Q); X Low mood (BDI)	USA
10.	(Buerger et al., 2019)	MaiStep	Integrative	Universal	5 weeks, one 90-minute session per week	Group	School students, girls - 52.8%. Age: 12-15 years	↑Interoceptive awareness (EDI-2); ↓Body avoidance (BIAQ); X Body dissatisfaction (BSQ-8c);	Germany
11.	(Wilksch & Wade, 2009)	Media Smart	Media literacy	Universal	8 sessions	Group	School students, girls – 50.6%. Mean age: 13.62 years	↓ Body weight and shape concerns (EDE-Q -WSC); ↓Dietary restraint (DEBQ-R); ↓Body dissatisfaction (EDI-BD); ↓Feelings of ineffectiveness (EDI-FOI); ↓Depression (CDI)	Australia

Item	Authors/ Study	Program	Theoretical framework	Prevention category	Duration	Modality	Population	Results/ Measurement tools	Country
12.	(Wilksch et al., 2018a)	Media Smart--Targeted	Media literacy	Indicated	9 modules	Online	Young women. Age: 18-25 years. Mean age: 20.80 years	↓ Behaviours associated with eating disorders (EDE-Q)	Australia
13.	(Wick et al., 2011)	PriMa	Cognitive dissonance	Universal	9 lessons	Group	School-age girls. Age: 10-13 years	↑Body image self-assessment (FBeK) X Eating behaviours (EAT-26D)	Germany
14.	(Taylor et al., 2006)	Student Bodies	Cognitive--behavioural	Selective	8 weeks, one session per week	Online – individual work + discussion group	Female college students. Age: 18-30 years. Mean age: 20.8 years	↓Body weight and shape concerns (EDE-Q - WSC); ↓Drive for thinness (EDI); X Low mood (CES-D)	USA

Key: **BAS** = Body Appreciation Scale; **BES** = Body Esteem Scale; **BDI** = Beck Depression Inventory; **BIAQ** = Body Image Avoidance Questionnaire - Short Version; **BPDS** = The Body Parts Scale; **BSQ-8c** = Body Shape Questionnaire - Short Version; **BSVAS** = Body Satisfaction Visual Analogue Scale; **CDI** = Child Depression Inventory; **CES-D** = Centre for Epidemiologic Studies Depression Scale; **DEBQ-R** = Dutch Eating Behaviour Questionnaire - Restrained subscale; **DERS** = Difficulties in Emotion Regulation Scale; **DRES** = Dutch restrained eating scale; **EAT-26D** = Eating Attitudes Test, German Version; **EDDI** = Eating Disorder Diagnostic Interview; **EDE-Q** = Eating Disorder Examination - Questionnaire, subscales: BN = Bulimia, WSC = Weight and shape concerns; R = Dietary restraint; EDI = Eating Disorder Inventory, subscales: BD = Body dissatisfaction, BN = Bulimic behaviour, **DT** = Drive for Thinness, **FOI** = Feelings of Ineffectiveness; **FBeK** = Fragebogen zur Beurteilung des eigenen Körpers [Body image self-assessment questionnaire]; **IBSS-R** = Ideal-Body Stereotype Scale-Revised; **MAIA** = Multidimensional Assessment of Interoceptive Awareness; **MBSRQ-AS** = Multidimensional Body Self-Relations Questionnaire - Appearance Subscales; **MEQ** = Mindful Eating Questionnaire; **MSCS-S** = Mindful Self-Care Scale-Short; **OBC** = Objectified Body Consciousness Scale; **PANAS-X** = Positive Affect and Negative Affect Scale-Revised; **SATAQ-3** = Sociocultural Attitudes Towards Appearance Questionnaire-3; **SOQ** = Self-Objectification Questionnaire; **TFEQ** = Three-Factor Eating Questionnaire, subscales: **DR** = Dietary restraint, EA = Emotional eating; **TIIS** = Thin-Ideal Internalisation scale

3.2. DESCRIPTION OF PREVENTION PROGRAMMES IN THE REVIEWED ARTICLES

Body Project

The Body Project has been designed to explore and reduce thin-ideal internalisation. The participants critically assess media images of ideal bodies during group discussions, through written exercises, and behavioural therapy (Stice et al., 2008). The programme effectively reduced ED risk factors, symptoms, and psychosocial discomfort during a three-year follow-up period (Halliwell & Diedrichs, 2014; Stice et al., 2008; Stice et al., 2015). The Body Project decreased the risk of cardiovascular disease in women with clinical and subclinical symptoms of ED (Green et al., 2017). Functional magnetic resonance imaging (fMRI) scans revealed a reduction in physiological/neuronal responses in subjects viewing images of thin models, which suggests that women who completed the programme perceive the thin ideal as a less desirable goal (Stice et al., 2015). The participants initially attended three sessions. The final version of the programme consists of four sessions addressed to adolescent girls and young women (Stice et al., 2008; Stice et al., 2015). The Body Project had been designed as a selective prevention programme, and it currently meets universal prevention criteria (Becker & Stice, 2017; Levine, 2017).

eBody Project

The eBody Project is an Internet-based version of the Body Project, during which participants complete six 40-minute modules over four weeks. The programme was found to be effective in reducing ED risk factors and symptoms over a four-year follow-up period (Stice et al., 2020). An adapted version of the programme (6 weeks) was tested in China, and it was effective among adolescent girls younger than 18 (Luo et al., 2021).

PriMa

PriMa is a prevention programme designed for implementation in schools, and it consists of a textbook and an exercise book for students. The programme involves discussions and interactive measures such as role play (Wick et al., 2011). PriMa was developed to reduce AN risk factors, including ED and low body satisfaction, and it relies on the biopsychosocial health model (Engel, 1977). The reviewed analyses indicate that the programme did not induce significant changes in eating behaviours but improved body satisfaction over a 7-8-year follow-up period (between childhood and early adulthood) (Adametz et al., 2017).

Guardians of the Crystal

Guardians of the Crystal is a persuasive health game (Orji et al., 2017) based on cognitive-behavioural therapy for preventing AN in teenage girls. The programme is a visual story designed to familiarise players with risk factors, protective factors, and psychoeducation materials through interactive activities. The content is presented through characters, dialogues, scenarios, and puzzles. The game is divided into eight levels representing eight days in a player's life. Each day, the players are presented with new materials on ED. The game involves the following types of activities: (1) problem-solving, (2) overcoming challenges, (3) acquiring and practising new skills, (4) understanding something or someone from a new perspective (Lepe-Salazar & Salgado-Torres, 2023).

Student Bodies

Student Bodies is an eight-week, structured, Internet-based programme incorporating cognitive-behavioural therapy techniques to reduce body weight and shape concerns and improve body image. The main topics of online interventions include protective factors and risk factors in ED, work on improving body image, and healthy eating strategies. During weekly sessions, participants have unlimited access to the current week's materials and accompanying components. They are encouraged to keep a journal, set goals, and participate in an online discussion group moderated by a psychologist (Taylor et al., 2006). A significant improvement in ED-related attitudes was observed during a six-month follow-up period, and analyses revealed that the programme effectively reduced risk factors in young adults (Jacobi et al., 2012) and school students (Abascal et al., 2004).

Image and Mood

Image and Mood was derived from the Student Bodies programme, involving ten instead of eight weekly sessions. In addition to the original content, the programme addresses problems associated with social functioning, coping with criticism, and seeking support. The programme was designed for female college students who face numerous challenges during the transition to adulthood (new environment, academic pressure, and moving out of the family home). For nine months after the intervention, the participants received monthly newsletters on ED, cognitive-behavioural therapeutic techniques, and the option of returning to the programme (Taylor et al., 2016).

Food, Mood, and Attitude

The Food, Mood and Attitude programme relies on the cognitive-behavioural framework and the Dual Pathway model proposed by Stice, Nemeroff, and Shaw (1996), which postulates that social and cultural pressures endorsing ideal body stereotypes lead to thin-ideal internalisation because these ideals are largely impossible to achieve, which contributes to negative affect and the risk of ED (Stice & van Ryzin, 2019). In addition to ED-related topics (body dissatisfaction, eating behaviours, negative affect), the programme addresses general mental health problems, including self-worth and coping skills for difficult situations. A significant reduction in ED symptoms and thin-ideal internalisation was reported after the intervention and during a three-month follow-up period (Franko et al., 2005). However, the following randomised controlled trial did not reveal a significant improvement in ED symptoms (Franko et al., 2012).

Media Smart

Media Smart is an informed media literacy programme for adolescents, consisting of eight sessions. The programme aims to analyse gender stereotypes in advertisements and provide the participants with tools to help them understand and interpret media messages and make conscious choices. The programme effectively reduced body dissatisfaction, symptoms of depression, body weight and shape concerns, and dietary restraint in 13-year-old girls and boys. A post-test conducted 30 months after the intervention confirmed the programme's efficacy (Wilksch et al., 2015; Wilksch & Wade, 2009).

Media Smart-Targeted

Media Smart-Targeted is an online adaptation of the programme targeting young women (18-25 years) at a higher risk of ED. The programme effectively reduced ED behaviours (Wilksch et al., 2018a; Wilksch et al., 2018b).

Happy Being Me

Happy Being Me is a three-session, school-based body image intervention which was designed for 11- to 14-year-old Australian girls to reduce body dissatisfaction and thin-ideal internalisation, increase self-esteem, improve social skills, and eliminate appearance-related comparisons that lead to body dissatisfaction (Richardson & Paxton, 2010). A follow-up study revealed that the intervention could also be effective in boys and girls aged 10-11 (Bird et al., 2013). No significant differences were observed between universal (co-educational) and selective

(girls only) delivery, which suggests that the programme can be implemented in both modes (Dunstan et al., 2017).

MaiStep

MaiStep is an integrative psychoeducation programme (cognitive dissonance, media literacy, emotion regulation strategies) involving bodywork (mindfulness) which was designed to reduce thin-ideal internalisation and improve interoceptive awareness, self-efficacy, and body satisfaction. The programme involves interactive measures such as skills training and group discussion. Two persons (male and female) deliver the intervention to maximise the participants' comfort. Body-related issues can be discussed separately with girls and boys (Buerger et al., 2019).

Eat Breathe Thrive

Eat Breathe Thrive is an integrative psychoeducation programme (cognitive dissonance, media literacy) involving bodywork (yoga) to enhance the mind-body connection and interoceptive awareness. Each session consists of one hour of psychoeducation, followed by one hour of yoga. Different types of yoga practice are incorporated in each session to achieve a balance between bodywork and psychoeducation (mind-body connection, body functional appreciation, interception, body image, self-regulation). The session ends with a four-step Interoceptive Meditation to promote breath awareness, body awareness (emptiness, constriction, pain), needs awareness (hunger, rest), and to encourage the participants to address their needs (such as eating a nutritious meal) (Estey et al., 2022).

Girls' Group

Girls' Group is a programme integrating positive psychology techniques with yoga to improve the body-mind connection. The intervention aims to reduce body dissatisfaction and drive for thinness. The curriculum involves issues related to body image, self-esteem, social skills, media literacy, and thin-ideal internalisation. Each session begins with 30 minutes of yoga, followed by a theoretical introduction and interactive discourse. The session ends with 15 minutes of relaxation. During the last four sessions, the participants are encouraged to develop a project (a magazine or a DVD recording) to disseminate the learned information (Scime et al., 2006).

Expand Your Horizon

The Expand Your Horizon programme was designed for women to increase body satisfaction and decrease self-objectification. The participants completed

three structured written assignments to focus on the functionality rather than the appearance of their bodies. The intervention begins with a brief introduction to different aspects of body image. Each written assignment focuses on a different area of body functionality: (1) senses and physical capacities; (2) health and creative endeavours; (3) self-care and communication with others (Alleva et al., 2015). During a one-month follow-up, women who participated in the intervention experienced greater appearance and functionality satisfaction (Alleva et al., 2018).

Differences in the level of detail in programme descriptions are due to differences in the level of source texts.

4. DISCUSSION

4.1. GENERAL CONCLUSIONS

This study aimed to review the literature on AN prevention programmes targeting the general population and populations at risk of AN and to characterise the programmes selected for the review.

Fourteen prevention programmes designed to reduce AN risk factors, inhibit AN development, and minimise the risk of disease recurrence were examined. The efficacy of the reviewed programmes differed considerably; it should be stressed that many programmes that delivered satisfactory results did not have long-term follow-up periods, which prevents a reliable assessment of the persistence of treatment outcomes.

The first ED prevention programmes involved mainly psychoeducation and lessons, but their efficacy was low. Current programmes are more interactive – they actively engage the participants, teach new skills, and focus on specific risk factors, such as thin-ideal internalisation and body dissatisfaction (Stice et al., 2013).

The analysed programmes also differed in modality. Four leading approaches were identified: cognitive dissonance, cognitive-behavioural therapy, media literacy, and integrative therapy.

Social psychologists developed the cognitive dissonance theory. It claims that people seek psychological consistency between their behaviours, thoughts, and beliefs. Cognitive dissonance can lead to psychological tension, a negative emotional state that drives people to change their attitudes to reduce the inconsistency between thoughts and behaviours (Harmon-Jones & Mills, 2019). Cognitive dissonance is intensified when an individual voluntarily adopts an attitude inconsistent with his or her beliefs. Therapeutic approaches based on dissonance are

more effective than psychoeducation, where a teacher motivates participants to change their behaviour (Stice et al., 2008). Eating disorder prevention programmes that rely on the cognitive dissonance theory reduce thin-ideal internalisation, which, according to the Dual Pathway model, minimises ED risk factors such as destructive eating habits, body weight and shape concerns, and negative affect (Stice & van Ryzin, 2019).

Cognitive-behavioural therapy is based on the assumption that negative responses to the source of an undesirable influence (risk factors) result from cognitive distortions rather than the nature of that source (Ledley, 2020). Effective adaptive strategies (protective factors) can be developed using various techniques, particularly cognitive restructuring, Socratic questioning, and systematic and gradual exposure to behavioural exercises (Lepe-Salazar & Salgado-Torres, 2023). Cognitive-behavioural therapy is presently the most popular modality in treating distorted body image, which is one of the key predictors of ED (Lewis-Smith et al., 2019). However, research has demonstrated that cognitive-behavioural therapy is effective in treating certain types of ED, such as bulimia (BN) and binge eating disorder (BED), but there is little evidence to confirm its efficacy in the treatment of AN (Baile & Rabito-Alcón, 2022).

Exposure to media messages and images promoting unrealistic body ideals leads to body dissatisfaction and thin-ideal internalisation (McLean et al., 2016a). Media literacy programmes are promoted as a promising educational tool which prevents ED through the development of critical thinking. People who participate in media literacy programmes: (1) learn about the media's role in shaping definitions of beauty, health, and appearance; (2) become familiar with the techniques used by the media to convey beauty ideals and manipulate images; (3) create positive media messages through the development of consumer activism (McLean et al., 2016b).

There is a general scarcity of evidence to support the efficacy of various interventions and modalities in AN prevention and treatment. Integrative psychology has attempted to rise to this challenge, both in the context of reporting and validating the efficacy of trials. Currently, various therapeutic approaches are being integrated on the assumption that the selected strategies and procedures must be adapted to specific problems. Integrative psychotherapy draws heavily upon the humanistic philosophy, which focuses on humans and their needs. Integrative psychotherapy also relies on the cognitive-behavioural approach, where considerable emphasis is placed on identifying and modifying automatic thought patterns that negatively affect emotions and behaviours. Body-oriented therapy is also becoming an increasingly recognised modality in practices that integrate classical psychotherapeutic models.

Body-oriented methods are incorporated into ED prevention because they reinforce protective factors by cultivating positive embodiment (Perey & Cook-Cottone, 2020). Evidence indicates that body-oriented therapy effectively promotes interoceptive awareness and body-mind communication (Alleva et al., 2020). During mindfulness practice, participants must focus inwards and listen to their bodies without attempting to change or control them (Khoury, 2018). In turn, yoga enhances body functionality, appreciation and embodiment, reducing self-objectification and body control by promoting body acceptance, self-compassion, and a sense of personal agency (Cox & Tylka, 2020). These competencies are fundamental in preventing and treating ED (Neumark-Sztainer et al., 2020). A systematic review of body-oriented therapies in ED prevention demonstrated that programmes engaging the body effectively reduce risk factors and promote protective factors. Such programmes can be incorporated into basic therapeutic modalities to minimise the symptoms of ED (Korsak, 2022).

4.2. IMPLICATIONS FOR FUTURE RESEARCH

Considerable advances in developing and designing effective ED prevention programmes have been made in recent years, but several important issues need to be addressed in future research.

For prevention programmes to be broadly implemented by educators and clinicians, scientists who develop and validate these programmes should strive to design interventions that deliver more substantial and more lasting outcomes, for example, by relying on the integrative approach, including large population samples, prolonging the observation period, and conducting blinded trials. The most effective interventions should be optimised and tested multiple times to improve participation and cost-effectiveness. The most promising programmes should also be independently replicated. Although new programmes are being developed, there is a general scarcity of research into methods for promoting and implementing these interventions. Potential barriers to the broad implementation of prevention programmes should be identified.

As mentioned, women are more susceptible to the negative consequences of risk factors, such as thin-ideal internalisation and body dissatisfaction, than men, and they are more predisposed to develop ED. However, recent research suggests that ED increasingly often affect men (Baker & Blanchard, 2018). For this reason, parallel studies should be conducted on both genders to evaluate the efficacy of interventions in the male population. In the future, the applicability of

prevention programmes should also be examined in various ethnic, gender, and sexual orientation groups to determine their efficacy in different populations.

Research indicates that prevention programmes should target specific risk factors of ED, including thin-ideal internalisation, body image perception, coping strategies, and negative affect (Svantorp-Tveiten et al., 2022). Most interventions developed to date have focused on body image. However, other risk factors have been identified as possible causes of ED (such as negative affect); therefore, attempts should be made to determine whether interventions that directly target these factors are more effective.

AN incidence, including cases requiring hospitalisation, increased dramatically during the COVID-19 pandemic (Haripersad et al., 2021). Remote mental health interventions surged during the lockdown are continued in the post-pandemic period when health restrictions no longer apply (Pellegrini et al., 2022). There is considerable evidence to indicate that virtual mental health care is a promising therapeutic modality. Therefore, in-person and virtual delivery of mental health services should be considered during the development of AN prevention programmes. Telehealth services can be implemented broadly, including on a global scale, and they should also be addressed to patients in areas where in-person medical care is not available (such as rural areas). In addition, app-based and web-based virtual interactions, chatbots, and other sociotechnical tools, such as anonymous or asynchronous communication, can be deployed to make ED prevention programmes more available to individuals unable to attend therapy in person.

4.3. LIMITATIONS

The main weakness of this study was that only 14 research studies were included in the systematic review. Due to the limited number of examined studies, the results should be interpreted cautiously. The language of the article was one of the inclusion criteria (only Polish – or English-language papers were considered), and it is possible that other effective AN prevention programmes that did not meet the above criterion have been developed.

5. CONCLUSIONS

Considerable scientific advances in the treatment of ED have been made in the last 18 years. The key risk factors associated with AN have been identified and included in prevention programmes to effectively reduce these risks, alleviate the

symptoms of ED, and minimise disease recurrence. However, further research is needed to develop more effective programmes, deliver more lasting outcomes, and target various populations. Greater emphasis should also be placed on methods that enable broad implementation of mental health interventions to reach the largest possible number of individuals at risk of AN.

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MOVEMENT AS PREVENTIVE EDUCATION FOR FEMALES AT RISK OF ANOREXIA NERVOSA: EFFECTS OF PHYSICAL-COGNITIVE INTERVENTIONS ON PSYCHOPHYSIOLOGICAL MARKERS

Emilia Korsak [1*] [ABCDEF], **Ewa Ratajczak** [2] [CDE]

[1] Department of Clinical Psychology, Development, and Education, Faculty of Social Sciences, University of Warmia and Mazury in Olsztyn, Poland
[2] Department of Clinical Psychology and Neuropsychology, Institute of Psychology Faculty of Philosophy and Social Sciences, Nicolaus Copernicus University in Toruń, Poland

Authors' contribution:

A. Study design/planning
B. Data collection/entry
C. Data analysis/statistics
D. Data interpretation
E. Preparation of manuscript
F. Literature analysis/search
G. Funds collection

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*Author for correspondence: emilia.korsak@gmail.com

Abstract:

Background: Anorexia nervosa (AN) is a complex psychiatric disorder posing major challenges to treatment. Effective early prevention requires interdisciplinary approaches integrating physical activity with health education. The aim of this study was to evaluate the preventive potential of structured body-oriented interventions by comparing their effectiveness in improving subjective and physiological well-being among young women at risk of developing AN.

Methods: Forty-two women exhibiting Anorexia Readiness Syndrome (ARS) symptoms were randomly assigned to three *Nalu. Mindful Movement* interventions: Dance Movement Therapy (DMT), yoga, and mindfulness. Well-being was assessed subjectively (stress, anxiety, mood, eating disorder symptoms) and objectively (heart rate and heart rate variability parameters). Measurements were taken at baseline, after a four-week control period, and following a four-week intervention. Interoceptive awareness was examined as a potential mediator of psychophysiological resilience to AN risk.

Results: Mixed-design repeated-measures ANOVA showed no changes in psychometric measures and a stress-like physiological decline during the control period. All interventions improved subjective well-being, while physiological improvement occurred after yoga and mindfulness training. Yoga produced the strongest overall effects. Regression analyses indicated that ARS scores were predicted by body dissatisfaction and low self-esteem, both linked to interoceptive deficits and trait anxiety. Improvements in self-esteem and body dissatisfaction were associated with intervention-related increases in interoceptive awareness.

Conclusion: Integrative physical–mental practices may serve as effective preventive strategies against eating disorders by enhancing interoceptive awareness and emotional regulation. These findings support the inclusion of such interventions within health education and exercise science curricula targeting at-risk populations.

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Introduction

Anorexia nervosa (AN) is a prevalent eating disorders, marked by impaired psychosocial functioning, chronicity, and recurrence, often leading to additional psychiatric disorders [1]. A key diagnostic criterion for AN is the disruption in body image, which drives dietary restrictions causing severe weight loss and malnutrition, and plays a significant role in the disease's onset, persistence, and relapse [2]. AN is also associated with impaired emotional and cognitive functioning, further contributing to body image disturbance [3].

Diagnosing AN is not always feasible, as symptoms may lack the necessary duration, frequency, or severity for a formal diagnosis. In such instances, it may be appropriate to refer to a predisposition toward AN. The Anorexia Readiness Syndrome (ARS) is identified by psychological, physiological, and social indicators (Table A, Supplement A). The symptoms affect cognitive and behavioural functioning; irregularities in food needs, body attitudes, and perception of attractiveness [4]. ARS is not equivalent to specific eating disorders nor classified as a nonspecific eating or feeding disorder. It does not predict anorexia onset but may be a risk factor. To date, no systematic studies have examined the psychophysiological characteristics of this syndrome.

Body image disturbance is a core characteristic for many ED aetiology models however, neither model includes interoceptive abilities. Empirical studies point towards low proprioception [5] and interoceptive deficits [6] in ED development, congruent with brain activity alterations within regions linked to body perception [7]. More pronounced deficits in interoceptive awareness (IA) are associated with poorer ED treatment outcomes [8].

Paulus and Stein [9] state that in anxiety and depression, self-referential beliefs significantly affect the evaluation of anticipatory interoceptive signals, amplifying their negative aspects. The model suggests two types of dysregulation: primary bottom-up and predominantly top-down. Individuals struggle to discern bodily signals due to a reduced signal-to-noise ratio of interoceptive afferents. The brain's need to modulate interoceptive signals leads to overactivity in cognitive control regions, resulting in intensified negative thoughts and beliefs [9]. Poor interoceptive abilities may enhance anxiety from stressful situations and adverse life events - key risk factors for anorexic behaviour. Body image disruption, such as objectification and lack of body acceptance, is linked to low self-esteem, self-loathing, and distorted perceptions of bodily signals.

The perception of body image is associated with interoceptive sensitivity [10]. Body awareness is fundamental in the embodiment disturbances in ED [11]. Interoception is critical for self-awareness, emotional perception [12] and adaptive emotion regulation [13]. Deficits in IA can hinder the differentiation between bodily sensations and emotional states, e.g. distinguishing hunger from anxiety in EDs [14]. The self-perpetuation of AN reinforces psychological challenges through starvation's adverse effects on physiological feedback [15]. The disconnection between cognitive and physiological information leads to incongruence between emotional experiences and physiological responses [16], contributing to the vague and overwhelming emotions reported in AN [17].

Early signs of AN often resemble a healthy athletic lifestyle – the 'female athlete triad': menstrual dysfunction, low energy availability, and low bone density [18]. However, AN adversely affects psychophysiological functioning, impacting autonomic nervous system (ANS) activity. Regulation of autonomic balance is often measured by heart rate variability (HRV) [19], a biomarker of mental and physical stress [20] and stress adaptability [21]. High HRV represents psychological resilience and the ability to cope with stress, while low HRV indicates autonomic imbalance, stress, anxiety, depression and poor health overall [22–24]. Although inconsistencies in the relationship between EDs and HRV were reported [25], compared to healthy individuals [26] and even athletes [18], AN patients exhibit bradycardia and higher HRV. This suggests that HR and HRV could serve as potential diagnostic biomarkers of AN. The primary reason for ED-related changes in cardiac functioning include caloric restrictions [27,28] combined with energy expenditure related to heavy exercise and growth at puberty, leading to physiological 'hibernation'. Refeeding partially restores HR and HRV values to control levels, rendering cardiovascular functioning a viable measure of both AN progression and recovery [18].

Early identification and effective prevention programs could reduce AN prevalence and progression. Body-oriented approaches, such as Yoga, Mindfulness, and Dance Movement Therapy (DMT), are increasingly used in the prevention and treatment of EDs [29–31]. Recent research supports their effectiveness in alleviating body image concerns, media message internalization, and negative affect [32]. A systematic review shows that body-oriented therapies effectively reduce risk factors and promote protective factors, significantly reducing ED symptoms [33].

The lack of adequate interoceptive awareness is increasingly recognised to play a fundamental role in AN development and maintenance [7]. Emotional avoidance and maladaptive regulation in AN [17] result in employing eating disorder behaviours as a means to regulate emotions. Body-oriented interventions support the development of adaptive strategies for managing affect (e.g. cognitive (re) appraisal) and interoceptive awareness [34]. However,

to our best knowledge, no randomised trial has investigated the effectiveness of such methods in AN prevention on both objective (physiological) and subjective (psychometric) measures of well-being. The objective of this pilot study is to fill this gap by answering the following question: *Which body-oriented approach demonstrates the greatest effectiveness in enhancing well-being at the subjective and physiological levels among individuals at risk of developing anorexia nervosa?* Based on the articulated objectives, the following general hypotheses were formulated: (1) Participation in a body-oriented intervention will yield improvements in subjective indicators; (2) Participation in a body-oriented intervention will result in enhancements in physiological indicators; (3) Participation in various body-oriented interventions will produce differential effects on both subjective and physiological outcomes.

Subjective effectiveness is defined as a reduction in ED symptoms (body dissatisfaction, deficits in interoceptive awareness, and low self-esteem), anxiety (state and trait), and perceived stress intensity, and an improvement in mood (tension, energetic arousal, and hedonic tone). Objective effectiveness is interpreted as changes in physiological parameters (HR and HRV). Since no systematic studies of ARS-related psychophysiological characteristics exist, this study aims to explore the potential aetiology and prevention of AN from the standpoint of interoceptive awareness and its deficits.

Material and Methods

Study Design

The study was conducted between March and December 2023 at the University of Warmia and Mazury's Academic Psychological Assistance and Therapy Centre EMPATIA. It included two 4-week phases: (1) control and (2) experimental, assessing changes in subjective and psychophysiological variables related to, respectively, (1) life as usual (LAU) and (2) participation in weekly educational sessions based the Nalu. Mindful Movement program tailored for individuals at risk of developing AN (Figure 1). The program consists of eight modules, each featuring a psychoeducational component and a corresponding movement segment within a mindfulness approach. The effectiveness of three modules was evaluated in separate experimental groups: (1) DMT; (2) Yoga; and (3) Mindfulness. Subjective assessment of psychological and physiological well-being was conducted three times: (1) at baseline (beginning of the control phase), (2) at pretest (beginning of the experimental phase), and (3) at posttest (following the experimental phase). The study was approved by the Ethical Committee for Scientific Research at the affiliated institution (Decision No. 17/2021).

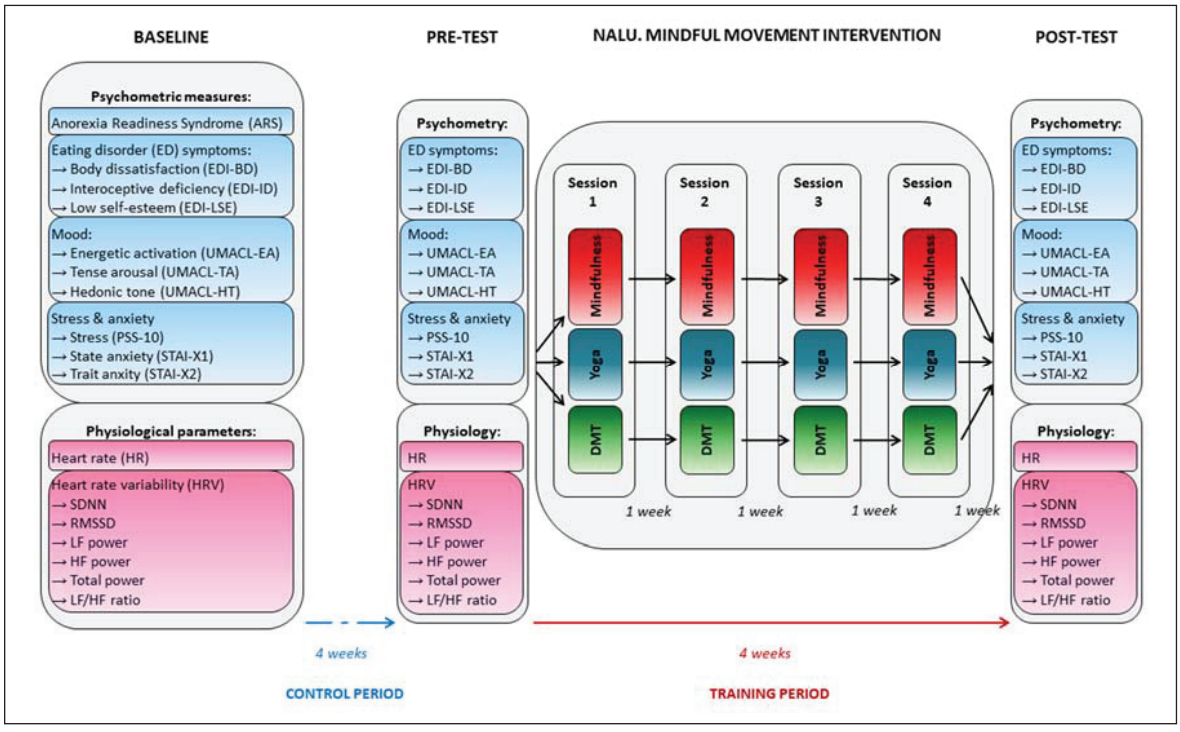


Figure 1. Schematic representation of the study design

Participants

Participants were recruited through the University's and EMPATIA Centre's social media. Voluntary participation was confirmed with a written consent. Given the absence of established norms for the Anorexia Readiness Syndrome Inventory (SGA-12), the pre-anorexic state was assumed at ARS score one standard deviation above the mean [4]. The population mean for young adult women was assessed among 154 female university students aged 18-25 ($M = 23.47$, $SD = 2.46$). ARS was assumed at ARS score ≥ 5.93. 98 participants aged 18-25 with self-assessed concerns related to ED-like habits and beliefs volunteered for the study. Their eligibility was assessed in two steps (Figure 2): 1) ARS symptom screening (SGA-12) and 2) structured clinical interview designed to exclude mental disorders or somatic illnesses. 16 participants were excluded on the grounds of a pre-existing ED diagnosis, four were not interested in the program, and 29 resigned due to the expected inability to attend all sessions. Following random assignment to experimental groups, four DMT group participants dropped out for personal reasons. Physiological data were missing from three participants. A total of 42 participants aged 19-25 ($M = 22.10$, $SD = 1.69$) completed the training: $N_{DMT} = 10$, $N_{Yoga} = 17$, $N_{Mindfulness} = 15$. The groups did not differ with respect to their size ($Chi^2(2)=1.86$; $p=0.395$), the participants' age, psychometric and physiological variables at both baseline and pre-test (except for hedonic tone, lower for DMT group compared to Yoga at baseline; for all descriptive statistics see Table 1 in the Results section).

Interventions

The interventions were conducted in weekly group sessions using three established body-oriented approaches (for a comprehensive program description see Supplement B). The Nalu. Mindful Movement program is a psychoeducational intervention designed to prevent the onset of AN through the integration of movement, mindfulness, and health education. In the present study, the focus was placed specifically on its movement-based component to examine the preventive potential of body-oriented practices in at-risk individuals. (1) The Nalu. Mindful Movement DMT intervention was based on Chace's model [35] and included guided imagery [36] and movement references from Laban's

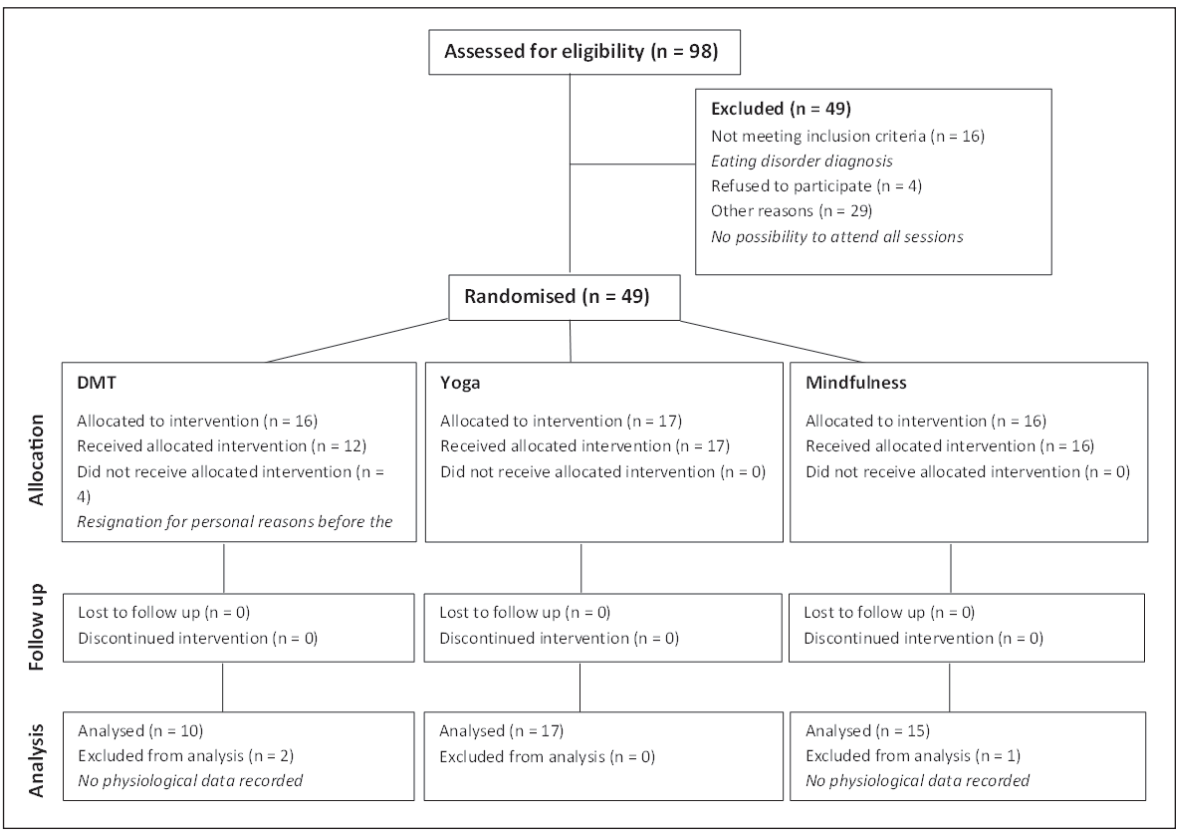


Figure 2. A CONSORT diagram of participants' flow through stages of the randomised trial

analysis [37]. (2) The Nalu. Mindful Movement Yoga module was developed by a certified yoga teacher based on a systematic literature review of effective yoga interventions [38–40]. (3) The Nalu. Mindful Movement Mindfulness program was based on a manual by Teasdale, Segal, and Williams (2002); the intervention was abbreviated and adapted for a non-clinical population with ARS. Treatment fidelity was assessed as session attendance, while adherence to home practice was controlled based on participants' declaration.

Psychometric Assessment Tools

The following psychometric questionnaires were utilised (for a comprehensive description see Supplement B): the Anorexia Readiness Syndrome Inventory (SGA-12) [4], the Eating Disorder Inventory (EDI) [41], the Perceived Stress Scale (PSS-10) [42], the State-Trait Anxiety Inventory (STAI) [43], and the UWIST Mood Adjective Checklist (UMACL) [44].

Physiological Measurements & Data Processing

Physiological functioning was assessed with the Aidmed Telemedical System (Aidlab, Poland) [45]. The electrocardiographic (ECG) signal was registered using the Aidmed One single-lead recorder at 250 Hz sampling rate and analysed with the Aidmed Health software. HR time series was detected from the QRS complex with the Hamilton algorithm. Ectopic beats and RR interval outliers (beyond the 30-200 bpm range) were removed using linear interpolation [46]. Power spectrum analysis of the RR intervals subjected to linear interpolation with a 4 Hz sampling rate was based on the FFT method. HRV parameters were calculated in time-domain (HR – heart rate, SDNN - standard deviation of the normal-to-normal intervals, RMSSD – root mean square of successive differences between normal heartbeats) and frequency-domain (TP – total power, LF – low-frequency power, HF – high-frequency power, LF/HF – ratio of low- to high-frequency power) (Table B.4, Supplement B).

Statistical Analysis

Statistical analysis was performed using SPSS ver. 29.0.2.0 (IBM Corp., 2024) with significance assumed at $p < 0.05$. Descriptive statistics are available in Table 1. HR and HRV indices were natural log-transformed due to a lack of normal distribution. Intervention-related changes in all dependent variables were calculated as simple differences (post-test minus pre-test).

Interventions' effects were compared with a mixed-design repeated-measures ANOVA with the type of intervention *group* (DMT, Yoga, Mindfulness) as the between-subjects factor and measurement *time* (baseline, pre-test, post-test) as the within-subjects (repeated-measures) factor. Simple effects were confirmed with non-parametric tests. Linear and quadratic trend analysis was performed for main and simple main effects. Data distribution was controlled for variance homogeneity (Levene's test) and sphericity (Mauchly's test), with violations corrected using the Greenhouse-Geisser adjustment. Effect sizes were calculated as partial eta-squared (η_p^2) for general linear models and Cohen's d for t-tests. To address data skewness, BCa bootstrap intervals were calculated for simple effects tests (1000 random samples stratified by *group*). The Bonferroni correction was applied to address family-wise alpha error inflation in post-hoc analysis.

The disorder's aetiology and preventive intervention mechanisms were investigated using stepwise (F-inclusion $p<=.050$, F-exclusion $p>=.100$) multiple linear regression modelling of the ARS score with intervention-related changes in ED symptoms. To avoid reverse causation, dependent variables from antecedent models were not used as predictors in subsequent models. Autocorrelation of residuals was assessed via the Durbin-Watson statistic, and predictor cross-correlation was addressed by calculating partial correlation and collinearity parameters (tolerance and VIF). A 95% CI for regression coefficient B was calculated using the BCa bootstrap method (2000 random samples).

Results

Interventions' Effects on Psychometric & Physiological Data

The descriptive statistics for psychometric and physiological parameters for each *group* and each *time* point can be found in Table 1 together with simple main effects of intervention *group* at each of the three *time* points.

Table 1. Descriptive statistics and between-group differences for psychometric and physiological variables in different intervention groups at three time points

	Mean (SD)			ANOVA	
	DMT	Yoga	Mindfulness	p	η_p^2 (CI95%)
Age	23.00 (1.05)	22.00 (1.87)	21.60 (1.68)	.122	.10 (.00-.27)
ARS	8.90 (1.91)	8.77 (1.64)	8.62 (1.62)	.576	.03 (.00-.15)
Baseline					
EDI-BD	14.70 (7.24)	14.18 (9.30)	12.27 (8.00)	.732	.02 (.00-.12)
EDI-ID	19.90 (8.10)	14.82 (6.53)	14.47 (8.52)	.180	.08 (.00-.25)
EDI-LSE	10.50 (4.65)	7.53 (5.01)	7.60 (4.98)	.269	.07 (.00-.22)
PSS-10	17.80 (4.80)	18.18 (5.25)	18.33 (3.81)	.961	.00 (.00-.02)
STAI-X1	43.00 (8.67)	43.47 (11.19)	42.60 (13.08)	.977	.00 (.00-.00)
STAI-X2	52.10 (9.72)	5.82 (10.11)	51.20 (8.86)	.945	.00 (.00-.04)
UMACL-EA	23.20 (4.98)	26.29 (6.01)	24.20 (5.35)	.337	.05 (.00-.20)
UMACL-TA	2.90 (5.15)	19.59 (5.08)	2.60 (7.42)	.832	.01 (.00-.09)
UMACL-HT	24.30 (4.90)	3.71 (4.96)	26.73 (7.46)	.027	.17 (.00-.35)
HR	4.35 (.21)	4.33 (.12)	4.38 (.10)	.702	.02 (.00-.12)
SDNN	3.98 (.48)	4.14 (.37)	3.95 (.32)	.339	.05 (.00-.20)
RMSSD	3.57 (.60)	3.70 (.53)	3.43 (.49)	.355	.05 (.00-.20)
TP	7.53 (.95)	7.92 (.82)	7.54 (.77)	.355	.05 (.00-.20)
LF	6.81 (1.07)	6.95 (.94)	6.83 (.94)	.915	.01 (.00-.06)
HF	5.62 (1.35)	6.45 (1.22)	5.86 (1.11)	.195	.08 (.00-.24)
LF/HF	1.18 (.94)	.50 (1.09)	.97 (.73)	.159	.09 (.00-.25)
Pre-test					
EDI-BD	13.50 (8.07)	14.12 (9.69)	12.07 (8.32)	.804	.01 (.00-.10)
EDI-ID	16.10 (7.37)	13.82 (8.47)	13.07 (7.19)	.626	.02 (.00-.14)
EDI-LSE	8.40 (4.22)	8.82 (4.19)	8.67 (5.34)	.974	.00 (.00-.00)
PSS-10	18.30 (3.95)	18.41 (5.30)	18.47 (4.05)	.996	.00 (.00-.00)
STAI-X1	4.80 (6.39)	42.59 (12.25)	42.53 (13.49)	.917	.00 (.00-.06)
STAI-X2	51.30 (8.99)	49.29 (9.17)	5.07 (8.88)	.856	.01 (.00-.08)
UMACL-EA	23.50 (5.06)	27.12 (5.50)	24.27 (6.16)	.208	.08 (.00-.24)
UMACL-TA	19.40 (4.17)	19.94 (5.99)	18.80 (7.44)	.875	.01 (.00-.08)
UMACL-HT	28.00 (5.85)	28.12 (6.75)	27.93 (8.26)	.997	.00 (.00-.00)
HR	4.38 (.14)	4.46 (.12)	4.44 (.13)	.281	.06 (.00-.22)
SDNN	4.01 (.35)	3.92 (.42)	3.92 (.32)	.771	.01 (.00-.11)
RMSSD	3.50 (.34)	3.43 (.58)	3.45 (.50)	.937	.00 (.00-.04)
TP	7.59 (.74)	7.53 (.94)	7.38 (.64)	.78	.01 (.00-.11)
LF	6.72 (1.01)	6.71 (1.07)	6.58 (.71)	.914	.01 (.00-.06)
HF	5.92 (.88)	5.85 (1.33)	5.83 (.94)	.982	.00 (.00-.00)
LF/HF	.80 (.88)	.86 (1.04)	.75 (.83)	.942	.00 (.00-.04)
Post-test					
EDI-BD	10.70 (7.12)	9.65 (9.26)	8.13 (7.08)	.726	.02 (.00-.12)
EDI-ID	8.70 (5.98)	8.88 (8.75)	8.40 (5.69)	.982	.00 (.00-.00)
EDI-LSE	6.80 (4.44)	5.35 (4.64)	4.07 (2.52)	.248	.07 (.00-.22)
PSS-10	16.80 (3.43)	15.53 (5.52)	16.47 (4.39)	.76	.01 (.00-.11)
STAI-X1	3.10 (7.31)	3.59 (8.85)	33.07 (13.33)	.727	.02 (.00-.12)
STAI-X2	47.50 (7.18)	45.53 (9.83)	46.87 (10.53)	.858	.01 (.00-.08)

UMACL-EA	32.10 (4.79)	32.29 (4.81)	27.73 (6.37)	.047	.15 (.00-.32)
UMACL-TA	11.30 (4.11)	11.06 (2.44)	13.73 (5.84)	.188	.08 (.00-.24)
UMACL-HT	36.50 (3.54)	36.59 (2.45)	33.67 (7.58)	.225	.07 (.00-.23)
HR	4.33 (.16)	4.18 (.13)	4.26 (.18)	.069	.13 (.00-.30)
SDNN	4.02 (.42)	4.24 (.55)	4.12 (.58)	.553	.03 (.00-.15)
RMSSD	3.58 (.48)	4.08 (.71)	3.86 (.76)	.194	.08 (.00-.24)
TP	7.76 (.88)	8.13 (1.16)	7.90 (1.17)	.683	.02 (.00-.13)
LF	7.14 (1.17)	7.29 (1.27)	7.14 (1.35)	.938	.00 (.00-.04)
HF	6.04 (.80)	6.95 (1.41)	6.52 (1.20)	.182	.08 (.00-.25)
LF/HF	1.10 (1.14)	.34 (.76)	.63 (.75)	.099	.11 (.00-.28)

Psychometric variables: ARS – anorexia readiness syndrome, EDI-BD – body dissatisfaction, EDI-LSE – low self-esteem, EDI-ID – interoceptive deficiency, PSS-10 – perceived stress, STAI-X1 – state anxiety, STAI-X2 – trait anxiety, UMACL-EA – energetic arousal, EMACL-TA – tense activation, UMACL-HT – hedonic tone; physiological variables: HR – heart rate, SDNN - Standard deviation of the normal-to-normal intervals, RMSSD – root mean square of successive differences between normal heartbeats, TP – total power, LF – low-frequency power, HF – high-frequency power, LF/HF – ratio of low- to high-frequency power, DMT – Dance Movement Therapy, p – probability value (level of statistical significance), SD – standard deviation

Psychometric Measures

The ANOVA results for the psychometric measures can be found in Tables C.1-C.4 (Supplement C). Additionally, details on simple effects of *time* in all groups are presented in Table 2 and visualised in Figure 3.

ANOVA for the psychometric measures showed a significant main effect of *group* only for UMACL-EA (significantly higher values for Yoga than Mindfulness group). A significant main effect of *time* was found for all the dependent variables; EDI-BD, EDI-ID, EDI-LSE, PSS-10, STAI-X1, STAI-X2, UMACL-TA, UMACL-EA, UMACL-HT. The analysis revealed significant linear and quadratic trends for all variables; linear trends were more significant with larger effect sizes. Post-hoc analysis showed that compared to both baseline and pre-test, post-test measurements were significantly lower for EDI-BD, EDI-ID, EDI-LSE, PSS-10, STAI-X1, STAI-X2, and UMACL-TA and significantly higher for UMACL-EA and UMACL-HT.

The interaction effects between *group* and *time* were found to be significant at the trend level solely for UMCAL-HT and non-significant for the remaining parameters. A significant simple main effect of *group* was detected for UMACL-HT at *baseline* (significantly higher values for Yoga than DMT group) and for UMACL-EA at *post-test* (lower values for Mindfulness than Yoga or DMT groups).

In the DMT group, a significant simple main effect of *time* was detected for several parameters, including EDI-ID, STAI-X1, UMACL-EA, UMACL-TA, and UMACL-HT. A significant linear trend was detected for all these variables, while significant quadratic trends were less prominent for STAI-X1 and UMACL-EA and stronger for UMACL-TA. Post-hoc analysis showed that compared to both baseline and pre-test, post-test measurements were significantly lower for EDI-ID, STAI-X1, and UMACL-TA and significantly higher for UMACL-EA and UMACL-HT. Additionally, in comparison to baseline, EDI-ED and PSS-10 values were lower at pre-test at a tendency level.

In the Yoga group, simple main effect of *time* was significant for all parameters: EDI-BD, EDI-ID, EDI-LSE, PSS-10, STAI-X1, STAI-X2, UMACL-EA, UMACL-TA, and UMACL-HT. A significant linear trend was detected for all variables, while significant quadratic trends were less prominent for EDI-ID, PSS-10, STAI-X1, and UMACL-TA, and UMACL-HT and stronger for EDI-BD and EDI-LSE. Post-hoc analysis showed that compared to both baseline and pre-test, post-test measurements were significantly lower for EDI-BD, EDI-ID, EDI-LSE, PSS-10, STAI-X1, STAI-X2, and UMACL-TA and significantly higher for UMACL-EA and UMACL-HT.

In the Mindfulness group, the simple main effect of *time* was significant for all parameters except for UMACL-EA: EDI-BD, EDI-ID, EDI-LSE, PSS-10, STAI-X1, STAI-X2 (near-sig.), UMACL-EA, UMACL-TA, and UMACL-HT. A significant linear trend was detected for all variables, while significant quadratic trends were weaker for EDI-BD, EDI-ID, and PSS-10 and more prominent for EDI-LSE. Post-hoc analysis showed that compared to both baseline and pre-test, post-test measurements were significantly lower for EDI-BD, EDI-ID, EDI-LSE, PSS-10, STAI-X1, and UMACL-TA and significantly higher for UMACL-HT, while near-significant differences between baseline and post-test were found for STAI-X2 and UMACL-EA.

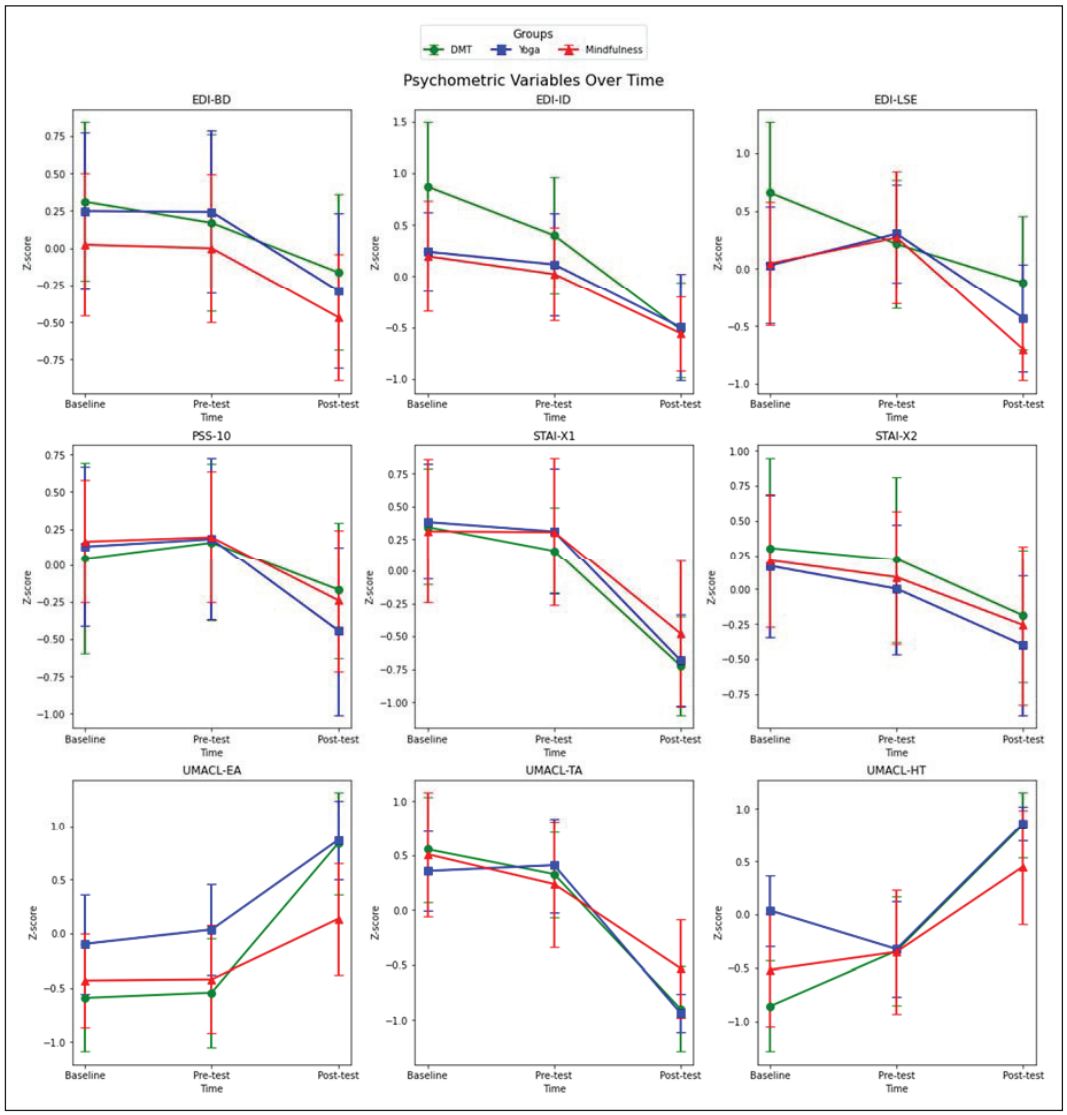
Table 2. Simple effects of time for psychometric and physiological variables in DMT, Yoga, and Mindfulness groups at three time points (baseline, pre-test, and post-test)

		Mean (SD)			Cohen's d (95% CI)		
	Measure	Baseline	Pre-test	Post-test	Baseline-Pre-test	Pre-test-Post-test	Baseline-Post-test
DMT	EDI-BD	14.70 (7.24)	13.50 (8.07)	10.70 (7.12)	.15 (-.48-.77)	.65† (-.05-1.33)	.70 (-.02-1.38)
	EDI-ID	19.90 (8.10)	16.10 (7.37)	8.70 (5.98)	.40 (-.25-1.04)	1.04† (.25-1.81)	1.07* (.27-1.84)
	EDI-LSE	10.50 (4.65)	8.40 (4.22)	6.80 (4.44)	.26 (-.38-.89)	.41 (-.25-1.05)	.51 (-.17-1.16)
	PSS-10	17.80 (4.80)	18.30 (3.95)	16.80 (3.43)	-.16 (-.78-.47)	.67† (-.03-1.35)	.42 (-.24-1.05)
	STAI-X1	43.00 (8.67)	40.80 (6.39)	30.10 (7.31)	.28 (-.36-.91)	1.33* (.45-2.18)	.98* (.20-1.73)
	STAI-X2	52.10 (9.72)	51.30 (8.99)	47.50 (7.18)	.12 (-.50-.74)	.57 (-.11-1.23)	.49 (-.18-1.13)
	UMACL-EA	23.20 (4.98)	23.50 (5.06)	32.10 (4.79)	-.07 (-.68-.56)	-.96* (-1.70--.18)	-1.25** (-2.07--.39)
	UMACL-TA	20.90 (5.15)	19.40 (4.17)	11.30 (4.11)	.32 (-.32-.95)	2.33** (1.09-3.54)	1.41** (.50-2.28)
	UMACL-HT	24.30 (4.90)	28.00 (5.85)	36.50 (3.54)	-.46 (-1.10-.21)	-1.35** (-2.20--.46)	-1.75** (-2.73--.72)
	HR	4.35 (.21)	4.38 (.14)	4.33 (.16)	-.15 (-.77-.48)	.30 (-.34-.93)	.11 (-.52-.73)
	SDNN	3.98 (.48)	4.01 (.35)	4.02 (.42)	-.05 (-.67-.57)	.00 (-.62-.62)	-.06 (-.68-.56)
	RMSSD	3.57 (.60)	3.50 (.34)	3.58 (.48)	.11 (-.52-.73)	-.15 (-.77-.48)	-.01 (-.63-.61)
	TP	7.53 (.95)	7.59 (.74)	7.76 (.88)	-.06 (-.68-.56)	-.14 (-.76-.49)	-.25 (-.88-.38)
	LF	6.81 (1.07)	6.72 (1.01)	7.14 (1.17)	.07 (-.55-.69)	-.28 (-.91-.36)	-.33 (-.96-.32)
	HF	5.62 (1.35)	5.92 (.88)	6.04 (.80)	-.20 (-.82-.43)	-.13 (-.74-.50)	-.25 (-.87-.39)
	LF/HF	1.18 (.94)	.80 (.88)	1.10 (1.14)	.25 (-.38-.88)	-.25 (-.87-.39)	.05 (-.57-.67)
Yoga	EDI-BD	14.18 (9.30)	14.12 (9.69)	9.65 (9.26)	.02 (-.46-.49)	.57* (.05-1.08)	.51† (.00-1.01)
	EDI-ID	14.82 (6.53)	13.82 (8.47)	8.88 (8.75)	.18 (-.30-.66)	.85* (.28-1.40)	.78** (.23-1.32)
	EDI-LSE	7.53 (5.01)	8.82 (4.19)	5.35 (4.64)	-.41 (-.90-.09)	.78* (.23-1.32)	.67** (.13-1.19)
	PSS-10	18.18 (5.25)	18.41 (5.30)	15.53 (5.52)	-.12 (-.60-.36)	1.11*** (.49-1.71)	1.23** (.58-1.86)
	STAI-X1	43.47 (11.19)	42.59 (12.25)	30.59 (8.85)	.13 (-.35-.60)	.92* (.34-1.48)	.99*** (.39-1.56)
	STAI-X2	50.82 (10.11)	49.29 (9.17)	45.53 (9.83)	.37 (-.13-.85)	.66* (.12-1.18)	.86* (.29-1.41)
	UMACL-EA	26.29 (6.01)	27.12 (5.50)	32.29 (4.81)	-.12 (-.59-.36)	-.67† (-1.19--.14)	-.76** (-1.30--.21)
	UMACL-TA	19.59 (5.08)	19.94 (5.99)	11.06 (2.44)	-.05 (-.52-.43)	1.55*** (.83-2.26)	1.46*** (.76-2.14)
	UMACL-HT	30.71 (4.96)	28.12 (6.75)	36.59 (2.45)	.33 (-.16-.81)	-1.18** (-1.80--.55)	-1.09*** (-1.68--.47)
	HR	4.33 (.12)	4.46 (.12)	4.18 (.13)	-1.17** (-1.79--.54)	2.28*** (1.35-3.19)	.91* (.33-1.47)
	SDNN	4.14 (.37)	3.92 (.42)	4.24 (.55)	.67** (.13-1.18)	-.64* (-1.15--.11)	-.25 (-.73-.24)
	RMSSD	3.70 (.53)	3.43 (.58)	4.08 (.71)	.71* (.16-1.23)	-.96** (-1.53--.37)	-.76** (-1.29--.21)
	TP	7.92 (.82)	7.53 (.94)	8.13 (1.16)	.52* (.00-1.02)	-.54* (-1.04--.02)	-.23 (-.71-.26)
	LF	6.95 (.94)	6.71 (1.07)	7.29 (1.27)	.29 (-.20-.77)	-.41 (-.90-.09)	-.26 (-.74-.22)
	HF	6.45 (1.22)	5.85 (1.33)	6.95 (1.41)	.61* (.09-1.13)	-.79** (-1.33--.23)	-.42† (-.91-.08)
	LF/HF	.50 (1.09)	.86 (1.04)	.34 (.76)	-.45† (-.94-.06)	.35 (-.14-.84)	.13 (-.35-.61)
Mindfulness	EDI-BD	12.27 (8.00)	12.07 (8.32)	8.13 (7.08)	.07 (-.44-.58)	.89* (.28-1.48)	1.00** (.37-1.62)
	EDI-ID	14.47 (8.52)	13.07 (7.19)	8.40 (5.69)	.41 (-.13-.93)	.77* (.18-1.33)	.83* (.22-1.40)
	EDI-LSE	7.60 (4.98)	8.67 (5.34)	4.07 (2.52)	-.33 (-.85-.19)	.90* (.28-1.49)	.66* (.09-1.21)
	PSS-10	18.33 (3.81)	18.47 (4.05)	16.47 (4.39)	-.06 (-.57-.45)	.95** (.32-1.55)	.72* (.14-1.28)
	STAI-X1	42.60 (13.08)	42.53 (13.49)	33.07 (13.33)	.01 (-.50-.51)	.89** (.28-1.48)	.84* (.24-1.43)
	STAI-X2	51.20 (8.86)	50.07 (8.88)	46.87 (10.53)	.29 (-.23-.80)	.47 (-.07-1.00)	.58† (.02-1.12)
	UMACL-EA	24.20 (5.35)	24.27 (6.16)	27.73 (6.37)	-.01 (-.51-.50)	-.41 (-.93-.12)	-.54† (-1.08-.01)
	UMACL-TA	20.60 (7.42)	18.80 (7.44)	13.73 (5.84)	.42 (-.11-.94)	.82* (.22-1.40)	1.05** (.40-1.67)
	UMACL-HT	26.73 (7.46)	27.93 (8.26)	33.67 (7.58)	-.19 (-.70-.32)	-1.02** (-1.64--.38)	-.86* (-1.44--.25)
	HR	4.38 (.10)	4.44 (.13)	4.26 (.18)	-.61* (-1.16--.05)	.87** (.26-1.45)	.60† (.04-1.14)

Mindfulness	**SDNN**	3.95 (.32)	3.92 (.32)	4.12 (.58)	.09 (-.42-.60)	-.33 (-.84-.20)	-.24 (-.75-.27)
	RMSSD	3.43 (.49)	3.45 (.50)	3.86 (.76)	-.04 (-.54-.47)	-.55† (-1.09-.00)	-.48 (-1.01-.06)
	TP	7.54 (.77)	7.38 (.64)	7.90 (1.17)	.23 (-.29-.74)	-.39 (-.91-.14)	-.24 (-.75-.28)
	LF	6.83 (.94)	6.58 (.71)	7.14 (1.35)	.37 (-.16-.88)	-.38 (-.90-.15)	-.17 (-.68-.34)
	HF	5.86 (1.11)	5.83 (.94)	6.52 (1.20)	.02 (-.49-.53)	-.45 (-.97-.09)	-.40 (-.92-.14)
	LF/HF	.97 (.73)	.75 (.83)	.63 (.75)	.20 (-.31-.71)	.15 (-.37-.65)	.35 (-.18-.87)

* $p<0.05$, ** $p<0.01$, *** $p<0.001$, $p<0.1$

Psychometric variables: ARS – anorexia readiness syndrome, EDI-BD – body dissatisfaction, EDI-LSE – low self-esteem, EDI-ID – interoceptive deficiency, PSS-10 – perceived stress, STAI-X1 – state anxiety, STAI-X2 – trait anxiety, UMACL-EA – energetic arousal, EMACL-TA – tense activation, UMACL-HT – hedonic tone. Physiological variables: HR – heart rate, SDNN - Standard deviation of the normal-to-normal intervals, RMSSD – root mean square of successive differences between normal heartbeats, TP – total power, LF – low-frequency power, HF – high-frequency power, LF/HF – ratio of low- to high-frequency power.



Values displayed as z-scores. Error bars show 95% CI.

EDI-BD – body dissatisfaction, EDI-LSE – low self-esteem, EDI-ID – interoceptive deficiency, PSS-10 – perceived stress, STAI-X1 – state anxiety, STAI-X2 – trait anxiety, UMACL-EA – energetic arousal, EMACL-TA – tense activation, UMACL-HT – hedonic tone.

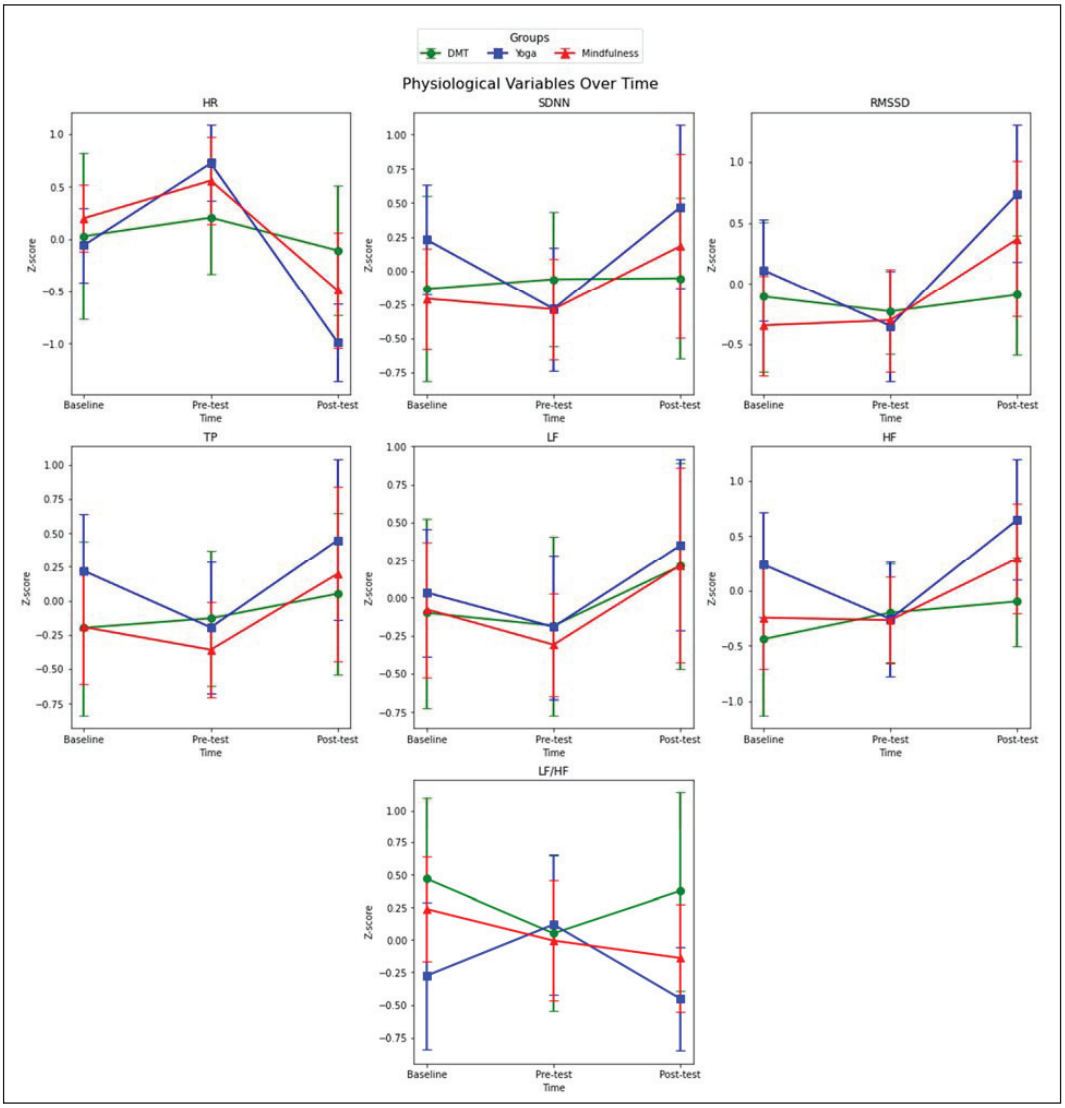
Figure 3. The effects of Dance-Movement Therapy (DMT), Yoga, and Mindfulness on psychometric measures of well-being at baseline, pre-test (pre-intervention), and post-test (post-intervention)

Physiological Parameters

The ANOVA results for the physiological parameters can be found in Tables C.5-C.8 (Supplement C). Additionally, details on simple effects of *time* in all groups are presented in Table 2 and visualised in Figure 4.

ANOVA for the physiological data revealed no significant main effect of *group*. For almost all dependent variables, the main effect of *time* was significant for HR, RMSSD, HF, near-significant for TP and LF, and non-significant for SDNN and LF/HF. Quadratic trends were significant for all variables except the LF/HF ratio, while a linear trend was equally strong for HF and of lower significance and smaller effect size for HR and RMSSD. HR values were significantly higher at pre-test than both baseline and post-test, and significantly lower at post-test than at baseline and pre-test. Compared to pre-test, the affected HRV parameters showed significantly (RMSSD, HF) or near-significantly (TP, LF) higher values at post-test.

A significant interaction effect between *group* and *time* was found only for HR. No significant simple main effect of *group* was found, only tendencies at post-test for HR and LF/HF, resulting from lower values achieved by the Yoga group compared to the DMT group.



Values displayed as z-scores. Error bars show 95%CI.

HR – heart rate, SDNN - Standard deviation of the normal-to-normal intervals, RMSSD – root mean square of successive differences between normal heartbeats, TP – total power, LF – low-frequency power, HF – high-frequency power, LF/HF – ratio of low- to high-frequency power.

Figure 4. The effects of Dance-Movement Therapy (DMT), Yoga, and Mindfulness on physiological measures of well-being at baseline, pre-test (pre-intervention), and post-test (post-intervention)

No significant simple main effect of time was detected in the DMT group.

In the Yoga group, it was present for almost all parameters: HR, SDNN, RMSSD, TP, and HF. A significant quadratic trend was detected for HR, SDNN, RMSSD, TP, and HF. Despite non-significant simple main effects of time, near-significant quadratic trends were also observed for LF and LF/HF. Moreover, less prominent linear trends were detected for HR and RMSSD. Post-hoc analysis showed that compared to pre-test, both baseline and post-test measurements were significantly higher for SDNN, RMSSD, TP, and HF and significantly lower for HR. Additionally, with respect to baseline, post-test parameters decreased significantly for HR and increased for RMSSD and HF.

In the Mindfulness group, the simple main effect of time was significant for HR and near-significant for RMSSD. HR exhibited a significant linear trend and a less prominent quadratic trend; compared to pre-test, both baseline and post-test measurements were significantly lower, while post-test parameters showed a tendency to decrease from baseline. RMSSD exhibited a tendency towards a linear trend, expressed by a near-significant increase from pre-test to post-test measurements. A significant and near-significant quadratic trend was observed for LF and TP, respectively.

The effects of each intervention on both psychometric and physiological measures of well-being are summarised in Table 4, indicating the direction and level of significance of all statistically significant and near-significant intervention-related changes (between pre-test and post-test).

Table 4. The effects of Dance-Movement Therapy, Yoga, and Mindfulness on psychometric and physiological measures of well-being

Measure	DMT	yoga	mindfulness
EDI-BD	↓□	↓*	↓**
EDI-ID	↓□	↓*	↓*
EDI-LSE		↓*	↓*
PSS-10	↓□	↓***	↓**
STAI-X1	↓*	↓*	↓**
STAI-X2		↓*	
UMACL-EA	↑*	↑□	
UMACL-TA	↓**	↓***	↓*
UMACL-HT	↑**	↑**	↑**
HR		↓***	↓**
SDNN		↑*	
RMSSD		↑**	↑□
TP		↑*	
LF			
HF		↑**	
LF/HF			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$, $p<0.1$

Psychometric measures EDI-BD – body dissatisfaction, EDI-LSE – low self-esteem, EDI-ID – interoceptive deficiency, PSS-10 – perceived stress, STAI-X1 – state anxiety, STAI-X2 – trait anxiety, UMACL-EA – energetic arousal, EMACL-TA – tense activation, UMACL-HT – hedonic tone. Physiological measures: HR – heart rate, SDNN - Standard deviation of the normal-to-normal intervals, RMSSD – root mean square of successive differences between normal heartbeats, TP – total power, LF – low-frequency power, HF – high-frequency power, LF/HF – ratio of low- to high-frequency power.

For each parameter, the intervention –related change of value is described by an arrow reflecting its direction– increase (↑) or decrease (↓) – and asterisks represent its significance level.

Regression Models of ARS Score, Baseline Levels & Intervention-Related Changes of ED Symptoms

Pairwise analysis showed significant Spearman correlations among baseline psychometric measurements, including the ARS score (Supplement C, Table C.9). No significant correlations were found between baseline psychometric and physiological measures. Step-wise multiple linear regression analysis (Table 3) revealed that the ARS score was best explained by EDI-BD and EDI-LSE, for both of which EDI-ID was the sole significant predictor. EDI-ID was itself

predicted by STAI-X2. Other variables were excluded (Supplement C, Table C.10). Physiological parameters did not predict any of the dependent variables.

Pairwise analysis showed significant Spearman correlations among intervention-related changes in psychometric measures (Supplement C, Table C.11). No significant correlations were detected between changes in psychometric and physiological parameters. Step-wise multiple linear regression analysis revealed predictors for intervention-related changes in the ED traits (Table 3). ΔEDI-BD was best explained by ΔEDI-ID and ΔUMACL-EA. For ΔEDI-LSE, ΔEDI-ID was the sole significant predictor. ΔEDI-ID was negatively predicted only by the baseline ARS score. Other factors were excluded (Supplement C, Table C.12). Again, changes in physiological indices did not explain changes in any of the dependent variables.

Table 3. Parameters of step-wise multiple linear regression models for baseline ARS score and eating disorder traits, as well as for intervention-related changes in eating disorder traits

DV	Step	Predictor	Model fit		Model parameters			Bootstrap parameters			
			$F(df_1,df_2)$	p	R	cR^2	DW	B (95%CI)	β	p	r_p
ARS	1	EDI-BD	143.99 (1,40)	<.001	.89	.78	1.83	.17 (.14-.20)	.89	<.001	.89
	2	EDI-BD	100.91 (2,39)	<.001	.92	.83	1.99	.16 (.13-.18)	.82	<.001	.89
		EDI-LSE						.08 (.04-.13)	.25	.003	.51
EDI-BD	1	EDI-ID	6.50 (1,40)	.015	.37	.12	2.28	.40 (.12-.65)	.74	.008	.37
EDI-LSE	1	EDI-ID	26.94 (1,40)	<.001	.63	.39	1.99	.40 (.25-.56)	.63	<.001	.63
EDI-ID	1	STAI-X2	25.67 (1,40)	<.001	.63	.38	1.68	.52 (.29-.75)	.63	<.001	.63
Δ EDI-BD-BD	1	Δ EDI-ID	11.85 (1,40)	.001	.48	.21	1.88	.46 (.12-.84)	.48	.017	.48
	2	Δ EDI-ID	9.90 (2,39)	<.001	.58	.30	1.87	.51 (.17-86)	.53	.004	.54
		Δ UMACL-EA						.24 (.05-.43)	.33	.036	.38
Δ EDI-LSE	1	Δ EDI-ID	23.16 (1,40)	<.001	.61	.35	1.97	.45 (.25-.67)	.61	<.001	.61
Δ EDI-ID	1	ARS	4.53 (1,40)	.040	.32	.08	1.86	-1.21 (-2.35–.04)	-.32	.028	-.32

DW: Durbin-Watson statistic, cR^2: corrected R^2, r_p: partial correlation

EDI-BD – body dissatisfaction, EDI-LSE – low self-esteem, EDI-ID – interoceptive deficiency, ΔEDI-BD – changes in body dissatisfaction, ΔEDI-LSE – changes in low self-esteem, ΔEDI-ID – changes in interoceptive deficiency, ARS - anorexia readiness syndrome.

Discussion

Through this study, we investigated the effects of three mind-body interventions—DMT, Yoga, and Mindfulness—on the psychophysiological functioning of young women with ARS symptoms, emphasizing deficits in interoceptive awareness.

Effects of mind-body interventions on ED symptoms and mood in ARS

During the 4-week LAU control period, no significant psychological changes were observed. In contrast, all interventions improved ED symptoms and mood compared to baseline and pre-training. Intervention-specific effects (Table 4) mirrored the nature of each method. DMT enhanced mood and bodily experiences through expressive movement, while showing a tendency to influence body perception. Yoga influenced mood, stress, anxiety, body perception, and self-related thoughts by integrating movement, breath, and attention. Finally, mindfulness modified self-related beliefs and reduced stress and anxiety. The interventions may impact AN-related mental states through distinct pathways in the Paulus & Stein model: movement-based practices (DMT, Yoga) by enhancing bottom-up bodily awareness, while Mindfulness – by engaging top-down cognitive control over beliefs and emotions.

Effects of mind-body interventions on cardiovascular functioning in ARS

The three interventions affected the physiological indicators of well-being in a different manner, consistent with their nature (Table 4). DMT showed no significant HR or HRV changes, possibly due to no cognitive regulation involved or smaller sample size. Yoga proved most effective, enhancing parasympathetic activity (lower HR, increased RMSSD

and HF power), with moderate effects on global HRV (SDNN, total power). Mindfulness also improved vagal tone (lower HR, increased RMSSD), though less robustly than yoga.

Quadratic trends show physiological decline during the LAU phase (HR increase, HRV decrease), reversed upon intervention. Such decline may reflect a prodromal phase of AN development, suggesting a three-phase model: (1) sympathetic upregulation due to stress/anxiety, (2) starvation-induced parasympathetic rebound (apparent balance), and (3) pathological parasympathetic dominance (full AN). ARS could likely encompasses phases one and two, explaining the high physiological variability in this group as compared to normative data [48]. However, although a pre-existing ED diagnosis excluded from participation in the study, screening with the ARS did not allow for discrimination between pre-ED and full-ED symptoms in the undiagnosed individuals. Therefore, the large variation in HRV measures might alternatively reflect different stages of the undiagnosed EDs. Hence, the proposed three-phase model should be subjected to further research to clarify the underlying physiological mechanisms of AN development.

Possible mechanism of ARS aetiology and treatment

ARS severity was predicted by body dissatisfaction and low self-esteem—both linked to interoceptive deficits predicted by trait anxiety. These results suggest that anxiety-induced disruptions in bodily signal perception contribute to distorted body image and low self-worth, key features of the pre-anorexic state. This aligns with the Paulus and Stein model [9], where interoceptive deficits impair body trust, potentially leading to maladaptive behaviours like binge eating [47].

Intervention-driven improvements in body dissatisfaction and self-esteem were explained by changes in interoceptive deficiency and energetic arousal; the former predicted solely by baseline ARS severity, underscoring the importance of early intervention. All interventions enhanced the mind-body connection through bodily engagement, likely exerting a bottom-up effect on cognition and emotions. Improved interoception may reduce anxiety and negative body bias, while increased energetic arousal may foster a positive feedback loop enhancing body trust and self-perception. However, the directionality of this relationship remains unclear and warrants further investigation.

Curiously, HRV parameters did not predict baseline ARS scores, ED traits or their changes, possibly due to high physiological inhomogeneity of the study sample. As mentioned above, compared to normative data [48], the participants exhibited a much broader range of HRV values, possibly reflecting different physiological states/ARS stages.

Cardiovascular biomarkers & HRV-based interventions for the pre-anorectic state

HR and vagally-mediated HRV show promise as potential biomarkers of AN, as diagnostic tools and indicators of recovery [18]. The circumventricular organs in the brain detect metabolic signals, influencing major cardiovascular control centres and creating a neural connection between AN-related starvation and changes in HRV [18].

Presented outcomes highlight a key trend in ARS. Despite no apparent changes in psychological well-being, the participants' HR increased and HRV decreased, contrary to the drop in HR and rise in HRV typically found in full-blown AN [18]. These changes resemble stress-related disorders [49], consistent with pre-anorexic stress and anxiety experienced due to the perceived lack of control [50] or distorted self-beliefs [47]. However, these results should not be interpreted as direct markers of a pre-anorectic state but rather as indicators of stress-related physiological reactivity. This possibly reflects prodromal symptoms of AN, complicating the detection of a developing ED. As dieting and exercise counterbalance increased HR and decreased HRV, the initial symptoms may be disguised as health or fitness goals, often supported by family, friends, and healthcare professionals and fail to raise suspicions of an ED [18].

Previous studies indicate that HRV normalises upon treatment of AN [18], though findings can be contradictory [49]. Since an "ideal" healthy range of HRV exists [49], balancing HRV should enhance psychophysiological healing. HRV-based interventions have proven useful in various mental and somatic disorders, particularly anxiety and stress-related [51].

Study Limitations and Future Directions

This study underscores the need for a multidimensional diagnostic framework for AN, integrating psychometric and psychophysiological methods. While subjective tools remain valuable, their limitations (susceptibility to self-presentation biases or emotional misperceptions) necessitate the inclusion of objective physiological markers (e.g., EEG, HR, HRV, skin conductance) to enhance diagnostic accuracy and inform more tailored interventions.

Despite the advantages of combining subjective and objective measures, this study is subject to limitations. Given its preliminary and exploratory nature, the results obtained should be interpreted with caution. The relatively scarce number of participants, resulting from low incidence of preclinical anorexic states and difficulties in accessing this population, limits the statistical reliability and generalisability of the findings. The small sample size and the

large number of statistical tests both raise the possibility that some findings may be artefactual. Inclusion of female participants reflects the epidemiology of AN, yet precludes extrapolation to males. Observed physiological heterogeneity – stemming from variations in disorder stage, body weight, caloric intake, exercise intensity, and binge/purge behaviours – may have introduced substantial variability in HR and HRV outcomes, complicating the interpretation of the interventions' effects.

Future research should address these issues by including underrepresented groups (e.g., males, adolescents, non-binary individuals), standardising physiological conditions, and implementing long-term follow-up assessments. Comparing body-oriented therapies with other treatments and active control groups would strengthen causal inferences. Identifying metabolic or neurophysiological biomarkers would facilitate earlier and more accurate detection of the pre-anorexic state. Development of clinically grounded, subjective and objective evidence-based prevention protocols could support early intervention and long-term recovery in AN.

Conclusions

This study emphasizes the diagnostic complexity of the pre-anorexic state, characterized by a divergence between psychometric and physiological indicators of well-being, thereby underscoring the need for multidimensional diagnostic frameworks. Integrative body-oriented practices—including Dance Movement Therapy (DMT), yoga, and mindfulness—show promise as early preventive strategies for eating disorders by alleviating anxiety, stress, and related symptoms, while concurrently enhancing mood, emotional regulation, and interoceptive awareness. Notably, yoga appears particularly effective in promoting physiological self-regulation. Given that interoceptive deficits may underlie key risk factors, such as body dissatisfaction and low self-esteem, incorporating mind-body interventions into health education and exercise science curricula, and including mindful movement programs, such as Nalu. Mindful Movement, at schools and universities, could meaningfully strengthen early prevention efforts among at-risk populations.

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Supplement A

Anorexia Readiness Syndrome

Table A. Indicators Specific to Anorexia Readiness Syndrome [1]

Area of functioning		Indicators of the Anorexia Readiness Syndrome
Psyche	**Self-Esteem**	• Usually unrealistic and understated, sometimes concerning a specific sphere of life rather than general functioning; • Poor handling of failures; • Assigning blame to oneself for any failure.
	Perfectionism & Perseverance	• A significant need for control, which forms the basis for later perseverance, evident in selected areas of activity; • A need for perfectionism, however, not extended to all spheres of life.
	Attitude Towards Food	• Abnormal (following a diet, treating food as "comfort food," celebrating meals, experiencing chaotic eating); • May initially be mediocre, but an event such as somatic illness, family dieting, or negative comments about attractiveness can trigger a change in eating habits.
	Sense of Self-Attractiveness	• Inadequate self-assessment of attractiveness, along with a tendency to underestimate it and overestimate the role of physical attractiveness in achieving success in life.
	Emotions & Moods	• A tendency to feel depressed and dissatisfied with oneself. • Lacking ability to cope with stress.
Soma	**Body Weight & Dimensions**	• Weight normal or above for age and height; • A tendency to excessively focus on one's own weight and body measurements; • Comparing oneself to actresses and models.
Polis	**Relationships within the Family System**	• Abnormal (based on excessive proximity or distance) or a fairly well-functioning family.
	Susceptibility to the Influence of Advertising	• Selective susceptibility to the influence of advertising and the comparison to female beauty ideals conveyed by the media.

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Supplement B

Interventions

Nalu. Mindful Movement DMT Group

The intervention program was based on Chace's model [1] and incorporated the 'guided imagery' tool [2], as well as movement quality references derived from Laban's movement analysis [3]. The program content is outlined in Table B.1.

Table B.1. The Framework Content of the Nalu. Mindful Movement DMT group.

Section	Content
Check-in	Movement Exercises: Where are you now?
Warm-up	Movement Exercises: Warm-up activities based on the participants' feedback during the Check-in section
Guided imagery	Movement Exercises: Movement self-regulation techniques; exploration of personal resources
Exploration in movement	Movement Exercises: Deepening of previous exercises utilising Laban's Movement Analysis: • Session 1 – Body • Session 2 – Effort • Session 3 – Space • Session 4 – Shape
Writing	Written Exercises: Documenting reflections on the therapeutic process
Check out and Homework	Verbal Exercises: An opportunity to share experiences within the group; discussion of homework assignments

Nalu. Mindful Movement Yoga Group

The intervention program was developed by a certified yoga teacher based on a systematic literature review of the structure and content of effective yoga-based interventions [4–6]. The content of the program is presented in Table B.2.

Table B.2. The Framework Content of the Nalu. Mindful Movement DMT group.

Section	Content
Grounding	Movement Exercises: Grounding meditation.
Warm-up	Movement Exercises: Smooth warm-up movements to release tension and prepare the body for movement.
Yoga flow	Movement Exercises: A sequence of 12 asanas at a faster pace — yoga flow (standing, twisting, sitting).
Postures	Movement Exercises: Focusing on a selection of 4 asanas — slow pace with pauses.
Meditation	Movement Exercises: Breathing exercise and guided meditation in a selected position.
Completion	Opportunity to share experiences within the group and discuss homework.

Nalu. Mindful Movement Mindfulness Group

Mindfulness-Based Interventions (MBI) programs are based on Mindfulness-Based Cognitive Therapy (MBCT) and Mindfulness-Based Stress Reduction (MBSR) and should be appropriately aligned with the intervention's goals and objectives. The intervention program included an abbreviated version of MBCT based on a manual developed by Teasdale, Segal, and Williams (2002). MBCT was originally developed for patients with depression [7], so this study modified the structure of the MBCT

program to focus on improving the well-being of a subclinical population with Anorexia Readiness Syndrome. The content of the program is presented in Table B.3.

Table B.3. The Framework Content of the Nalu. Mindful Movement Mindfulness group.

Session	Topic	Content
1.	**Turning Off Automatic Pilot**	Psychoeducation: What is mindfulness? Exercises: Mindful eating ("raisin exercise"), Mindfulness of the body and breath Homework: Practice mindfulness of body and breath, Keep a journal, Mindfulness in routine activities
2.	**Two Sources of Knowledge**	Psychoeducation: The relationship between thoughts and moods Exercises: Thoughts vs. feelings, Mindfulness of body and breath, Body scanning Homework: Body scanning, Calendar of pleasant experiences, Keep a journal - mindfulness in daily life
3.	**Dwell in the Present**	Psychoeducation: Awareness of a wandering mind vs. being present Exercises: Mental time travel, Meditation - breath as an anchor, Movement meditation Homework: Three-minute breathing space, Selected form of meditation, Keep a journal
4.	**Self-Compassion in Practice**	Psychoeducation: Cognitive biases and self-compassion Exercises: Recognizing thoughts as thoughts, Identifying triggers, Implementing behavioural changes, Movement meditation Homework: Three-minute breathing space - extended, Selected form of meditation, Keep a journal

Psychometric Assessment Tools

Anorexia Readiness Syndrome Inventory (SGA-12)

The Anorexia Readiness Syndrome Inventory SGA-12 [8] is a diagnostic instrument developed to assess anorectic tendencies in individuals aged 10 to 17. It evaluates attitudes toward food, body image, and the internalisation of societal standards of attractiveness. The instrument comprises 12 yes-no statements.

Eating Disorder Inventory (EDI)

The Eating Disorder Inventory (EDI) [9] is employed to evaluate both the symptomatology and psychological characteristics, attitudes, and behaviours associated with eating disorders. It facilitates the measurement of the psychological attributes of individuals with eating disorders, thereby enabling the differentiation of specific subgroups of patients and enhancing their understanding and treatment. The inventory comprises 91 items rated on a 6-point scale (always, usually, often, sometimes, rarely, never). The items are categorised into 12 distinct subscales, as the total score for the entire scale is not determined. The subscales utilised in this study include the Body Dissatisfaction Scale (BD), the Interoceptive Deficits Scale (ID), and the Low Self-Esteem Scale (LSE).

Perceived Stress Scale (PSS-10)

The Perceived Stress Scale (PSS-10) [10] evaluates the intensity of stress associated with everyday life over the preceding month. This scale comprises ten items assessed on a five-point Likert scale, ranging from 0 (never) to 4 (very often).

State-Trait Anxiety Inventory (STAI)

The State-Trait Anxiety Inventory (STAI) [11] investigates anxiety conceptualised as a temporary and situationally conditioned state, as well as a relatively stable personality trait. The instrument comprises two components: the X-1 scale evaluates state anxiety, reflecting the individual's current experience of anxiety, and the X-2 scale assesses trait anxiety, which pertains to a personality predisposition to experience anxiety. Each component consists of 20 statements accompanied by four response options gauging the intensity of emotional experience.

UWIST Mood Adjective Checklist (UMACL)

The UWIST Mood Adjective Checklist (UMACL) [12] assesses mood conceptualised as an affective experience of moderate duration (at least a few minutes). The overall mood score includes three mood dimensions: Hedonic Tone (HT), Tense Arousal (TA), and Energetic Arousal (EA). The instrument comprises 29 adjectives evaluated on a 4-point scale, ranging from “strongly yes” to “strongly no”.

Physiological measurements & data processing

Table B.4. Chosen HRV indices with description and physiological explanation [13,14]

Analysis Domain	Index (unit)	Description	Physiological explanation
Time	**HR (RR index)**	Mean interbeat interval.	Reflects the time elapsed between consecutive contractions of the heart.
	SDNN (ms)	Standard deviation of the NN intervals.	Reflects booth sympathetic (SNS) and parasympathetic (PNS) activity, in short-term recordings primarily parasympathetically-mediated respiratory sinus arrhythmia.
	RMSSD (ms)	Square root of the mean squared successive differences between normal heartbeats.	Estimates vagally-mediated changes and the influence of respiration.
Frequency	**TP**	Total power is the total variance of NN intervals over the temporal segment.	Reflects all influences on the heart.
	LF	Power in the low-frequency range (0.04–0.15 Hz)	Reflects mainly baroreceptor activity (during resting conditions); may be produced by SNS and PNS activity, blood pressure regulation, and slow respiration below 8.5 breaths per minute.
	HF	Power in the high-frequency range (0.15–0.40 Hz)	Reflects PNS activity and HR variations related to the respiratory cycle. Low HF values correlate with stress, panic, anxiety, worry, and increased morbidity.
	LF/HF	Ratio of low-frequency range power to high-frequency range power	Previously understood as the SNS/PNS balance, more recently as a ratio between baroreflex and PNS activities.

HR – heart rate, SDNN - Standard deviation of the normal-to-normal intervals, RMSSD – root mean square of successive differences between normal heartbeats, TP – total power, LF – low-frequency power, HF – high-frequency power, LF/HF – ratio of low- to high-frequency power

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Supplement C

3.1.1 Results of ANOVA for psychometric measures

Table C.1. Main effects of time (with trends), group, and interaction effects for psychometric measures.

	Effect: time				Trend: linear				Trend: quadratic			
Psychometric measure	**F(2,78)**	**p-value**	**η_p^2**	**power**	**F(1,39)**	**p-value**	**η_p^2**	**power**	**F(1,39)**	**p-value**	**η_p^2**	**power**
EDI-BD	12.25	.000	.24	.99	15.62	.000	.29	.97	5.85	.020	.13	.66
EDI-ID	26.70	.000	.41	1.00	35.05	.000	.47	1.00	6.22	.017	.14	.68
EDI-LSE	11.47	.000	.23	.99	14.61	.000	.27	.96	7.27	.010	.16	.75
PSS-10	19.27	.000	.33	1.00	23.94	.000	.38	1.00	14.40	.001	.27	.96
STAI-X1	27.11	.000	.41	1.00	35.65	.000	.48	1.00	13.13	.001	.25	.94
STAI-X2	12.27	.000	.24	.98	15.90	.000	.29	.97	3.41	.073	.08	.44
UMACL-EA	16.59	.000	.30	1.00	28.88	.000	.43	1.00	6.18	.017	.14	.68
UMACL-TA	46.56	.000	.54	1.00	68.99	.000	.64	1.00	17.44	.000	.31	.98
UMACL-HT	35.77	.000	.48	1.00	59.39	.000	.60	1.00	12.79	.001	.25	.94

	Effect: group				Effect: group*time			
Psychometric measure	**F(2,39)**	**p-value**	**η_p^2**	**power**	**F(4,78)**	**p-value**	**η_p^2**	**power**
EDI-BD	.31	.735	.02	.10	.14	.954	.01	.08
EDI-ID	.68	.514	.03	.16	1.08	.368	.05	.30
EDI-LSE	.79	.463	.04	.17	1.12	.354	.05	.34
PSS-10	.03	.970	.00	.05	.95	.438	.05	.29
STAI-X1	.07	.929	.00	.06	.25	.909	.01	.10
STAI-X2	.13	.878	.01	.07	.06	.984	.00	.06
UMACL-EA	3.62	.036	.16	.64	.99	.418	.05	.30
UMACL-TA	.15	.862	.01	.07	1.00	.410	.05	.30
UMACL-HT	1.23	.303	.06	.25	2.14	.083	.10	.61

Table C.2. Simple main effects for psychometric measures.

	Effect: group											
	at baseline				at pre-test				at post-test			
Psychometric measure	**F(2,39)**	**p-value**	**η_p^2**	**power**	**F(2,39)**	**p-value**	**η_p^2**	**power**	**F(2,39)**	**p-value**	**η_p^2**	**power**
EDI-BD	.31	.732	.02	.10	.22	.804	.01	.08	.32	.726	.02	.10
EDI-ID	1.79	.180	.08	.35	.47	.626	.02	.12	.02	.982	.00	.05
EDI-LSE	1.36	.269	.07	.28	.03	.974	.00	.05	1.44	.248	.07	.29
PSS-10	.04	.961	.00	.06	.00	.996	.00	.05	.28	.760	.01	.09
STAI-X1	.02	.977	.00	.05	.09	.917	.00	.06	.32	.727	.02	.10
STAI-X2	.06	.945	.00	.06	.16	.856	.01	.07	.15	.858	.01	.07
UMACL-EA	1.12	.337	.05	.23	1.64	.208	.08	.32	3.31	.047	.15	.59
UMACL-TA	.19	.832	.01	.08	.13	.875	.01	.07	1.75	.188	.08	.34
UMACL-HT	3.98	.027	.17	.68	.00	.997	.00	.05	1.55	.225	.07	.31

	Effect: time											
	DMT				Trend: linear				Trend: quadratic			
Psychometric measure	F(2,78)	p-value	η_p^2	power	F(1,9)	p-value	η_p^2	power	F(1,9)	p-value	η_p^2	power
EDI-BD	2.19	.141	.20	.39	4.83	.056	.35	.50	.19	.670	.02	.07
EDI-ID	7.86	.004	.47	.91	11.48	.008	.56	.85	.77	.402	.08	.12
EDI-LSE	1.57	.236	.15	.29	2.59	.142	.22	.30	.02	.881	.00	.05
PSS-10	1.74	.204	.16	.32	1.73	.221	.16	.22	1.75	.219	.16	.22
STAI-X1	9.62	.007	.52	.87	9.68	.012	.52	.79	9.23	.014	.51	.77
STAI-X2	2.05	.158	.19	.37	2.37	.158	.21	.28	1.05	.332	.10	.15
UMACL-EA	10.04	.001	.53	.97	15.53	.003	.63	.94	4.53	.062	.33	.48
UMACL-TA	19.90	.001	.69	.99	19.82	.002	.69	.98	2.38	.001	.69	.98
UMACL-HT	15.31	.000	.63	1.00	3.47	.000	.77	1.00	1.44	.261	.14	.19

	Yoga				Trend: linear				Trend: quadratic			
Psychometric measure	F(2,78)	p-value	η_p^2	power	F(1,16)	p-value	η_p^2	power	F(1,16)	p-value	η_p^2	power
EDI-BD	4.57	.038	.22	.58	4.50	.050	.22	.51	4.82	.043	.23	.54
EDI-ID	8.51	.001	.35	.95	10.47	.005	.40	.86	3.74	.071	.19	.44
EDI-LSE	7.82	.002	.33	.93	7.65	.014	.32	.74	7.93	.012	.33	.75
PSS-10	17.23	.000	.52	1.00	25.80	.000	.62	1.00	10.02	.006	.39	.84
STAI-X1	13.55	.000	.46	.98	16.62	.001	.51	.97	7.76	.013	.33	.74
STAI-X2	8.60	.001	.35	.95	12.59	.003	.44	.91	1.36	.261	.08	.19
UMACL-EA	6.31	.005	.28	.87	9.93	.006	.38	.84	2.05	.172	.11	.27
UMACL-TA	2.22	.000	.56	1.00	36.36	.000	.69	1.00	9.46	.007	.37	.82
UMACL-HT	13.52	.000	.46	1.00	2.04	.000	.56	.99	10.60	.005	.40	.86

	Mindfulness				Trend: linear				Trend: quadratic			
Psychometric measure	F(2,78)	p-value	η_p^2	power	F(1,14)	p-value	η_p^2	power	F(1,14)	p-value	η_p^2	power
EDI-BD	11.09	.000	.44	.98	15.09	.002	.52	.95	5.62	.033	.29	.60
EDI-ID	8.82	.005	.39	.87	10.21	.006	.42	.84	3.66	.077	.21	.43
EDI-LSE	7.97	.002	.36	.93	6.49	.023	.32	.66	10.85	.005	.44	.86
PSS-10	7.11	.003	.34	.90	7.81	.014	.36	.74	5.91	.029	.30	.62
STAI-X1	6.64	.004	.32	.88	10.68	.006	.43	.86	3.07	.102	.18	.37
STAI-X2	3.84	.051	.22	.54	4.98	.042	.26	.55	.96	.344	.06	.15
UMACL-EA	2.02	.151	.13	.38	4.45	.053	.24	.50	.73	.407	.05	.13
UMACL-TA	11.47	.000	.45	.99	16.40	.001	.54	.96	2.30	.152	.14	.29
UMACL-HT	9.15	.001	.40	.96	11.06	.005	.44	.87	4.14	.061	.23	.47

Table C.3. Simple effects of intervention type at different time points for psychometric measures.

		baseline							pre-test							post-test						
Ind.	**group**	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***
	1-2	.52	3.09	.880	-6.10	6.37	.06	-.72 .84	-.62	3.40	.857	-7.03	5.50	-.07	-.85 .71	1.05	3.14	.732	-4.80	6.81	.12	-.66 .90
EDI-BD	**1-3**	2.43	3.01	.452	-3.07	8.10	.32	-.49 1.12	1.43	3.23	.682	-4.46	7.65	.17	-.63 .97	2.57	2.80	.406	-2.65	8.07	.36	-.45 1.16
	2-3	1.91	2.95	.512	-3.83	8.10	.22	-.48 .91	2.05	3.02	.504	-3.98	8.74	.23	-.47 .92	1.51	2.82	.631	-3.82	6.90	.18	-.52 .88
	1-2	5.08	2.94	.107	-1.46	11.16	.71	-.10 1.51	2.28	3.03	.481	-3.72	8.07	.28	-.51 1.06	-.18	2.75	.933	-5.67	4.81	-.02	-.80 .76
EDI-ID	**1-3**	5.43	3.36	.141	-1.59	12.00	.65	-.18 1.47	3.03	2.90	.324	-3.53	9.03	.42	-.40 1.22	.30	2.31	.888	-3.80	4.50	.05	-.75 .85
	2-3	.36	2.55	.905	-4.60	5.60	.05	-.65 .74	.76	2.62	.788	-4.33	5.90	.10	-.60 .79	.48	2.46	.861	-4.14	4.91	.06	-.63 .76
	1-2	2.97	1.80	.122	-.53	7.07	.61	-.20 1.40	-.42	1.61	.814	-3.81	2.53	-.10	-.88 .68	1.45	1.74	.413	-2.72	5.05	.32	-.47 1.10
EDI-LSE	**1-3**	2.90	1.90	.156	-.51	6.73	.60	-.23 1.41	-.27	1.79	.871	-4.58	3.42	-.05	-.85 .75	2.73	1.46	.081	-.31	5.87	.80	-.04 1.63
	2-3	-.07	1.73	.969	-3.45	3.40	-.01	-.71 .68	.16	1.67	.929	-3.24	3.60	.03	-.66 .73	1.29	1.25	.313	-1.09	3.82	.34	-.36 1.04
	1-2	-.38	1.98	.863	-4.11	3.37	-.07	-.85 .71	-.11	1.80	.955	-3.79	3.24	-.02	-.80 .76	1.27	1.73	.496	-2.14	4.54	.26	-.53 1.04
PSS-10	**1-3**	-.53	1.74	.759	-3.77	2.78	-.13	-.93 .68	-.17	1.54	.911	-3.53	3.06	-.04	-.84 .76	.33	1.50	.838	-2.63	3.37	.08	-.72 .88
	2-3	-.16	1.59	.923	-3.72	3.29	-.03	-.73 .66	-.05	1.68	.982	-3.52	3.61	-.01	-.71 .68	-.94	1.72	.591	-4.87	2.79	-.19	-.88 .51
	1-2	-.47	3.79	.916	-8.62	6.59	-.05	-.83 .74	-1.79	3.50	.625	-8.99	4.81	-.17	-.95 .61	-.49	3.04	.880	-6.79	5.67	-.06	-.84 .72
STAI-X1	**1-3**	.40	4.02	.915	-8.27	8.31	.03	-.77 .83	-1.73	3.80	.654	-9.63	5.95	-.15	-.95 .65	-2.97	3.89	.480	-11.29	4.66	-.26	-1.06 .55
	2-3	.87	4.15	.854	-7.67	10.20	.07	-.62 .77	.05	4.45	.986	-8.61	9.05	.00	-.69 .70	-2.48	3.84	.560	-10.70	4.94	-.22	-.92 .48
	1-2	1.28	3.86	.735	-6.71	8.79	.13	-.66 .91	2.01	3.54	.586	-5.74	8.57	.22	-.57 1.00	1.97	3.22	.569	-5.18	8.01	.22	-.57 1.00
STAI-X2	**1-3**	.90	3.66	.825	-6.37	8.23	.10	-.70 .90	1.23	3.41	.737	-6.66	7.97	.14	-.66 .94	.63	3.37	.832	-7.31	7.59	.07	-.73 .87
	2-3	-.38	3.21	.926	-6.75	5.77	-.04	-.73 .66	-.77	3.17	.834	-7.52	6.01	-.09	-.78 .61	-1.34	3.51	.720	-8.55	6.44	-.13	-.83 .56
	1-2	-3.09	2.06	.164	-6.86	.41	-.55	-1.34 .25	-3.62	1.99	.082	-7.29	-.17	-.68	-1.47 .13	-.19	1.77	.912	-3.78	3.54	-.04	-.82 .74
UMACL-EA	**1-3**	-1.00	2.06	.671	-4.97	2.67	-.19	-.99 .61	-.77	2.18	.771	-5.09	2.99	-.13	-.93 .67	4.37	2.15	.060	.47	8.43	.75	-.08 1.57
	2-3	2.09	1.92	.315	-1.55	5.70	.37	-.34 1.06	2.85	1.97	.173	-1.26	6.92	.49	-.22 1.19	4.56	1.99	**.039**	.76	8.16	.82	.09 1.53
	1-2	1.31	1.96	.525	-2.24	5.25	.26	-.53 1.04	-.54	1.90	.783	-4.26	3.46	-.10	-.88 .68	.24	1.38	.876	-1.97	3.00	.08	-.71 .86
UMACL-TA	**1-3**	.30	2.39	.899	-4.14	5.17	.05	-.76 .85	.60	2.22	.806	-3.87	5.33	.09	-.71 .89	-2.43	1.91	.225	-6.53	1.69	-.47	-1.27 .35
	2-3	-1.01	2.22	.649	-5.59	3.59	-.16	-.86 .54	1.14	2.31	.658	-3.44	5.59	.17	-.53 .86	-2.67	1.57	.133	-6.43	.68	-.61	-1.32 .10
	1-2	-6.41	1.99	.004	-10.18	-2.76	-1.30	-2.15 -.43	-.12	2.41	.951	-5.25	5.17	-.02	-.80 .76	-.09	1.22	.959	-2.58	2.28	-.03	-.81 .75
UMACL-HT	**1-3**	-2.43	2.45	.351	-7.17	1.85	-.37	-1.17 .44	.07	2.70	.987	-5.52	6.08	.01	-.79 .81	2.83	2.15	.246	-.80	6.66	.45	-.37 1.25
	2-3	3.97	2.21	.088	-.24	8.55	.64	-.08 1.34	.18	2.64	.944	-4.97	5.24	.02	-.67 .72	2.92	1.98	.208	-.23	6.45	.53	-.18 1.24

Table C.4. Simple effects of time in different intervention groups for psychometric measures.

		dance movement therapy (DMT)							yoga							mindfulness						
Ind.	**time**	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	
	0-1	1.20	2.45	.652	-2.60	6.91	.15	-.48	.77	.06	.82	.948	-1.18	1.29	.02	-.46	.49	.20	.70	.787	-.93	1.33	.07	-.44	.58
EDI-BD	**1-2**	2.80	1.30	.067	.40	5.24	.65	-.05	1.33	4.47	1.84	.045	1.02	8.88	.57	.05	1.08	3.93	1.10	.011	2.27	5.53	.89	.28	1.48
	0-2	4.00	1.77	.132	1.00	8.10	.70	-.02	1.38	4.53	2.10	.062	.76	9.03	.51	.00	1.01	4.13	1.04	.002	2.53	5.67	1.00	.37	1.62
	0-1	3.80	2.79	.248	-1.08	9.28	.40	-.25	1.04	1.00	1.30	.463	-1.62	3.53	.18	-.30	.66	1.40	.86	.136	-.13	2.97	.41	-.13	.93
EDI-ID	**1-2**	7.40	2.25	.082	3.28	12.90	1.04	.25	1.81	4.94	1.36	.017	2.00	8.65	.85	.28	1.40	4.67	1.53	.048	2.27	7.33	.77	.18	1.33
	0-2	11.20	3.18	.011	5.28	17.40	1.07	.27	1.84	5.94	1.78	.006	1.97	9.82	.78	.23	1.32	6.07	1.82	.018	3.00	9.00	.83	.22	1.40
	0-1	2.10	2.41	.440	-2.58	7.78	.26	-.38	.89	-1.29	.74	.108	-2.59	-.12	-.41	-.90	.09	-1.07	.78	.213	-2.20	.13	-.33	-.85	.19
EDI-LSE	**1-2**	1.60	1.20	.233	-.60	3.90	.41	-.25	1.05	3.47	1.05	.016	1.53	5.67	.78	.23	1.32	4.60	1.29	.025	2.47	6.67	.90	.28	1.49
	0-2	3.70	2.21	.169	-.40	8.66	.51	-.17	1.16	2.18	.77	.024	1.00	3.41	.67	.13	1.19	3.53	1.35	.037	1.20	5.80	.66	.09	1.21
	0-1	-.50	.91	.623	-2.50	1.30	-.16	-.78	.47	-.24	.45	.605	-1.06	.71	-.12	-.60	.36	-.13	.55	.801	-1.15	.93	-.06	-.57	.45
PSS-10	**1-2**	1.50	.68	.087	.10	2.90	.67	-.03	1.35	2.88	.61	<.001	1.82	4.01	1.11	.49	1.71	2.00	.54	.002	1.06	3.08	.95	.32	1.55
	0-2	1.00	.72	.229	-.53	2.50	.42	-.24	1.05	2.65	.49	.002	1.71	3.53	1.23	.58	1.86	1.87	.65	.020	.53	3.40	.72	.14	1.28
	0-1	2.20	2.35	.390	-2.00	6.00	.28	-.36	.91	.88	1.64	.602	-2.17	4.00	.13	-.35	.60	.07	3.17	.982	-6.92	7.17	.01	-.50	.51
STAI-X1	**1-2**	10.70	2.41	.018	6.50	15.64	1.33	.45	2.18	12.00	3.12	.010	7.18	18.24	.92	.34	1.48	9.47	2.65	.009	3.61	14.65	.89	.28	1.48
	0-2	12.90	3.92	.017	5.00	2.26	.98	.20	1.73	12.88	3.11	<.001	7.12	19.52	.99	.39	1.56	9.53	2.77	.024	4.83	15.04	.84	.24	1.43
	0-1	.80	2.01	.723	-3.50	5.40	.12	-.50	.74	1.53	.96	.146	-.71	3.71	.37	-.13	.85	1.13	1.01	.289	-.93	3.67	.29	-.23	.80
STAI-X2	**1-2**	3.80	2.01	.115	-.50	7.90	.57	-.11	1.23	3.76	1.30	.020	1.53	6.15	.66	.12	1.18	3.20	1.64	.105	.40	6.27	.47	-.07	1.00
	0-2	4.60	2.85	.177	-1.64	10.54	.49	-.18	1.13	5.29	1.44	.022	2.13	8.93	.86	.29	1.41	4.33	1.85	.056	.85	7.73	.58	.02	1.12
	0-1	-.30	1.38	.833	-2.80	2.20	-.07	-.68	.56	-.82	1.60	.621	-3.40	1.87	-.12	-.59	.36	-.07	2.09	.974	-3.13	3.87	-.01	-.51	.50
UMACL-EA	**1-2**	-8.60	2.66	.018	-14.19	-3.40	-.96	-1.70	-.18	-5.18	1.79	.057	-10.09	-1.47	-.67	-1.19	-.14	-3.47	2.08	.141	-8.13	.40	-.41	-.93	.12
	0-2	-8.90	2.08	.006	-12.70	-5.17	-1.25	-2.07	-.39	-6.00	1.81	.008	-9.55	-2.47	-.76	-1.30	-.21	-3.53	1.61	.057	-6.56	-.84	-.54	-1.08	.01
	0-1	1.50	1.42	.353	-.60	3.69	.32	-.32	.95	-.35	1.89	.878	-4.78	3.45	-.05	-.52	.43	1.80	1.05	.123	-.27	3.93	.42	-.11	.94
UMACL-TA	**1-2**	8.10	1.02	.004	6.00	10.30	2.33	1.09	3.54	8.88	1.35	<.001	6.29	11.52	1.55	.83	2.26	5.07	1.52	.010	2.60	7.53	.82	.22	1.40
	0-2	9.60	2.03	.003	6.10	13.20	1.41	.50	2.28	8.53	1.44	<.001	5.19	11.88	1.46	.76	2.14	6.87	1.62	.006	3.87	9.93	1.05	.40	1.67
	0-1	-3.70	2.44	.194	-8.20	.70	-.46	-1.10	.21	2.59	1.98	.254	-.12	6.23	.33	-.16	.81	-1.20	1.57	.475	-4.00	1.40	-.19	-.70	.32
UMACL-HT	**1-2**	-8.50	1.90	.008	-12.19	-5.20	-1.35	-2.20	-.46	-8.47	1.72	.002	-12.32	-5.33	-1.18	-1.80	-.55	-5.73	1.37	.009	-8.40	-3.20	-1.02	-1.64	-.38
	0-2	-12.20	2.15	.002	-16.30	-8.00	-1.75	-2.73	-.72	-5.88	1.36	<.001	-8.47	-3.45	-1.09	-1.68	-.47	-6.93	2.02	.010	-10.73	-3.53	-.86	-1.44	-.25

3.1.2 Results of ANOVA for logarithmised HRV measures

Table C.5. Main effects of time (with trends), group, and interaction effects for logarithmised HRV indices.

	Effect: time				Trend: linear				Trend: quadratic			
Psychometric measure	**F(2,78)**	**p-value**	**η_p^2**	**power**	**F(1,39)**	**p-value**	**η_p^2**	**power**	**F(1,39)**	**p-value**	**η_p^2**	**power**
HR	21.84	.000	.36	1.00	10.72	.002	.22	.89	43.62	.000	.53	1.00
SDNN	2.24	.113	.05	.44	1.34	.254	.03	.20	3.36	.075	.08	.43
RMSSD	7.09	.001	.15	.92	5.71	.022	.13	.64	9.14	.004	.19	.84
TP	3.19	.056	.08	.54	2.11	.154	.05	.29	4.69	.036	.11	.56
LF	3.28	.054	.08	.54	2.02	.163	.05	.28	5.39	.026	.12	.62
HF	4.96	.009	.11	.80	4.97	.032	.11	.58	4.94	.032	.11	.58
LF/HF	.55	.580	.01	.14	.97	.330	.02	.16	.01	.909	.00	.05

	Effect: group				Effect: group*time			
Psychometric measure	**F(2,39)**	**p-value**	**η_p^2**	**power**	**F(4,78)**	**p-value**	**η_p^2**	**power**
HR	.38	.690	.02	.11	3.32	.020	.15	.77
SDNN	.56	.576	.03	.14	.74	.565	.04	.23
RMSSD	.77	.469	.04	.17	1.56	.193	.07	.46
TP	.66	.522	.03	.15	.39	.783	.02	.13
LF	.12	.890	.01	.07	.04	.993	.00	.06
HF	1.37	.266	.07	.28	1.08	.373	.05	.32
LF/HF	1.93	.158	.09	.38	1.07	.378	.05	.32

Table C.6. Simple main effects for logarithmised HRV indices.

	Effect: group											
	at baseline				at pre-test				at post-test			
Psychometric measure	**F(2,39)**	**p-value**	**η_p^2**	**power**	**F(2,39)**	**p-value**	**η_p^2**	**power**	**F(2,39)**	**p-value**	**η_p^2**	**power**
HR	.36	.702	.02	.10	1.31	.281	.06	.27	2.86	.069	.13	.53
SDNN	1.11	.339	.05	.23	.26	.771	.01	.09	.60	.553	.03	.14
RMSSD	1.06	.355	.05	.22	.07	.937	.00	.06	1.71	.194	.08	.34
TP	1.06	.355	.05	.22	.25	.780	.01	.09	.39	.683	.02	.11
LF	.09	.915	.00	.06	.09	.914	.00	.06	.06	.938	.00	.06
HF	1.71	.195	.08	.34	.02	.982	.00	.05	1.78	.182	.08	.35
LF/HF	1.93	.159	.09	.38	.06	.942	.00	.06	2.46	.099	.11	.46
	Effect: time											
	DMT				**Trend: linear**				**Trend: quadratic**			
Psychometric measure	**F(2,18)**	**p-value**	**η_p^2**	**power**	**F(1,9)**	**p-value**	**η_p^2**	**power**	**F(1,9)**	**p-value**	**η_p^2**	**power**
HR	.37	.699	.04	.10	.11	.743	.01	.06	.74	.411	.08	.12
SDNN	.02	.982	.00	.05	.04	.847	.00	.05	.01	.943	.00	.05
RMSSD	.09	.914	.01	.06	.00	.970	.00	.05	.25	.627	.03	.07
TP	.24	.786	.03	.08	.64	.445	.07	.11	.02	.883	.00	.05
LF	.60	.560	.06	.13	1.07	.327	.11	.15	.38	.550	.04	.09
HF	.46	.637	.05	.11	.62	.450	.06	.11	.08	.785	.01	.06
LF/HF	.37	.695	.04	.10	.03	.876	.00	.05	1.03	.337	.10	.15
	Yoga				**Trend: linear**				**Trend: quadratic**			
Psychometric measure	**F(2,32)**	**p-value**	**η_p^2**	**power**	**F(1,16)**	**p-value**	**η_p^2**	**power**	**F(1,16)**	**p-value**	**η_p^2**	**power**
HR	36.38	.000	.69	1.00	14.00	.002	.47	.94	110.06	.000	.87	1.00
SDNN	5.18	.011	.24	.79	1.05	.320	.06	.16	8.94	.009	.36	.80
RMSSD	12.77	.001	.44	.97	9.79	.006	.38	.84	15.01	.001	.48	.95
TP	3.53	.041	.18	.62	.89	.361	.05	.14	6.08	.025	.28	.64
LF	2.00	.152	.11	.38	1.18	.294	.07	.18	3.10	.097	.16	.38
HF	7.19	.003	.31	.91	3.02	.102	.16	.37	11.16	.004	.41	.88
LF/HF	1.69	.201	.10	.33	.31	.588	.02	.08	3.13	.096	.16	.38
	Mindfulness				**Trend: linear**				**Trend: quadratic**			
Psychometric measure	**F(2,28)**	**p-value**	**η_p^2**	**power**	**F(1,14)**	**p-value**	**η_p^2**	**power**	**F(1,14)**	**p-value**	**η_p^2**	**power**
HR	8.18	.006	.37	.85	5.41	.036	.28	.58	12.98	.003	.48	.92
SDNN	1.06	.345	.07	.19	.89	.361	.06	.14	1.48	.244	.10	.21
RMSSD	2.95	.069	.17	.53	3.50	.082	.20	.41	1.83	.197	.12	.24
TP	1.42	.259	.09	.22	.87	.367	.06	.14	3.17	.097	.18	.38
LF	1.19	.301	.08	.19	.44	.520	.03	.09	5.13	.040	.27	.56
HF	1.98	.156	.12	.38	2.35	.148	.14	.30	1.42	.253	.09	.20
LF/HF	.96	.395	.06	.20	1.86	.194	.12	.25	.05	.823	.00	.06

Table C.7. Simple effects of intervention type at different time points for logarithmised HRV indices.

		baseline								pre-test								post-test							
HRV index	**group**	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***		**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***		**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	
	1-2	.01	.07	.841	-.12	.15	.09	-.69	.87	-.09	.05	.119	-.21	.02	-.65	-1.44	.16	.15	.06	**.029**	.02	.26	1.02	.18	1.84
HR	**1-3**	-.03	.07	.682	-.17	.11	-.18	-.98	.62	-.06	.05	.301	-.17	.05	-.42	-1.23	.39	.06	.07	.380	-.09	.19	.36	-.45	1.17
	2-3	-.04	.04	.308	-.12	.03	-.37	-1.07	.33	.03	.04	.561	-.06	.11	.21	-.49	.91	-.08	.05	.156	-.21	.02	-.53	-1.23	.18
	1-2	-.16	.17	.405	-.53	.15	-.38	-1.17	.41	.10	.14	.516	-.20	.37	.24	-.54	1.03	-.23	.18	.233	-.61	.13	-.45	-1.24	.34
SDNN	**1-3**	.03	.16	.859	-.31	.35	.08	-.72	.88	.10	.13	.488	-.19	.36	.29	-.52	1.09	-.10	.20	.639	-.50	.31	-.20	-1.00	.61
	2-3	.19	.12	.139	-.05	.48	.55	-.16	1.25	.00	.12	.996	-.25	.28	.00	-.69	.70	.13	.20	.544	-.24	.52	.22	-.48	.92
	1-2	-.13	.22	.583	-.57	.29	-.24	-1.02	.55	.07	.17	.688	-.25	.41	.14	-.64	.92	-.50	.22	**.035**	-.98	-.05	-.79	-1.59	.03
RMSSD	**1-3**	.14	.21	.507	-.32	.62	.27	-.54	1.07	.04	.16	.806	-.29	.36	.10	-.70	.90	-.28	.25	.292	-.74	.23	-.42	-1.23	.39
	2-3	.28	.18	.147	-.08	.69	.54	-.17	1.24	-.03	.18	.890	-.40	.35	-.05	-.75	.64	.22	.25	.419	-.23	.70	.30	-.40	1.00
	1-2	-.39	.35	.296	-1.13	.25	-.44	-1.23	.35	.06	.32	.847	-.59	.70	.07	-.71	.85	-.37	.38	.345	-1.17	.36	-.35	-1.13	.45
TP	**1-3**	-.01	.34	.989	-.79	.73	-.01	-.81	.79	.21	.27	.439	-.34	.79	.31	-.49	1.12	-.14	.41	.765	-.92	.70	-.13	-.93	.68
	2-3	.38	.28	.200	-.17	1.07	.48	-.23	1.18	.15	.26	.564	-.41	.77	.19	-.51	.88	.23	.41	.588	-.52	1.03	.20	-.50	.89
	1-2	-.14	.39	.723	-.97	.64	-.14	-.92	.64	.01	.40	.983	-.83	.78	.01	-.77	.79	-.15	.46	.765	-1.15	.77	-.12	-.90	.66
LF	**1-3**	-.03	.39	.960	-.89	.83	-.03	-.83	.78	.13	.34	.707	-.59	.85	.16	-.64	.96	-.01	.50	.993	-1.02	1.01	.00	-.80	.80
	2-3	.12	.32	.722	-.49	.85	.12	-.57	.82	.13	.30	.689	-.51	.85	.14	-.56	.83	.14	.46	.782	-.72	1.04	.11	-.59	.80
	1-2	-.82	.50	.121	-1.89	.09	-.65	-1.44	.16	.07	.41	.879	-.75	.93	.06	-.72	.84	-.91	.40	**.035**	-1.71	-.15	-.74	-1.54	.07
HF	**1-3**	-.24	.48	.611	-1.28	.79	-.20	-1.00	.61	.08	.35	.825	-.65	.84	.09	-.71	.89	-.48	.39	.270	-1.18	.29	-.45	-1.25	.37
	2-3	.59	.41	.178	-.32	1.48	.50	-.21	1.20	.01	.38	.982	-.75	.86	.01	-.68	.70	.43	.45	.376	-.39	1.29	.33	-.37	1.02
	1-2	.68	.40	.118	-.11	1.48	.66	-.15	1.45	-.06	.35	.874	-.76	.63	-.06	-.84	.72	.76	.38	.058	-.04	1.55	.83	.01	1.64
LF/HF	**1-3**	.21	.33	.534	-.46	.88	.26	-.55	1.06	.05	.34	.870	-.66	.74	.06	-.74	.86	.47	.39	.260	-.31	1.32	.51	-.31	1.32
	2-3	-.47	.33	.178	-1.09	.13	-.50	-1.20	.21	.11	.31	.725	-.54	.73	.12	-.58	.81	-.29	.26	.289	-.80	.22	-.38	-1.08	.32

Table C.8. Simple effects of time in different intervention groups for logarithmised HRV indices.

		dance movement therapy (DMT)							yoga							mindfulness						
HRV index	**time**	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***	**Δμ**	**SE**	**p**	**95% CI***		**d**	**95% CI***
	0-1	-.03	.06	.660	-.16	.09	-.15	-.77 .48	-.13	.03	.007	-.17	-.09	-1.17	-1.79 -.54	-.06	.02	.033	-.10	-.02	-.61	-1.16 -.05
HR	**1-2**	.05	.05	.362	-.04	.15	.30	-.34 .93	.28	.03	<.001	.24	.34	2.28	1.35 3.19	.17	.05	.008	.06	.28	.87	.26 1.45
	0-2	.02	.06	.735	-.11	.16	.11	-.52 .73	.15	.04	.012	.09	.23	.91	.33 1.47	.11	.05	.057	.02	.20	.60	.04 1.14
	0-1	-.03	.19	.909	-.42	.29	-.05	-.67 .57	.22	.08	.008	.08	.38	.67	.13 1.18	.03	.09	.720	-.15	.20	.09	-.42 .60
SDNN	**1-2**	.00	.20	.986	-.44	.41	.00	-.62 .62	-.33	.12	.019	-.57	-.08	-.64	-1.15 -.11	-.20	.16	.226	-.47	.08	-.33	-.84 .20
	0-2	-.03	.16	.841	-.29	.21	-.06	-.68 .56	-.10	.10	.315	-.39	.12	-.25	-.73 .24	-.17	.18	.392	-.46	.12	-.24	-.75 .27
	0-1	.07	.20	.744	-.29	.39	.11	-.52 .73	.28	.09	.013	.10	.45	.71	.16 1.23	-.03	.17	.886	-.40	.30	-.04	-.54 .47
RMSSD	**1-2**	-.08	.17	.656	-.47	.28	-.15	-.77 .48	-.66	.16	.003	-1.05	-.27	-.96	-1.53 -.37	-.41	.18	.063	-.71	-.08	-.55	-1.09 .00
	0-2	-.01	.23	.970	-.37	.35	-.01	-.63 .61	-.38	.12	.009	-.70	-.10	-.76	-1.29 -.21	-.43	.22	.106	-.81	-.03	-.48	-1.01 .06
	0-1	-.06	.34	.860	-.71	.53	-.06	-.68 .56	.38	.17	.049	.09	.71	.52	.00 1.02	.15	.17	.383	-.21	.48	.23	-.29 .74
TP	**1-2**	-.17	.37	.680	-1.02	.61	-.14	-.76 .49	-.60	.25	.036	-1.12	-.06	-.54	-1.04 -.02	-.52	.33	.153	-1.07	.03	-.39	-.91 .14
	0-2	-.23	.27	.466	-.71	.26	-.25	-.88 .38	-.21	.22	.353	-.76	.25	-.23	-.71 .26	-.36	.38	.399	-.98	.24	-.24	-.75 .28
	0-1	.09	.41	.839	-.60	.79	.07	-.55 .69	.24	.19	.260	-.10	.59	.29	-.20 .77	.25	.17	.183	-.08	.58	.37	-.16 .88
LF	**1-2**	-.42	.45	.401	-1.52	.55	-.28	-.91 .36	-.58	.32	.108	-1.22	.11	-.41	-.90 .09	-.56	.37	.180	-1.17	.05	-.38	-.90 .15
	0-2	-.33	.31	.356	-.88	.24	-.33	-.96 .32	-.34	.29	.290	-.94	.25	-.26	-.74 .22	-.31	.46	.538	-1.08	.45	-.17	-.68 .34
	0-1	-.29	.44	.542	-1.16	.62	-.20	-.82 .43	.60	.23	.019	.17	1.09	.61	.09 1.13	.03	.33	.943	-.64	.68	.02	-.49 .53
HF	**1-2**	-.12	.29	.709	-.70	.42	-.13	-.74 .50	-1.10	.32	.009	-1.83	-.28	-.79	-1.33 -.23	-.68	.38	.132	-1.31	.00	-.45	-.97 .09
	0-2	-.42	.49	.434	-1.42	.54	-.25	-.87 .39	-.50	.28	.097	-1.19	.19	-.42	-.91 .08	-.66	.42	.162	-1.36	.03	-.40	-.92 .14
	0-1	.38	.47	.438	-.46	1.18	.25	-.38 .88	-.36	.19	.092	-.73	.01	-.45	-.94 .06	.22	.28	.471	-.37	.74	.20	-.31 .71
LF/HF	**1-2**	-.30	.36	.424	-1.05	.45	-.25	-.87 .39	.52	.35	.170	-.21	1.18	.35	-.14 .84	.12	.21	.587	-.35	.56	.15	-.37 .65
	0-2	.09	.51	.860	-.81	.95	.05	-.57 .67	.16	.29	.585	-.42	.70	.13	-.35 .61	.34	.25	.221	-.24	.81	.35	-.18 .87

3.2 Results of regression modelling

Baseline psychometric measurements

Spearman correlation analysis

Pairwise Spearman correlation analysis revealed significant relations between several pairs of baseline psychometric measurements. The ARS score correlated positively and very strongly with EDI-BD, but also moderately with EDI-ID and EDI-LSE, and weakly with STAI-X2. Additionally, EDI-ID correlated positively and strongly with EDI-LSE and STAI-X2, as well as moderately with PSS-10 and weakly with STAI-X1. EDI-LSE correlated positively and moderately with STAI-X2 and weakly with PSS-10 and STAI-X1. PSS-10 was correlated positively and very strongly with STAI-X2 and strongly with STAI-X1, and the latter two were also moderately positively correlated. UMACL-TA was correlated positively and moderately with STAI-X1 and weakly with PSS-10, while UMACL-HT was correlated positively and moderately with UMACL-EA and showed a negative strong correlation with UMACL-TA. See Table C.4 for details.

Table C.9. Spearman ρ coefficient and p-values of correlations between baseline levels of psychometric measures among all participants. Correlation strength is represented by colour intensity (red - positive, blue - negative).

Score	ARS	EDI-BD	EDI-ID	EDI-LSE	PSS-10	STAI-X1	STAI-X2	UMACL-EA	UMACL-TA	UMACL-HT
Anorectic readiness syndrome (ARS)		0.85***	0.47**	0.47**	0.23	0.24	0.38*	0.03	0.17	-0.13
Body dissatisfaction (EDI-BD)	<0.001		0.39*	0.24	0.16	0.17	0.26†	<0.01	0.22	-0.16
Interoceptive deficiency (EDI-ID)	0.002	0.012		0.72***	0.46**	0.32*	0.64***	-0.29†	0.30†	-0.17
Low self-esteem (EDI-LSE)	0.002	0.122	<0.001		0.38*	0.31*	0.55***	-0.23	0.21	-0.17
Perceived stress (PSS-10)	0.142	0.328	0.002	0.013		0.66***	0.82***	-0.34*	0.37*	-0.21
State anxiety (STAI-X1)	0.122	0.289	0.041	0.043	<0.001		0.55***	-0.12	0.49**	-0.41*
Trait anxiety (STAI-X2)	0.012	0.093	<0.001	<0.001	<0.001	<0.001		-0.23	0.26	-0.12
Energetic arousal (UMACL-EA)	0.834	0.984	0.065	0.140	0.030	0.466	0.150		-0.46**	0.53***
Tense arousal (UMACL-TA)	0.290	0.168	0.056	0.175	0.015	0.001	0.101	0.002		-0.68***
Hedonic tone (UMACL-HT)	0.411	0.304	0.287	0.268	0.185	0.007	0.454	<0.001	<0.001	

* p<0.05, ** p<0.01, *** p<0.001, † p<0.1

Stepwise multiple linear regression

Table C.10. Predictor parameters of multiple linear regression models for ARS score and eating disorder trait measures: EDI-BD, EDI-LSE, and EDI-ID.

DV	Predictor	Model	Standardised coefficients				Colinearity	
			β	t	p	r_p	tolerance	VIF
ARS	**EDI-BD**	1	.82	12.16	<.001	.89	.92	1.09
	EDI-LSE	2	.25	3.65	.001	.51	.92	1.09
	EDI-ID	Excluded	-.10	-1.12	.270	-.18	.56	1.80
	PSS-10	Excluded	-.02	-.27	.790	-.04	.90	1.11
	STAI-X1	Excluded	.04	.55	.588	.09	.90	1.11
	STAI-X2	Excluded	<.01	.06	.955	.01	.79	1.27
	UMACL-EA	Excluded	.10	1.57	.126	.25	.93	1.08
	UMACL-TA	Excluded	-.07	-1.02	.315	-.16	.93	1.08
	UMACL-HT	Excluded	.03	.41	.687	.07	.97	1.03
EDI-BD	**EDI-ID**	1	.74	2.55	.15	.37	1.00	1.00
	EDI-LSE	Excluded	.07	.37	.716	.06	.60	1.67
	PSS-10	Excluded	<.01	.01	.989	<.01	.79	1.27
	STAI-X1	Excluded	.08	.54	.591	.09	.92	1.09
	STAI-X2	Excluded	.04	.20	.841	.03	.61	1.64
	UMACL-EA	Excluded	.16	1.08	.286	.17	.93	1.08
	UMACL-TA	Excluded	.09	.58	.569	.09	.90	1.11
	UMACL-HT	Excluded	-.05	-.36	.720	-.06	.98	1.03
EDI-LSE	**EDI-ID**	1	.63	5.19	<.001	.63	1.00	1.00
	EDI-BD	Excluded	.05	.37	.716	.06	.86	1.16
	PSS-10	Excluded	<.01	.05	.963	<.01	.79	1.27
	STAI-X1	Excluded	.13	1.02	.316	.16	.92	1.09
	STAI-X2	Excluded	.07	.45	.655	.07	.61	1.64
	UMACL-EA	Excluded	-.08	-.61	.549	-.10	.93	1.08
	UMACL-TA	Excluded	.03	.23	.816	.04	.90	1.11
	UMACL-HT	Excluded	-.07	-.53	.602	-.08	.98	1.03
EDI-ID	**STAI-X2**	1	.63	5.08	<.001	.63	1.00	1.00
	PSS-10	Excluded	-.14	-.66	.511	-.11	.24	2.96
	STAI-X1	Excluded	-.05	-.33	.744	-.05	.74	1.36
	UMACL-EA	Excluded	-.14	-1.11	.276	-.17	.96	1.05
	UMACL-TA	Excluded	.14	1.09	.281	.17	.92	1.09
	UMACL-HT	Excluded	-.08	-.60	.549	-.10	.98	1.02

Intervention-related changes in psychometric measurements

Spearman correlation analysis

Pairwise Spearman correlation analysis revealed significant associations between several pairs of intervention-related changes in psychometric measurements. ΔEDI-BD correlated positively and moderately with ΔEDI-LSE, but also weakly with ΔEDI-ID. ΔEDI-ID further correlated positively moderately with ΔEDI-LSE and weakly with ΔPSS-10; moreover, there was a significant negative moderate correlation with baseline ARS score. Additionally, ΔEDI-LSE correlated positively and weakly with ΔPSS-10. ΔPSS-10 were correlated positively and strongly with ΔSTAI-X2 and moderately with ΔSTAI-X1. ΔSTAI-X1 were moreover correlated positively and moderately with ΔUMACL-TA and negatively and moderately with ΔUMACL-HT. The latter showed also a moderate positive correlation with ΔUMACL-EA and a very strong negative correlation with ΔUMACL-TA. See Table C.5 for details.

Table C.11. Spearman ρ coefficient and p-values of correlations between baseline ARS score and intervention-related changes in levels of psychometric measures among all participants. Correlation strength is represented by colour intensity (red - positive, blue - negative).

Score	ARS	ΔEDI-BD	ΔEDI-ID	ΔEDI-LSE	ΔPSS-10	ΔSTAI-X1	ΔSTAI-X2	ΔUMACL-EA	ΔUMACL-TA	ΔUMACL-HT
Anorectic readiness syndrome (ARS)		-0.15	-0.41**	-0.20	-0.09	-0.03	-0.13	0.15	-0.18	0.21
Change in body dissatisfaction (ΔEDI-BD)	0.333		0.39*	0.48**	0.13	-0.14	0.14	0.20	-0.19	0.08
Change in interoceptive deficiency (ΔEDI-ID)	0.008	0.011		0.50**	0.32*	0.20	0.30†	-0.05	0.19	-0.11
Change in low self-esteem (ΔEDI-LSE)	0.207	0.001	0.001		0.31*	0.15	0.27†	0.16	0.02	-0.04
Change in perceived stress (ΔPSS-10)	0.577	0.409	0.036	0.044		0.46**	0.63***	0.23	0.19	-0.21
Change in state anxiety (ΔSTAI-X1)	0.839	0.374	0.210	0.336	0.002		0.210	-0.18	0.43**	-.044**
Change in trait anxiety (ΔSTAI-X2)	0.403	0.364	0.054	0.089	<0.001	0.183		0.23	-0.05	0.13
Change in energetic arousal (ΔUMACL-EA)	0.353	0.209	0.765	0.308	0.146	0.268	0.147		-0.24	0.42**
Change in tense arousal (ΔUMACL-TA)	0.263	0.221	0.218	0.926	0.228	0.005	0.759	0.129		-.75***
Change in hedonic tone (ΔUMACL-HT)	0.173	0.618	0.487	0.810	0.187	0.004	0.397	0.005	<0.001	

* p<0.05, ** p<0.01, *** p<0.001, † p<0.1

Stepwise multiple linear regression

Table C.12. Predictor parameters of step-wise multiple linear regression models for intervention-related changes in eating disorder trait measures: ΔEDI-BD, ΔEDI-LSE, and ΔEDI-ID.

DV	Predictor	Step	Standardised coefficients				Colinearity	
			β	t	p	r_p	tolerance	VIF
	Δ EDI-ID	1	.53	4.04	<.001	.54	.97	1.03
	Δ UMACL-EA	2	.33	2.52	.016	.38	.97	1.03
	Δ EDI-LSE	Excluded	.13	.72	.476	.12	.57	1.74
	Δ PSS-10	Excluded	.01	.06	.956	.01	.92	1.09
Δ EDI-BD	**Δ STAI-X1**	Excluded	.08	..60	.550	.10	.97	1.03
	Δ STAI-X2	Excluded	-.13	-.95	.348	-.15	.89	1.13
	Δ UMACL-TA	Excluded	-.08	-.60	.550	-.10	.88	1.14
	Δ UMACL-HT	Excluded	-.12	-.90	.373	-.15	.90	1.12
	RSA	Excluded	-.16	-1.17	.248	-.19	.90	1.11
	Δ EDI-ID	1	.61	4.82	<.001	.61	1.00	1.00
	Δ EDI-BD	Excluded	.20	1.39	.172	.22	.77	1.30
	Δ PSS-10	Excluded	.16	1.26	.215	.20	.99	1.02
	Δ STAI-X1	Excluded	.06	.43	.672	.07	.99	1.01
Δ EDI-LSE	**Δ STAI-X2**	Excluded	.02	.12	.903	.02	.95	1.15
	Δ UMACL-EA	Excluded	.25	2.02	.051	.31	.97	1.03
	Δ UMACL-TA	Excluded	-.03	-.19	.848	-.03	.94	1.06
	Δ UMACL-HT	Excluded	-.05	-.36	.719	-.06	.99	1.01
	RSA	Excluded	-.06	-.45	.657	-.07	.90	1.11
	ARS	1	-.32	-2.13	.040	-.32	1.00	1.00
	Δ PSS-10	Excluded	.11	.71	.485	.11	1.00	1.00
	Δ STAI-X1	Excluded	.09	.58	.568	.09	.99	1.01
Δ EDI-ID	**Δ STAI-X2**	Excluded	.19	1.25	.218	.20	.99	1.01
	Δ UMACL-EA	Excluded	-.15	-.99	.327	-.16	1.00	1.00
	Δ UMACL-TA	Excluded	.18	1.20	.239	.19	.96	1.04
	Δ UMACL-HT	Excluded	-.02	-.13	.897	-.02	.94	1.06

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NALU. MINDFUL MOVEMENT: DEVELOPMENT AND VALIDATION OF A PSYCHOEDUCATIONAL PROGRAMME FOR THE PREVENTION OF ANOREXIA IN EDUCATIONAL SETTINGS

Nalu. Mindful Movement: Opracowanie i walidacja psychoedukacyjnego programu profilaktyki anoreksji – kontekst edukacyjny

Emilia Korsak
University of Warmia and Mazury in Olsztyn
Department of Clinical Psychology, Development and Education
Faculty of Social Sciences
e-mail: emilia.korsak@gmail.com
ORCID 0000-0002-9677-3731

Abstract

The aim of this article was is to present the development and empirical validation of the *Nalu. Mindful Movement* psychoeducational programme, designed to prevent anorexia among adolescents. This programme, intended for implementation in schools and care institutions, was developed in accordance with the PRECEDE-PROCEED model which provides a structured approach to identifying needs, planning interventions, and evaluating their effectiveness. It was specifically tailored for individuals at risk of developing anorexia, based on the scientific model of the Anorexia Readiness Syndrome (ARS). The programme incorporates the latest guidelines for health education and includes interventions targeting both subjective aspects (related to experiences and perceptions) and physiological factors. The programme was created based on a comprehensive review of contemporary methodologies in eating disorder prevention and health education programmes. The distinguishing feature of the programme is that it has been validated at both subjective and physiological levels.

An analysis of the programme's effectiveness revealed significant educational and psychosocial benefits. The programme was empirically validated both at the subjective (psychometric) and objective (physiological) levels. The evaluation involved 42 young women exhibiting symptoms of Anorexia Readiness Syndrome (ARS). Well-being was assessed using subjective measures (stress, anxiety, mood, and eating disorder symptoms) and objective physiological indicators (heart rate and heart rate variability – HRV). The participants demonstrated a marked improvement in their understanding of anorexia, its risk factors, and preventive strategies. The integration of bottom-up processes (enhanced sensitivity to bodily signals) and top-down processes (regulation of thoughts, emotions, and beliefs) was the key mechanism responsible for the programme's success. This approach resulted in improved emotional awareness and regulatory skills, as well as increased self-esteem, motivation, and a sense of agency

among participants. The programme also fostered the development of critical thinking and reflection on cultural norms, enabling young people to make informed decisions about their health and well-being.

The findings highlight the programme's potential to holistically support the prevention of eating disorders, and the educational and emotional development of adolescents. The study also emphasises the need for further development of similar initiatives that integrate multidimensional approaches to health prevention.

Keywords: health pedagogy, health education, prevention, educational programme, eating disorders, anorexia.

Streszczenie

Celem niniejszego artykułu jest przedstawienie opracowanego i empirycznie zweryfikowanego programu psychoedukacyjnego *Nalu. Mindful Movement*, zaprojektowanego w celu zapobiegania anoreksji wśród młodzieży. Program, przeznaczony do wdrażania w szkołach i placówkach opiekuńczych, został opracowany zgodnie z wytycznymi modelu PRECEDE-PROCEED, który zapewnia ustrukturyzowane podejście do identyfikacji potrzeb, planowania interwencji i oceny ich skuteczności. Program stworzono z myślą o osobach zagrożonych wystąpieniem anoreksji, opierając się na naukowym modelu Syndromu Gotowości Anorektycznej (ARS). Program uwzględnia najnowsze wytyczne dotyczące edukacji zdrowotnej, a jego interwencje obejmują zarówno aspekty subiektywne (związane z doświadczeniami i przeżyciami), jak i fizjologiczne. Powstał na bazie kompleksowego przeglądu współczesnych metodologii prewencji zaburzeń odżywiania oraz programów edukacji zdrowotnej. Jego wyróżnikiem jest walidacja zarówno na poziomie subiektywnym, jak i fizjologicznym.

Badania nad skutecznością programu wykazały istotne korzyści edukacyjne i psychospołeczne. Uczestnicy znacząco poprawili swoje zrozumienie anoreksji, jej czynników ryzyka oraz strategii zapobiegawczych. Kluczowym mechanizmem skuteczności programu było zintegrowanie procesów oddolnych (uwrażliwienie na sygnały cielesne) i odgórnych (regulacja myśli, emocji i przekonań). Rezultatem była poprawa świadomości emocjonalnej i umiejętności regulacyjnych, a także wzrost samooceny, motywacji oraz poczucia sprawczości uczestników. Program wspierał również rozwój krytycznego myślenia i refleksji nad normami kulturowymi, co umożliwiło młodym ludziom podejmowanie świadomych decyzji dotyczących zdrowia i dobrostanu.

Wyniki badań podkreślają potencjał programu w holistycznym zapobieganiu zaburzeniom odżywiania oraz rozwoju edukacyjnym i emocjonalnym młodzieży. Wskazano także na konieczność dalszego rozwijania podobnych inicjatyw, które integrują podejście wielowymiarowe w profilaktyce zdrowotnej.

Słowa kluczowe: pedagogika zdrowia, edukacja zdrowotna, profilaktyka, program edukacyjny, zaburzenia odżywiania, anoreksja.

Introduction

The escalating health risks in the 21st century, exacerbated by the rising mortality associated with lifestyle diseases, necessitate the search for effective strategies to mitigate this surge of illness and to promote overall well-being. Eating disorders (ED), particularly anorexia nervosa (AN), which is characterised by impaired psychosocial functioning and may lead to the onset of other mental health disorders, are a prevalent issue in this context (Dakanalis, et al., 2019). The existing treatments for AN demonstrate inconsistent effectiveness, and the disorder frequently results in significant clinical and social repercussions due to its protracted nature and increased rates of chronicity, mortality, and relapse (Herpertz-Dahlmann et al., 2018).

These considerations underscore the urgent need to reflect on preventive intervention strategies. The development of comprehensive preventive strategies and the establishment of early intervention programs should be prioritised. Such initiatives have the potential to curtail the burden of AN by addressing the root causes of the disorder and mitigating its profound impact on individuals and society.

The advancements of restorative medicine, including new pharmaceuticals and sophisticated diagnostic and treatment technologies, are costly to implement, which renders them largely inaccessible to many individuals. In contrast, health education and prevention initiatives can be made available to virtually everyone. Due to their relatively modest costs, these initiatives can be regarded as investments that are likely to generate savings by reducing the expenses associated with treatment, care, and rehabilitation of individuals with health conditions.

In contemporary pedagogical literature, health pedagogy is considered a distinct subdiscipline in research areas focusing on the diagnosis of health needs, health interventions, and analysis and evaluation of health education processes designed to enhance physical, mental, and social health, as well as the life skills that promote a healthy lifestyle and improve the overall quality of life at all stages. This approach aims to inform compensatory pedagogical actions that benefit both the individual and the broader environment (Syrek, 2008; Woynarowska, 2023). Since health is an inherently interdisciplinary concept, health education interventions require collaboration among specialists from a myriad of fields, including medicine, psychology, pedagogy, sociology, and philosophy, in both conducting research and devising prevention programs informed by such research.

Health education should be regarded as a fundamental component of the treatment and prevention of ED, and the promotion of healthy eating habits. The rising incidence and high risk of life-threatening outcomes associated with these disorders across diverse age groups contribute to their global spread, posing not only a significant medical challenge but also a social and an economic burden. Educating individuals at risk of ED can foster a sense of co-responsibility for their treatment and well-being, thereby facilitating a partnership-oriented and a professional relationship among the participants in this process.

The purpose of this article is to present *Nalu. Mindful Movement*, an empirically validated psychoeducational programme for the prevention of anorexia, which can be utilised and implemented by teachers and educators in schools and other care settings. This prevention programme was developed between 2023 and 2024 in accordance with the guidelines of the PRECEDE-PROCEED model of health education programme planning (Green & Kreuter, 2005), which offers a structured approach and effectively addresses the complex determinants of anorectic eating disorders. This model provides a systematic approach to identifying needs, planning interventions, and evaluating the effectiveness of educational activities.

In the following sections, all eight phases of the PRECEDE-PROCEED model (Green & Kreuter, 2005) are presented, encompassing both the diagnostic (PRECEDE) and the implementation and evaluation (PROCEED) components. This comprehensive framework guided the conceptualisation, development, implementation, and assessment of the *Nalu. Mindful Movement* programme. Each phase demonstrates how theoretical foundations were translated into contextually appropriate and evidence-based strategies to address the increasing prevalence of anorexia nervosa (AN) among adolescents. The structure of the article reflects its primary objective: to provide a detailed account of a scientifically grounded, systematically planned, and practically applicable preventive intervention. The programme has the following characteristics: (1) it was designed specifically for individuals who have been diagnosed as being at risk of developing AN based on the scientific model of the Anorexia Readiness Syndrome (ARS) (Ziółkowska, 2001); (2) it was designed according to the latest health education guidelines to incorporate the population health model with interventions targeting both psychological and physiological issues (Borden & Cook-Cottone, 2020; Sala, et al., 2020; Syper, et al., 2023); (3) it was developed based on a comprehensive review of contemporary ED prevention methods (Korsak, 2022), as well as health education programmes (Korsak, 2023). A distinguishing feature of the programme is that it has been validated at both subjective and physiological levels (Korsak & Ratajczak, 2025).

Nalu. Mindful movement. Phases of the precede-proceed model (Green & Kreuter, 2005)

Part One – PRECEDE

Phase 1: Social Assessment and Situational Analysis

Health disorders encompassing both physical and mental ailments adversely impact cognitive processes, perception, emotions, behaviour, and social relationships, thereby constraining the educational and developmental opportunities available to individuals. This presents a significant challenge for teachers and educators who are tasked with creating environments that assist students in navigating their difficulties and realising their potential. Recent global events, including the COVID-19 pandemic, the climate crisis, and political instability, have exacerbated issues such as anxiety, depression, eating disorders, and suicide (Cianconi, et al., 2020; Devoe, et al., 2023; Persaud, et al., 2018; Torales, et al., 2020). These circumstances necessitate the implementation of appropriate pedagogical measures, including emotional education, prevention programmes, and the cultivation of mental resilience among youth.

In many countries, the prevailing health model is predicated upon the traditional medical framework that predominantly emphasises emergency care. This methodology

engenders a substantial imbalance between the demand for and the availability of services (Carbonell, et al., 2020). Therefore, concepts associated with a paradigm shift in healthcare are emerging. A population health approach has the potential to address the health needs of extensive demographic groups. This model examines the determinants of health, including lifestyle choices and various social factors, while focusing on disease prevention and the implementation of interventions aimed at averting health complications (Samet & Hussein, 2024). Health education that fosters community engagement is a critical component of this paradigm, creating a ripple effect whereby healthier behaviours are normalised and adopted at the societal level.

Phase 2: Identification of Health Issues and Risk Factors within a Population through Traditional Epidemiological Indicators and Analyses of Genetic, Behavioural, and Environmental Determinants.

It is estimated that eating disorders lead to the loss of over 3.3 million healthy life years globally each year. Unlike other mental health conditions, the years lived with disability (YLDs) linked to AN and bulimia nervosa continue to increase. Despite progress in treatment options, mortality rates for these disorders remain disturbingly high (van Hoeken & Hoek, 2020). The risk of suicide is eleven-fold higher in individuals with severe eating disorders than in their peers without symptoms of an eating disorder. Furthermore, this risk is twice higher in individuals presenting with sub-threshold symptoms (Lipson & Sonneville, 2020). Eating disorders significantly decrease the quality of life, and annual healthcare expenses in this group are 48% higher compared to the general population (Van Hoeken & Hoek, 2020).

The health implications of mental disorders, as quantified by Disability-Adjusted Life Years (DALYs) – a metric that accounts for years of life lost due to premature death, as well as years of life lived with a disability, adjusted for the severity of that disability – are most pronounced in the 14 to 24 age group (Global Psychology Alliance, 2024). After the political transformations of 1989 in Central and Eastern Europe, AN and bulimia nervosa have emerged as the most prevalent mental disorders affecting female adolescents in Poland (Pilecki, et al., 2009). From a population health perspective, targeted investments in the quality of life of this age cohort would likely yield significant benefits.

Phase 3: Educational and Environmental Assessment – Identification of Factors Influencing Health Behaviour

The treatment of AN poses a significant challenge, particularly if an intervention is not initiated within the first three years following the onset of symptoms (Treasure & Russell, 2011). The effectiveness of the currently available treatment modalities is limited,

with only 30–40% of patients achieving remission (Stice, et al., 2021). Early identification of individuals at risk, combined with widespread implementation of effective prevention programmes, holds promise for halting the progression of the disorder and reducing the overall prevalence of ED.

The population-based approach to health underscores the critical importance of health education in preventing and significantly mitigating the development of AN, particularly among young females. To implement effective educational interventions, it is essential to identify the optimal moment at which the issue can be addressed educationally, before it progresses to a stage that requires clinical treatment. The associated disease risks and risk factors must also be identified. The ARS model developed by Ziółkowska is a noteworthy framework in this context. The model supports the identification of symptoms indicative of potential abnormalities in the fulfilment of nutritional needs and attitudes towards one's own body (Ziółkowska, 2001). The ARS also considers risk factors that may be utilised to develop educational interventions. An individual's susceptibility to eating disorders is assessed with the use of specific indicators relating to psychological (Psyche: Self-Esteem, Perfectionism and Perseverance, Attitude Towards Food, Sense of Self-Attractiveness, Emotions and Moods), physiological (Soma: Body Weight and Dimensions), and social (Polis: Relationships within the Family System, Susceptibility to the Influence of Advertising) dimensions. It has been posited that the ARS comprises a set of symptoms that are situated primarily within cognitive and behavioural domains and raise concerns regarding abnormal recognition of hunger and satiety, attitudes towards one's own body, and the internalisation of media messages regarding physical attractiveness (Ziółkowska & Ocalewski, 2021).

Although the ARS incorporates the term "anorexia," it is not equivalent to a clinical eating disorder such as AN. Rather, ARS refers to a constellation of cognitive, emotional, and behavioural predispositions that may increase the likelihood of developing AN. Consequently, it serves as a valuable reference for educational interventions because it identifies several key factors that contribute to the development of AN. These factors include the desire for peer acceptance, tension arising from the need for social comparison, drive for control, competitive behaviours, perfectionism, and conflicting pressures faced by young women.

Phase 4 consists of two parts:

1. Intervention Planning – development of strategies and methodologies for implementing the programme based on a previous diagnosis.

Current psycho-pedagogical knowledge indicates that the provision of learning materials in a pre-packaged format does little to engage learners and fails to facilitate the assimilation of content (Marshall, 2014). Furthermore, research on the prevention of eating disorders suggests that didactic psychoeducational interventions are less effective

than interactive approaches (Shaw, Stice, & Becker, 2009). Therefore, solutions should be sought within the interpretivist-constructivist paradigm which posits that stimulating activity and fostering conditions conducive to independent work are the key prerequisites for a successful outcome.

Expanding on this, the theory of expansive learning underscores the significance of collaborative processes and the transformation of learning environments through active participation. Expansive learning is a process of creating new meanings through iterative cycles of questioning, reflection, and innovation. This framework is particularly relevant for addressing complex issues, such as the prevention of eating disorders, where interactive and experiential methods assist learners in exploring the underlying factors and developing sustainable strategies (Engeström & Sannino, 2013).

Moreover, the humanistic paradigm posits that education should take place in a multidimensional context. This approach differs from popular concepts in that it encompasses not only cognitive functions but also the physical body and emotional experiences. This perspective arises from a holistic conception of the human being, where different spheres of functioning are not separated, but form an integral whole (Hannaford, 1998).

Jack Mezirow's theory of transformative learning aligns with this perspective by underscoring critical reflection as a fundamental mechanism in adult education. Transformative learning takes place when individuals critically assess their beliefs, assumptions, and experiences, which leads to profound changes in their worldview. Within the framework of AN prevention programmes, this approach can empower learners to question societal norms and biases related to body image, thereby facilitating the development of healthier self-perceptions. The reflective aspect of transformative learning promotes a deeper engagement with content and encourages the synthesis of theoretical knowledge with personal experiences, which is essential for enduring behavioural change (Pleskot-Makulska, 2007).

David A. Kolb's model of experiential learning aligns seamlessly with the aforementioned concepts by positing that the learning process is cyclical and encompasses intellect, emotion, and practical action. This model comprises four stages: concrete experience, reflection on experience, formulation of abstract concepts, and active experimentation (Kolb & Kolb, 2017). This framework not only enables the participants to acquire theoretical knowledge but, more importantly, to assimilate it through practice and reflection, which is crucial in AN prevention programmes. Engaging students in body work activities, such as mindfulness practice, yoga, intuitive movement, exploration of emotions related to body image, and the development of interpersonal skills and interoceptive awareness, supports the cultivation of healthy habits and fosters a positive self-attitude. Kolb's method facilitates direct involvement in the learning process, which, according to research on the efficacy of interactive interventions in eating disorders, significantly enhances the effectiveness of preventive measures. Consequently,

this method addresses educational needs in a manner consistent with a holistic and humanistic approach.

The significance of reflective education in adult learning and methodologies that integrate individual experiences with broader social and cultural contexts should be underscored. Such approaches encourage learners to engage critically with the learned content and to co-construct knowledge through dialogue and collaboration (Perkowska-Klejman, 2013). The above approach aligns with the principles of expansive and transformative learning by fostering agency and adaptability in learners. Reflective education creates opportunities for meaningful and sustainable change by situating the learning process within the participants' personal experiences.

Body-oriented methods such as yoga, mindfulness, and dance and movement therapy are increasingly employed in the prevention and treatment of eating disorders (Borden & Cook-Cottone, 2020; Sala et al., 2020; Syper et al., 2023). These approaches aim to enhance protective factors by fostering a positive body experience and mitigating risk factors. A systematic review of body-oriented therapies in the prevention of eating disorders has demonstrated that programmes based on bodywork techniques are effective in reducing risk factors and promoting protective factors. Furthermore, these techniques can be incorporated into a fundamental therapeutic framework to significantly reduce the symptoms of eating disorders (Korsak, 2022).

2. Administrative and Political Assessment – identification of opportunities and resources pertinent to the implementation of the programme.

Research has demonstrated that a skilful combination of health education, promotion, and prevention activities can produce synergistic effects, thus enhancing the efficacy of these measures and contributing significantly to public health improvement (Woynarowska, 2023). The discussed strategies align with the contemporary empowerment model, which is a collaborative approach to health promotion that involves individuals and communities. This model is predicated on social policies that promote education and health. The empowerment of individuals and communities is the critical element of this model because it enables the participants to assume control over their health and life (Syrek, 2019). The empowerment model is consistent with the holistic approach in health pedagogy, which recognises the interdependencies between physical, mental, and social health. In this context, the promotion of shared responsibility is a key educational component that encourages individuals and communities to actively cultivate a health-promoting environment. Health education has two primary goals within this framework: to foster a supportive environment for the acquisition of knowledge about health, health resources, risks, and diseases, and to influence decision-makers who formulate social policy, determine the functioning of environments, and support individual and community health initiatives (Woynarowska, 2023).

Part Two – PROCEED

Phase 5: Implementation of the Programme Based on the Established Strategy and Using the Planned Methods

In view of the above, the *Nalu. Mindful Movement* programme is founded on five key educational principles:

Learning is a continuous process embedded in experience. Knowledge is consistently derived from experience and tested through experience. However, the source of learning is the reflective engagement with experience, rather than the experience itself. The educational process can be enriched by emphasising the learner's perspectives and articulated theories, scrutinizing and evaluating these theories, and integrating new and enhanced ideas into the existing belief system.

Learning is a fundamental process of human adaptation. Effective learning requires four essential skills: (1) the ability to grasp specific experiences, (2) the capacity to reflect on those experiences, (3) the aptitude for abstract conceptualisation, and (4) the ability to actively experiment with the acquired knowledge. Mindfulness practice seeks to transcend automatism and facilitate direct and unmediated experiences, which is critical to the learning process. When individuals engage attentively, they (1) examine a situation from multiple perspectives, (2) perceive the information presented within that context as novel, (3) remain cognisant of the context in which this information is perceived, and ultimately, (4) formulate new categories for processing that information.

Learning is a holistic process of adapting to the world. Experiential learning integrates all mental functions and responses: thinking, feeling, perceiving, and taking action. It is not confined to a specific domain of human activity, such as cognition or perception. An understanding of the mechanisms that underlie thought and emotion is not sufficient: one should also be able to distinguish between behaviours that are influenced by conscious thought and those that are driven by affective responses.

Learning involves an interaction between the individual and the environment. Knowledge is the product of the exchange between social and individual knowledge. The former is a compilation of human cultural experiences, while the latter reflects an individual's subjective experiences. Knowledge is generated through the interplay of objective and subjective experiences in a process referred to as learning. As learners, we do not merely respond to a predetermined environment; rather, we actively construct situations that align with our learning intentions.

Learning is best understood as a process, rather than in terms of outcomes. Learning encompasses successive stages of knowledge acquisition, but it does not end upon the attainment of knowledge, nor is it always evident through tangible experience. Instead, learning is an ongoing process characterised by continuous experience. Concepts and reflections are not static; they are formed and transformed through successive experiences.

Nalu. Mindful Movement is a proprietary programme for the prevention of eating disorders that focuses on the emerging risk factors of the ARS in three spheres: (1) psyche, (2) soma, and (3) polis. The programme relies on mindfulness-based bodywork and involves the most effective and scientifically proven bodywork techniques, as well as attention-based cognitive therapy and cognitive-behavioural methods.

The programme comprises four modules, and it lasts four weeks, with one session per week. Each module consists of two components: (1) a psychoeducational component that lasts 1 hour and 15 minutes and focuses on mental health promotion, understanding the unity of body and mind, effective emotional regulation, body image, mindfulness, social pressures, and cultural influences on beauty standards; and (2) a movement component that lasts 1 hour and involves a mindfulness-based approach to enhance interoceptive awareness.

The programme addresses three important domains of human functioning, but it serves educational rather than psychotherapeutic purposes. It does not aim to reorganise psychological structures or processes; instead, it provides knowledge, skills, and competencies that support self-regulatory processes. Through this approach, individuals at risk of developing a disorder can rely on their abilities to stay in good mental health.

The objective of the programme is to provide the participants with support in identifying and changing inappropriate beliefs and habits, and developing more effective and appropriate ways of dealing with difficult situations. The programme helps cultivate the skills needed to understand and correct faulty thinking, which contributes to a positive self-image and acceptance of one's own body. Furthermore, the programme aims to improve daily functioning and teach healthy strategies for coping with challenges, including improved body self-awareness.

Learning to consciously identify own thoughts, feelings, and behaviours is central to the programme. This is achieved by, among other things, paying attention to bodily responses and their relevance in daily life. By acquiring and developing these skills, the participants become empowered to take control of their lives (Wojnarowska-Soldan 2017). The programme can also help individuals reduce undesirable behaviours, improve their living conditions, and optimise their overall health (Sokołowska 2007). The programme can be implemented in both individual and group settings.

The programme addresses the risk factors of ARS, encompasses three spheres of human functioning, and is based on psychoeducation that targets individual, social, and body-oriented resources. The educational principles underpinning each module are discussed below.

Module 1: Strengthening Self-Esteem

Educational Objectives: (1) to develop self-awareness and self-acceptance, (2) to establish a healthy self-esteem that is grounded in internal resources, and (3) to comprehend cultural pressures related to appearance.

Description: The module aims to enhance the participants' self-awareness by encouraging reflection on individual values, inner resources, and experiences. The participants reflect on how their traits, talents, and relationships influence their identity. The exercises in this module have been designed to facilitate the discovery and reinforcement of self-esteem, and to foster a healthy relationship with one's own body based on internal resources, rather than external judgments or standards.

Module 2: Positive Body Image

Educational Objectives: (1) to critically analyse social norms of beauty and the influence of media, (2) to promote a healthy relationship with the body by understanding its functionality, and (3) to foster body acceptance irrespective of external standards.

Description: The module centres on assisting participants in cultivating a healthy attitude towards their bodies by fostering an awareness of their functional value. The participants reflect on the impact of social and media role models on their perceptions of appearance and learn to critically evaluate unrealistic beauty standards. Through discussions as well as group and individual exercises, the participants develop skills to identify destructive messages and appreciate the body for its capabilities, such as movement, health, and emotional expression. The module reinforces the acceptance of diversity in appearance and cultivates positive self-attitudes, thereby contributing to the prevention of eating disorders.

Module 3: Regulation of Emotions and Relationship with the Body

Educational Objectives: (1) to develop the ability to recognise and express emotions, (2) to establish a healthy relationship with the body as an integral component of personality, and (3) to enhance awareness of the body and its needs.

Description: In this module, the participants learn to recognise and accept their emotions as a natural aspect of everyday experiences. Workshops and exercises will focus on the practical dimensions of developing emotion regulation skills, including relaxation techniques, breath work, and exercises designed to establish healthy boundaries within relationships. The participants are encouraged to explore the interplay between their emotions and bodily needs, thus fostering a positive relationship with their bodies. Furthermore, the module aims to cultivate empathy towards oneself and others, while promoting authenticity in interpersonal relationships.

Module 4: Mindfulness and Future Planning

Educational Objectives: (1) to develop mindfulness and emotion regulation in daily life, (2) to strengthen self-acceptance and self-compassion, and (3) to consolidate the acquired knowledge and build long-term resilience to pressure.

Description: The concluding module centres on integrating the acquired knowledge and tools into participants' daily functioning. The participants are encouraged to develop mindfulness by practicing techniques, such as observing thoughts, regulating automatic emotional reactions, and expressing gratitude. They formulate plans to implement positive changes in their lives, which enhances their commitment to maintaining a healthy relationship with their bodies and emotions. Reflecting on progress, discussing challenges, and reinforcing self-acceptance are the pivotal components of the final module which enable the participants to further cultivate and solidify healthier patterns of thought and behaviour.

Phase 6: Process Evaluation

The programme was implemented by the EMPATIA Academic Psychological Assistance and Therapy Centre (AOPPiT EMPATIA) of the University of Warmia and Mazury in Olsztyn, and its effectiveness at both subjective and psychophysiological levels has been empirically validated (Korsak & Ratajczak, 2025). The programme relies on AidMed, an advanced biofeedback device that enables real-time monitoring of bodily responses by measuring physiological parameters, such as the respiration rate and heart rate variability (HRV).

The program has been evaluated based on several key aspects, including the participants' feelings and physiological indicators, to enable further improvement and development of its components.

The programme's effectiveness was validated between March and December 2023. The implementation comprised two phases: (1) a control phase and (2) an experimental phase. Each phase lasted four weeks. The objective of the control phase was to register the initial parameters which were then used as the baseline for the experimental phase. The aim of the experimental phase was to monitor changes in the levels of subjective and psychophysiological variables in women at risk of anorectic eating disorders who had participated in educational classes based on the *Nalu. Mindful Movement* programme. During the experimental phase, the sessions were held once a week. Three components of the programme were experimentally verified: (1) the Dance and Movement Therapy component; (2) the Yoga component, and (3) the Mindfulness component, across three experimental groups: (1) the Nalu. Mindful Movement Dance and Movement Therapy group; (2) the Nalu. Mindful Movement Yoga group, and (3) the Nalu. Mindful Movement Mindfulness group. In each group, subjective assessments of psychological well-being and physiological parameters were conducted three times as part of: (1) a pre-test of the control phase, (2) a post-test of the control phase that also constituted the pre-test of the experimental phase, and (3) a post-test of the experimental phase. In addition, at the beginning and end of each session during the experimental

phase, stress levels and mood were assessed using the thermometer method. The research project was approved by the Research Ethics Committee of the University of Warmia and Mazury in Olsztyn (Decision No. 17/2021).

Due to the lack of established norms for the Anorexia Readiness Syndrome Inventory (SGA-12), a pre-anorexic state is diagnosed when the ARS score is more than one standard deviation above the mean (Ziółkowska & Ocalewski, 2021). A total of 98 participants aged 18–25 who self-reported concerns related to eating disorder-like habits and beliefs volunteered for the study. Their eligibility was evaluated in two stages. First, the participants completed the SGA-12 questionnaire to confirm the presence of pre-anorexic symptoms. This was followed by a structured clinical interview to exclude individuals with existing mental disorders or somatic illnesses. Due to diagnoses of eating disorders and various organisational factors, 49 participants withdrew from the study. The remaining subjects were randomly assigned to experimental groups. Ultimately, 42 individuals aged 19–25 (M = 22.10, SD = 1.69) completed the training: NaluDMT = 10, NaluYoga = 17, NaluMindfulness = 15. Participation in the study was voluntary, and all participants gave their written informed consent before being enrolled in the study.

Phase 7: Impact Evaluation

The results of programme validation with a detailed analysis are presented in a separate article (Korsak & Ratajczak, 2025). The main conclusions of the validation process are briefly outlined in the following section.

All interventions led to improvements in the participants' subjective measures of well-being, including eating disorder symptoms and mood, relative to both baseline and pre-training measurements. Each intervention was analysed separately, and group comparisons were made at all time points to identify the optimal treatment for ARS.

All interventions resulted in significant or near-significant improvements in physiological measures of well-being, specifically the heart rate (HR) and most HRV parameters. Each intervention was analysed separately, and the groups were compared at all time points to identify the most effective approach to influencing the physiology of ARS. The outcomes were consistent with the nature of each intervention. The Dance Movement Therapy (DMT) did not significantly affect any HRV parameters, and the lack of physiological improvement after DMT suggests that therapeutic movement without thought control may be insufficient to impact ARS physiology. However, the obtained result could also be attributed to smaller sample size compared to other groups. Yoga practice proved to be most effective in stimulating the parasympathetic autonomic nervous system (ANS), as indicated by a decrease in HR and an increase in vagally-mediated HRV indices (RMSSD and HF power). The measures influenced by both branches of the ANS were also improved, including SDNN and total power, although

LF and the LF/HF ratio remained unchanged. Mindfulness meditation appeared to enhance parasympathetic signalling to the heart, although not as effectively as yoga.

Post-intervention energetic arousal was higher after movement-related training (DMT and yoga) than after mindfulness meditation. The observed differences in effects were consistent with the nature of each intervention. The DMT emphasises movement, and it positively influenced mood and body-related experiences. Yoga improves body control, attention, and breathing, and it was the most versatile and effective component of the programme that impacted mood, bodily perceptions, stress, anxiety, and self-related thoughts. Mindfulness meditation focuses on body signals and thought control, and it was effective in altering self-related beliefs and reducing stress and anxiety, but less effective in improving mood and energising the body.

Body movement and bodily self-awareness enhance perception and influence the mind in a bottom-up manner, while thought control exerts a top-down effect on beliefs and emotions.

Phase 8: Evaluation of Outcomes

The *Nalu. Mindful Movement* programme integrates body movement with mindful attention to bodily sensations, and it had a significant impact on the participants' educational outcomes. The evaluation of outcomes focuses on two primary mechanisms of influence: bottom-up processes derived from enhanced perception and integration of bodily signals, and top-down processes involving thought control and the regulation of beliefs and emotions.

The programme's effectiveness was evaluated based on its impact on educational indicators. The participants' understanding of AN, including the risk factors and preventive strategies, improved markedly, and the acquired knowledge was reinforced through experiential learning activities that integrated movement and mindfulness practices. The programme also fostered substantial improvements in emotional awareness and regulation skills. It enhanced sensitivity to bodily and emotional signals, thus helping the participants to better understand and manage their emotional states – abilities that are vital for effective learning and coping with academic demands. By merging bottom-up approaches, such as sensitivity to bodily signals, with top-down strategies, such as cognitive and emotional control, the programme increased the participants' engagement, motivation, and self-esteem, thus fostering a sense of control over their bodies and minds and contributing to improved academic performance. Moreover, by reshaping beliefs about health and the body, the programme encouraged critical thinking and reflective skills, thus enabling the participants to critically analyse and challenge detrimental cultural norms and make informed decisions regarding their physical and mental well-being.

However, the significance of methodological rigor and interpretive caution should be acknowledged when evaluating the programme (Mertens, 2024). The results of this study offer promising insights into the efficacy of integrated body movement and mindfulness practices to address psychoeducational challenges, particularly in relation to AN risk factors. Nevertheless, due to the methodological limitations of the evaluation, a nuanced discussion is needed to ensure the validity and applicability of the findings.

The *Nalu. Mindful Movement* programme led to measurable improvements in the participants' emotional regulation, self-esteem, and understanding of AN, but small sample size (N = 42) and single-site implementation could undermine the generalizability of the results. In addition, the sustainability of the observed changes could not be monitored due to the lack of follow-up assessments. Research in educational and psychological interventions frequently highlights the risk of temporal decay in intervention effects. Without longitudinal data, it remains unclear whether the programme's benefits persist over time or are merely short-term outcomes of a structured intervention. The decision to evaluate individual programme components (Dance and Movement Therapy, Yoga, and Mindfulness) separately, rather than as an integrated whole, hinders a comprehensive understanding of potential synergistic effects. Holistic interventions should be evaluated for the presence of interactions between their elements. For example, the interplay between movement-based and mindfulness-based components could potentially amplify the resulting benefits through complementary mechanisms – enhanced interoceptive awareness could be accompanied by improvements in emotional regulation.

The present findings are consistent with the foundational principles of the programme and emphasise the importance of experiential and reflective learning. The observed improvements in the participants' emotional regulation, self-esteem, and body image can be attributed to the programme's focus on experiential learning cycles, which actively engaged the participants in reflective observation, conceptualization, and experimentation. These outcomes align with Kolb's experiential learning theory which underpins the programme's design and advocates for the integration of cognitive, emotional, and physical domains in education.

Several recommendations can be made for future research to address the limitations of the study and enhance the evidence base. Firstly, the generalizability of the findings could be improved and potential biases could be reduced by increasing sample size and diversity, and recruiting participants from multiple sites. Secondly, longitudinal assessments with follow-up evaluations at six months, one year, and beyond could be incorporated into the study design to determine the long-term sustainability of the programme's effects. In addition, the programme should be evaluated using a more holistic approach to assess its integrated impact rather than the impact of individual components. Such an approach could provide deeper insights into the potentially synergistic effects of the programme's components, and it would enable the researchers to optimize the

design of the intervention. A mixed-method approach combining quantitative and qualitative techniques could shed new light on the participants' experiences and the nuanced mechanisms driving change.

Conclusion

The educational program based on mindfulness, bodywork, and analysis of personal beliefs proved to be highly effective in addressing the key educational indicators. The integration of bottom-up and top-down approaches was crucial for the program's multidimensional impact and its ability to promote knowledge acquisition, as well as the development of psychosocial skills. These findings underscore the need for further initiatives that holistically support the prevention of eating disorders and the overall educational and emotional development of young people.

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Oświadczenia

Olsztyn, 24.04.2026
.....
(miejscowość, data)

dr hab. Beata Krzywosz-Rynkiewicz, prof. UWM
Wydział Nauk Społecznych
Uniwersytet Warmińsko-Mazurski w Olsztynie

dr hab. Marzenna Nowicka, prof. UWM

Przewodnicząca Rady Naukowej Dyscypliny Pedagogika

Uniwersytetu Warmińsko-Mazurskiego w Olsztynie

OŚWIADCZENIE

Promotora rozprawy doktorskiej

Oświadczam, że rozprawa doktorska Pani Emilii Korsak pod tytułem: „Metoda pracy z ciałem jako program profilaktyki zaburzeń odżywiania dla dziewcząt i młodych kobiet" została przygotowana pod moim kierunkiem i stwierdzam, że spełnia ona warunki do przedstawienia jej w postępowaniu o nadanie stopnia naukowego.

.....
(podpis promotora)

Toruń, 24.04.2026
……..

(miejscowość, data)

dr Ewa Ratajczak
Instytut Psychologii, Wydział Filozofii i Nauk Społecznych,
Uniwersytet Mikołaja Kopernika w Toruniu

dr hab. Marzenna Nowicka, prof. UWM

Przewodnicząca Rady Naukowej Dyscypliny Pedagogika

Uniwersytetu Warmińsko-Mazurskiego w Olsztynie

OŚWIADCZENIE

Promotora pomocniczego rozprawy doktorskiej

Oświadczam, że rozprawa doktorska Pani Emilii Korsak pod tytułem: „Metoda pracy z ciałem jako program profilaktyki zaburzeń odżywiania dla dziewcząt i młodych kobiet” została przygotowana pod moim kierunkiem i stwierdzam, że spełnia ona warunki do przedstawienia jej w postępowaniu o nadanie stopnia naukowego.

Ewa Ratajczak
……

(podpis promotora pomocniczego)

Olsztyn, 26.04.2026
(miejscowość, data)

Emilia Korsak
Dyscyplina: Pedagogika
Wydział Nauk Społecznych
Uniwersytet Warmińsko-Mazurski w Olsztynie

dr hab. Marzenna Nowicka, prof. UWM

Przewodnicząca Rady Naukowej Dyscypliny Pedagogika

Uniwersytetu Warmińsko-Mazurskiego w Olsztynie

OŚWIADCZENIE

O samodzielnym napisaniu rozprawy doktorskiej

Świadoma odpowiedzialności prawnej oświadczam, że rozprawa doktorska pod tytułem: „Metoda pracy z ciałem jako program profilaktyki zaburzeń odżywiania dla dziewcząt i młodych kobiet" została napisana przeze mnie samodzielnie i nie zawiera treści uzyskanych w sposób niezgodny z obowiązującymi przepisami.

Oświadczam również, że przedstawiona rozprawa nie jest i nie była wcześniej podstawą do ubiegania się o nadanie stopnia naukowego doktora.

Ponadto oświadczam, że treść rozprawy doktorskiej przedstawionej przez mnie do obrony, zawarta na przekazywanym nośniku elektronicznym, jest identyczna z jej wersją drukowaną.

W związku z powyższym oświadczam, że wyrażam zgodę na poddanie rozprawy doktorskiej procedurze antyplagiatowej.

Emilia Korsak
(podpis kandydata)

Olsztyn, 26.04.2026
(miejscowość, data)

Emilia Korsak
Dyscyplina: Pedagogika
Wydział Nauk Społecznych
Uniwersytet Warmińsko-Mazurski w Olsztynie

dr hab. Marzenna Nowicka, prof. UWM

Przewodnicząca Rady Naukowej Dyscypliny Pedagogika

Uniwersytetu Warmińsko-Mazurskiego w Olsztynie

OŚWIADCZENIE

Autora rozprawy doktorskiej

Oświadczam, że w pracy pod tytułem „ Movement as Preventive Education for Females at Risk of Anorexia Nervosa: Effects of Physical-Cognitive Interventions on Psychophysiological Markers” Korsak, E., Ratajczak, E. (2025). *Journal of Kinesiology and Exercise Sciences*. https://doi.org/10.5604/01.3001.0055.4509 mój wkład merytoryczny w jej przygotowanie polegał na: opracowywaniu koncepcji i metodologii, zarządzaniu projektem, wykonywaniu części eksperymentalnej, analizie statystycznej, opracowaniu i interpretacji wyników tej pracy, przygotowaniu oryginalnej wersji tekstu, a następnie redakcji i korekcie.

Emilia Korsak
(podpis kandydata)

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dr Ewa Ratajczak
Instytut Psychologii, Wydział Filozofii i Nauk Społecznych,
Uniwersytet Mikołaja Kopernika w Toruniu

dr hab. Marzenna Nowicka, prof. UWM

Przewodnicząca Rady Naukowej Dyscypliny Pedagogika

Uniwersytetu Warmińsko-Mazurskiego w Olsztynie

OŚWIADCZENIE

Współautora

Oświadczam, że w pracy pod tytułem „ Movement as Preventive Education for Females at Risk of Anorexia Nervosa: Effects of Physical-Cognitive Interventions on Psychophysiological Markers" Korsak, E., Ratajczak, E. (2025). *Journal of Kinesiology and Exercise Sciences*. https://doi.org/10.5604/01.3001.0055.4509 mój wkład merytoryczny w jej przygotowanie polegał na: analizie statystycznej, opracowaniu wizualizacji wyników, przygotowaniu oryginalnej wersji tekstu, a następnie redakcji i korekcie.

Jednocześnie wyrażam zgodę na przedłożenie w/w pracy przez mgr Emilię Korsak jako część rozprawy doktorskiej w formie spójnego tematycznie zbioru artykułów naukowych opublikowanych w czasopismach naukowych.

Oświadczam, iż samodzielna i możliwa do wyodrębnienia część ww. pracy wykazuje indywidualny wkład kandydata polegający na opracowywaniu koncepcji i metodologii, zarządzaniu projektem, wykonywaniu części eksperymentalnej, analizie statystycznej, opracowaniu i interpretacji wyników tej pracy, przygotowaniu oryginalnej wersji tekstu, a następnie redakcji i korekcie.

Ewa Ratajczak
(podpis)

Podziękowania

Doktorat zapisuje się językiem nauki – tezami, metodologią i wnioskami – lecz dojrzewa w przestrzeni relacji. Ma swoją strukturę, argumentację i rygor, ale wyrasta z rozmów, ze wspólnego namysłu, z obecności drugiego człowieka. Choć więc ta rozprawa przybiera formę uporządkowanego wywodu, jest przede wszystkim historią spotkań. Bez nich nie powstałaby ani jedna strona.

Chciałabym podziękować tym, którzy tę drogę współtworzyli i nadawali jej sens.

Pani Profesor Beacie Krzywosz-Rynkiewicz, mojej Promotor, dziękuję za zaufanie, którym obdarzyła mnie od pierwszego dnia, za wymagające pytania uczące mnie myśleć odważniej, oraz za cierpliwość wobec kolejnych pomysłów i licznych „ostatecznych wersji". Dziękuję za to, że nauczyła mnie Pani nie tylko pisać, ale uprawiać naukę. Za mądrość, precyzję i klasę – postawę, której mam zaszczyt się od Pani uczyć.

Pani Doktor Ewie Ratajczak, mojej Promotor Pomocniczej, dziękuję za uważność i merytoryczne towarzyszenie w momentach, gdy szczegóły zaczynały mieć większe znaczenie niż całość. Za rozmowy, które porządkowały nie tylko tekst, ale i myśli. Za wzmacnianie w chwilach, gdy wątpliwości bywały głośniejsze niż argumenty.

Każda strona tej pracy powstała dzięki rozmowom, wsparciu i ciszy, którą dawali mi bliscy. Dziękuję za wyrozumiałość w czasie, gdy zbyt często odpowiadałam: „nie mogę, mam doktorat". Dziękuję wszystkim, którzy słuchali o moich badaniach z cierpliwością godną współautorów i zdecydowanie częściej, niż nakazywałby rozsądek. Nie sposób wymienić tu wszystkich, ale Wy wiecie.

Szczególne podziękowania należą się Marzenie Wilamowskiej-Korsak i Andrzejowi Korsakowi, moim Rodzicom – za fundament, na którym stoi wszystko. Wychowaliście mnie w domu pełnym książek, pozwalając mi swobodnie wśród nich buszować, czytać „za długo" i pytać „za dużo". To Wy nauczyliście mnie, że ciekawość i odwaga myślenia są wartością, a wiedza przygodą.

Irkowi – mojemu Ulubionemu Człowiekowi, który nauczył mnie, że „razem" to nie przysłówek, lecz obecność, spokój i pewność. Dziękuję za kibicowanie moim pomysłom oraz za wiarę, która często wyprzedza moją własną. Ten doktorat nosi w sobie więcej Twojego wsparcia, niż kiedykolwiek da się zapisać w przypisach.

A mówiąc zupełnie praktycznie – Rodzino, dziękuję za bardzo konkretną pomoc: za bajki czytane wtedy, gdy pisałam rozdziały, za spacery, gdy kończyłam podrozdziały, za

otaczanie troską świata Dziewczynek, kiedy ja próbowałam uporządkować swój naukowy. Prawda jest prosta: bez Was ta rozprawa powstawałaby w nieskończoność. Albo nie powstałaby wcale. Jestem wdzięczna bardziej, niż potrafię to wyrazić.

I wreszcie – Dziewczynkom: G i Z. Za pytania ważniejsze niż wszystkie hipotezy. Za przypominanie, że świat nie kończy się na artykule. Ta praca powstawała wolniej, bo była pisana między bajką a „Mamo, zobacz", ale dzięki temu ma sens większy niż naukowy.

Dziękuję.
Ten doktorat jest tak samo Wasz, jak mój.