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„Motywacyjne mechanizmy zmiany zachowań zdrowotnych wśród dzieci
i młodzieży z nadwagą i chorobą otyłościową: badania w populacji województwa
podkarpackiego”

Rozprawa doktorska w oparciu o cykl publikacji naukowych
w dziedzinie nauk medycznych i nauk o zdrowiu
w dyscyplinie *nauki o zdrowiu*

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1. **Wąsacz M**, Sarzyńska I, Błajda J, Orlov N, Kopańska M. The impact of digital technologies in shaping weight loss motivation among children and adolescents. *Children*. 2025 May;12(6):685. doi:10.3390/children12060685. (**MEiN: 40 pkt.; IF: 2.1**)

Prace oryginalne:

1. **Wąsacz M**, Ochojska D, Sarzyńska I, Bartkowska O, Stańczyk S, Błajda J, Frej D, Kopańska M. Family support and motivational factors in weight loss among children and adolescents: a cross-sectional study. *Front Nutr*. 2025 Oct;12:1618016. doi:10.3389/fnut.2025.1618016. (**MEiN: 70 pkt.; IF: 5.1**)
2. **Wąsacz M**, Sarzyńska I, Ochojska D, Błajda J, Bartkowska O, Brydak K, Stańczyk S, Bator M, Kopańska M. Psychosocial consequences of excess weight and the importance of physical activity in combating obesity in children and adolescents: a pilot study. *Nutrients*. 2025 May;17:1690. doi:10.3390/nu17101690. (**MEiN: 140 pkt.; IF: 5.0**)
3. **Wąsacz M**, Frej D, Ochojska D, Kopańska M. Psychometric properties and factor structure of the Polish ChEDE-Q in a community sample of adolescents: associations with BMI. *Nutrients*. 2026 Mar;18:1028. doi:10.3390/nu18071028. (**MEiN: 140 pkt.; IF: 5.0**)

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1. Wstęp

W ostatnich latach można zaobserwować coraz większe zainteresowanie zdrowym stylem życia, które obejmuje m.in. prawidłowe nawyki żywieniowe, regularną aktywność fizyczną oraz ograniczanie używek, takich jak tytoń i alkohol. Przestrzeganie tych zasad pomaga w utrzymaniu prawidłowej masy ciała, a tym samym wpływa pozytywnie na jakość życia (Li et al. 2023). Wzrost tej świadomości jest wynikiem wielu działań profilaktycznych, kampanii społecznych oraz przeprowadzanej w szkołach edukacji zdrowotnej (Casa-Coila et al. 2025). Pomimo rosnącej świadomości oraz licznych działań profilaktycznych, problem nadwagi i otyłości nadal jest wyzwaniem dla zdrowia publicznego. Szczególnie niepokojące jest zwiększające się rozpowszechnienie tego zjawiska wśród dzieci i młodzieży, co wskazuje na fakt, że podejmowane kroki nie zawsze przynoszą oczekiwane rezultaty (Zhang et al. 2024).

Wzrost liczby przypadków nadwagi i otyłości obserwowany jest niemal na całym świecie, prowadząc do alarmujących statystyk. Zgodnie z danymi Światowej Organizacji Zdrowia (WHO) problem nadwagi i otyłości osiąga obecnie globalną skalę. W 2022 roku co ósma osoba na świecie była otyła, a częstość występowania tego zjawiska wzrosła ponad czterokrotnie wśród młodzieży w porównaniu z 1990 rokiem. Ponad 390 milionów dzieci i młodzieży w wieku 5-19 lat miało nadwagę, w tym 160 milionów chorowało na otyłość. Według WHO w 2024 roku nadwagę rozpoznano u około 35 milionów dzieci poniżej 5. roku życia (WHO, 2025).

Otyłość definiuje się jako nadmierne nagromadzenie tkanki tłuszczowej w organizmie, wynikające najczęściej z długotrwałego zaburzenia równowagi pomiędzy ilością dostarczanej energii a jej wydatkowaniem (Oussaada et al. 2019). Stan ten stanowi istotny problem zdrowotny, prowadzący do licznych konsekwencji metabolicznych, somatycznych oraz psychospołecznych. W praktyce klinicznej do oceny nadwagi i otyłości najczęściej wykorzystuje się wskaźnik masy ciała (BMI). Zgodnie z kryteriami Światowej Organizacji Zdrowia (WHO), u osób dorosłych nadwagę rozpoznaje się przy wartościach BMI ≥ 25 kg/m², natomiast otyłość przy BMI ≥ 30 kg/m² (WHO, 2025). W przypadku dzieci i młodzieży, ze względu na odmienną rozwójową zależną od wieku i płci, stosuje się siatki centylowe. Otyłość rozpoznaje się przy wartościach BMI ≥ 95 . percentyla, natomiast nadwagę przy wartościach pomiędzy 85. a 95. percentylem (CDC, 2024; Ministerstwo Zdrowia, 2023).

Chociaż wskaźnik BMI jest obecnie powszechnie wykorzystywany w praktyce klinicznej, bardziej obiektywną ocenę zawartości tkanki tłuszczowej umożliwiają bezpośrednie metody pomiaru składu ciała. Należą do nich m.in. analiza bioimpedancji elektrycznej (BIA), która

pozwała na ilościową ocenę komponentów składu ciała (Chan et al. 2023), a także metody referencyjne, takie jak tomografia komputerowa (TK) oraz rezonans magnetyczny (MR) (Xu et al. 2021; Fang et al. 2018). Jednak ze względu na wysokie koszty i ograniczoną dostępność tych technik, BMI pozostaje podstawowym narzędziem stosowanym w codziennej diagnostyce nadwagi i otyłości (Javed et al. 2015).

W badaniach nad zaburzeniami odżywiania związanymi z nadmierną masą ciała często wykorzystywane są standaryzowane narzędzia kwestionariuszowe. Jednym z najczęściej stosowanych narzędzi jest Eating Disorder Examination Questionnaire (EDE-Q), uznawany za jedno z podstawowych narzędzi oceny objawów zaburzeń odżywiania, obejmujące takie wymiary jak: restrykcje dietetyczne, koncentracja na jedzeniu, kształcie sylwetki i masie ciała (Lichtenstein et al. 2021). Równie powszechnie wykorzystywany jest kwestionariusz Eating Attitudes Test-26 (EAT-26), który jest narzędziem służącym do oceny ryzyka zaburzeń odżywiania na podstawie postaw i zachowań żywieniowych (Janahi et al. 2026). W praktyce klinicznej stosowany jest także krótki kwestionariusz SCOFF, który dzięki zwięzłej formie umożliwia szybkie wykrywanie osób z podwyższonym ryzykiem zaburzeń odżywiania i wykazuje zadowalającą trafność diagnostyczną (Solmi et al. 2015). Również wykorzystywane są kwestionariusze samoopisowe, które pozwalają na ocenę nasilenia objawów zaburzeń odżywiania, takich jak restrykcje dietetyczne, nadmierna koncentracja na jedzeniu, niezadowolenie z masy ciała czy kształtu sylwetki. Dodatkowo kolejnym, z stosowanych narzędzi w populacji dzieci i młodzieży jest kwestionariusz Child and Adolescent Eating Disorder Examination Questionnaire (ChEDE-Q), który stanowi adaptację kwestionariusza EDE-Q dostosowaną do wieku rozwojowego badanych (Kliem et al. 2017).

Otyłość i nadwaga u dzieci i młodzieży to zjawisko, które ma złożony charakter. Otyłość nie jest jedynie problemem estetycznym, lecz poważną chorobą prowadzącą do licznych konsekwencji zdrowotnych i społecznych (Zhang et al. 2024). Z tego względu warto przyjrzeć się bliżej temu zjawisku, jego przyczynom oraz skutkom.

Otyłość u dzieci i młodzieży wynika z interakcji wielu czynników m.in. biologicznych, środowiskowych oraz behawioralnych. Zjawisko to można podzielić na dwie główne kategorie: otyłość prostą i otyłość wtórną. W większości przypadków u dzieci i młodzieży występuje otyłość prosta. Głównym mechanizmem, który prowadzi do jej rozwoju jest dodatni bilans energetyczny - czyli spożywanie większej ilości kalorii niż ich zużycie. Zjawisko to często wiąże się z nadmiernym spożyciem produktów bogatych w cukry proste, spożywaniem dużych porcji oraz niskim poziomem aktywności fizycznej, ponadto pandemia COVID-19 dodatkowo zaostrzyła te problemy, prowadząc do gwałtownego wzrostu wskaźników otyłości wśród dzieci (Sahoo et al. 2015).

Jedną z kluczowych przyczyn tej formy otyłości jest nadmierne spożycie kalorii, co jest bezpośrednio związane z nieodpowiednią dietą. Gotowe dania i fast foody, które zawierają duże ilości cukru oraz tłuszczów nasyconych, a jednocześnie są ubogie w witaminy i mikroelementy, sprzyjają rozrostowi tkanki tłuszczowej. Ponadto, nieregularność posiłków oraz zbyt duże porcje również przyczyniają się do nadwagi i otyłości (Mannino et al. 2022; Jebeile et al. 2022).

W rozwoju otyłości u dzieci duże znaczenie mają również początkowe etapy życia, takie jak okres prenatalny i niemowlęcy. W tym czasie szczególnie ważne są zachowania zdrowotne matki, jak i dziecka. Do najważniejszych należą: prawidłowy przebieg ciąży, unikanie ekspozycji na dym tytoniowy, karmienie piersią oraz zapewnienie odpowiedniej długości snu, które mogą znacząco ograniczać ryzyko rozwoju otyłości już we wczesnym dzieciństwie (Marshall et al. 2019).

Kolejnym istotnym czynnikiem jest brak aktywności fizycznej. Współczesne dzieci i młodzież spędzają dużo czasu na oglądaniu telewizji, grach komputerowych oraz korzystaniu z mediów społecznościowych. Tego rodzaju rozrywki zastępują tradycyjne formy aktywności fizycznej, takie jak spacer, jazda na rowerze czy gry zręcznościowe. Ponadto, coraz mniej dzieci spędza czas na aktywnej zabawie z rówieśnikami, ponieważ większość interakcji odbywa się online. Siedzący tryb życia towarzyszy dzieciom od najmłodszych lat, co prowadzi do stopniowego przybierania na wadze (Stabouli et al. 2021). Co istotne, nadmierny czas spędzany przed ekranem nie tylko negatywnie wpływa na kondycję fizyczną, ale również sprzyja rozwojowi otyłości oraz prowadzi do zaburzeń snu. Niedobór snu jest uznawany za jeden z czynników ryzyka nadwagi i otyłości u dzieci i młodzieży, ponieważ zaburza gospodarkę hormonalną oraz mechanizmy regulujące apetyt, co może prowadzić do zwiększonego spożycia energii i przyrostu masy ciała (Felső et al. 2017).

Warto również zwrócić uwagę, że zachowania rodziców oraz środowisko, w którym wychowują się dzieci, w istotny sposób wpływają na ich nawyki żywieniowe oraz poziom aktywności fizycznej. Dzieci, których rodzice stosują niezdrową dietę i prowadzą siedzący tryb życia, częściej wykazują tendencję do nadwagi i otyłości (Goel et al. 2014). Ponadto, niepoprawne relacje rodzinne również mają wpływ na rozwój otyłości u dzieci i młodzieży. Dzieci, które przeżywają trudne sytuacje rodzinne, takie jak rozwód rodziców, wykorzystywanie seksualne lub nadmierne wymagania, często szukają pocieszenia w jedzeniu. W takich przypadkach jedzenie staje się mechanizmem radzenia sobie ze stresem, co prowadzi do zaburzeń łaknienia i przybierania na wadze. Dzieci mogą traktować jedzenie jako nagrodę za przetrwanie stresujących sytuacji, co dodatkowo zaburza ich prawidłowe nawyki żywieniowe (Mason 2020).

Rzadziej występującą formą zwiększonej masy ciała jest otyłość wtórna, wynikająca z innych schorzeń lub uwarunkowań genetycznych. U dzieci i młodzieży może być ona związana z zaburzeniami metabolicznymi, hormonalnymi lub genetycznymi, które wymagają specjalistycznej diagnostyki i odpowiedniego leczenia. Istotne jest, aby lekarze potrafili odróżnić otyłość wtórna, np. wynikającą z endokrynopatii, od otyłości prostej, ponieważ ma to istotne znaczenie dla wdrożenia właściwego postępowania terapeutycznego. Do jej przyczyn zalicza się również różnorodne schorzenia współistniejące do których należą (Pomahacova et al. 2023):

- choroby układu nerwowego: dziecięce porażenie mózgowe, rdzeniowy zanik mięśni, urazy ośrodkowego układu nerwowego, przebyte zapalenie opon mózgowych oraz występowanie guzów ośrodkowego układu nerwowego;
- choroby układu wewnątrzwydzielniczego: niedoczynność tarczycy, niedoczynność przytarczyc, zespół Cushinga, niski poziom hormonu wzrostu, podwyższony poziom insuliny we krwi prowadzący do insulinooporności, różne zaburzenia w czasie pokwitania;
- choroby związane z genetyką;
- długotrwałe stosowanie niektórych leków: przeciwpadaczkowych, z grupy steroidów, psychotropowych, uspokajających.

Otyłość jest czynnikiem, który wpływa na wszystkie układy organizmu w krótkiej, średniej i długiej perspektywie czasowej. Jednak nasilenie tych zmian zależy od wieku oraz stopnia zaawansowania otyłości (Jebeile et al. 2022). Liczne badania wskazują, że otyłość w dzieciństwie i okresie dojrzewania wiąże się ze zwiększonym ryzykiem przedwczesnej śmierci. Wynika to m.in. z większej częstości występowania chorób układu krążenia, cukrzycy typu 2 oraz zaburzeń endokrynologicznych, a także problemów psychicznych, takich jak depresja i zaburzenia poznawcze. Nieprawidłowości te mogą również negatywnie wpływać na funkcjonowanie szkolne (Marcus et al. 2022).

Nadmierna masa ciała wywiera niekorzystny wpływ na funkcjonowanie układu odpornościowego. Wynika to z procesu nadmiernego gromadzenia tkanki tłuszczowej, w wyniku którego komórki tłuszczowe powiększają się, a układ odpornościowy zostaje nieprawidłowo pobudzony. W efekcie rozwija się przewlekły stan zapalny. Proces ten jest związany zarówno z wydzielaniem substancji zapalnych przez adipocyty, jak i ze zwiększoną liczbą komórek układu odpornościowego, takich jak makrofagi czy limfocyty. Powstałe zaburzenia sprzyjają rozwojowi wielu chorób przewlekłych związanych z otyłością, w tym cukrzycy typu 2, schorzeń metabolicznych, chorób sercowo-naczyniowych, a także niektórych nowotworów i chorób

autoimmunologicznych (Marcus et al. 2022).

Nadwaga w wieku rozwojowym wpływa również negatywnie na układ krążenia, prowadząc m.in. do powiększenia lewej komory serca. Choroby układu sercowo-naczyniowego oraz miażdżyca rozwijają się stopniowo, dlatego ich konsekwencje mogą być szczególnie nasilone, gdy otyłość pojawia się już we wczesnym okresie życia. Dodatkowo istotną rolę odgrywa styl życia rodziny, który może utrzymywać nieprawidłowe wzorce żywieniowe i behawioralne (Ruiz et al. 2020).

Podobnie jak choroby układu sercowo-naczyniowego, insulinooporność oraz cukrzyca typu 2, które dawniej uznawano za schorzenia występujące głównie u osób dorosłych, coraz częściej obserwowane są również u dzieci i młodzieży z nadmierną masą ciała (Steinberger et al. 2001; Sinaiko et al. 2005). Szczególne znaczenie ma tu otyłość centralna, która wiąże się z obniżoną wrażliwością tkanek na insulinę. Jednym z pierwszych zaburzeń metabolicznych pojawiających się u otyłych nastolatków jest hiperinsulinemia. Dodatkowo fizjologiczny spadek wrażliwości na insulinę w okresie dojrzewania może nasilać istniejącą insulinooporność, zwiększając ryzyko rozwoju cukrzycy typu 2 (Ruiz et al. 2020).

Dodatkowo, otyłość u dzieci wiąże się również z występowaniem niealkoholowej stłuszczeniowej choroby wątroby (NAFLD), która jest jedną z najczęstszych przyczyn chorób tego narządu u pacjentów pediatrycznych (Huang et al. 2013). Schorzenie to obejmuje zarówno proste stłuszczenie wątroby, jak i jego bardziej zaawansowaną postać - NASH, charakteryzującą się obecnością stanu zapalnego i uszkodzenia komórek wątrobowych (Rafiq et al. 2009). NAFLD koreluje z zespołem metabolicznym, w tym otyłością centralną, insulinoopornością, cukrzycą typu 2 oraz nadciśnieniem tętniczym. Ponadto u dzieci z otyłością obserwuje się zwiększone ryzyko zaburzeń ortopedycznych, takich jak złuszczenie nasady głowy kości udowej (Kansra et al. 2021).

Nadwaga i otyłość prowadzą również do zaburzeń gospodarki lipidowej, co objawia się dyslipidemią. U młodzieży z otyłością brzuszną często obserwuje się niski poziom cholesterolu frakcji HDL oraz podwyższone stężenia trójglicerydów. Te zaburzenia metaboliczne mogą prowadzić do zespołu metabolicznego, który stanowi poważne ryzyko rozwoju chorób sercowo-naczyniowych (Skinner et al. 2015).

Otyłość u dzieci prowadzi również do wielu innych poważnych powikłań zdrowotnych, takich jak (Sinha et al. 2025; di Palmo et al. 2021; Marcus et al. 2022):

- kamica pęcherzyka żółciowego;
- choroby nerek, takie jak szklwienie kłębuszków nerkowych;
- obturacyjny bezdech senny;
- astma oskrzelowa;

- choroba Blounta;
- płaskostopie;
- skolioza;
- bóle kręgosłupa;
- zapalenie kości i stawów.

Otyłość wpływa również na przebieg dojrzewania płciowego: u dziewcząt często obserwuje się jego wcześniejsze rozpoczęcie, natomiast u chłopców ulega ono opóźnieniu. U młodych kobiet otyłość wiąże się z zaburzeniami cyklu miesięczkowego oraz insulinoopornością, która może prowadzić do hiperandrogenizmu i rozwoju zespołu policystycznych jajników. W konsekwencji zaburzenia te mogą skutkować problemami z płodnością (Burt Solorzano et al. 2010). U chłopców z otyłością często występuje ginekomastia, wynikająca z przemiany testosteronu w estrogeny w tkance tłuszczowej. Zmiany te mogą negatywnie wpływać na samopoczucie psychospołeczne i w niektórych przypadkach wymagają leczenia (Sansone et al. 2017).

Nadmierna masa ciała ma również poważne konsekwencje natury socjalnej i psychologicznej. Otyłe dzieci często izolują się od rówieśników i mają niską samoocenę. Bywają obiektem drwin, co może prowadzić do myśli samobójczych, nawet wśród uczniów szkół podstawowych. Otyłość w dzieciństwie oraz w wieku dojrzewania zwiększa ryzyko otyłości w dorosłości. W literaturze wskazuje się na istotny związek między otyłością a zaburzeniami psychicznymi, w tym depresją oraz zaburzeniami odżywiania. Relacja ta ma charakter dwukierunkowy, ponieważ depresja może zarówno sprzyjać rozwojowi otyłości, jak i być jej konsekwencją. Ponadto u młodzieży z otyłością częściej obserwuje się występowanie zaburzeń lękowych. Wiąże się to z większym ryzykiem rozwoju wielu poważnych chorób, w tym niektórych nowotworów (Sahoo et al. 2015).

Z tego względu istotne jest leczenie otyłości, które wymaga kompleksowych działań, obejmujących edukację zdrowotną, promowanie aktywności fizycznej i zdrowego stylu życia oraz wsparcie psychologiczne dla dzieci i ich rodzin (Enright et al. 2020).

Wsparcie rodziny jest jednym z najważniejszych czynników wpływających na skuteczność programów odchudzania wśród dzieci i młodzieży. Dzieci, których rodzice aktywnie uczestniczą w programach zdrowotnych, osiągają lepsze wyniki w redukcji masy ciała. Zaangażowanie rodziców w zdrowe nawyki żywieniowe oraz aktywność fizyczną jest kluczowe dla utrzymania motywacji u dzieci. Wsparcie emocjonalne i praktyczne ze strony rodziny może również znacznie wpłynąć na motywację do odchudzania. Rodzice, którzy sami stosują zdrowe nawyki, mogą być wzorem do naśladowania dla swoich dzieci. Ponadto, wspólne uczestnictwo w aktywnościach fizycznych oraz wspólne przygotowywanie zdrowych posiłków może wzmacniać więź rodziną

i motywować dzieci do utrzymania zdrowego stylu życia (Yackobovitch-Gavan et al. 2018; Fischer et al. 2018).

Motywacja wewnętrzna, taka jak chęć poprawy zdrowia czy samopoczucia, jest bardziej skuteczna w długoterminowym utrzymaniu wagi w porównaniu z motywacją zewnętrzną, np. presją społeczną. Osoby, które motywowane są wewnętrznymi celami, osiągają lepsze wyniki w odchudzaniu. Motywacja wewnętrzna prowadzi do bardziej trwałych zmian w stylu życia, co jest kluczowe w walce z otyłością (Teixeira et al. 2012). Badania wykazały, że młodzież, która jest motywowana poprawą swojego zdrowia i samopoczucia, jest bardziej skłonna do podejmowania i utrzymywania zdrowych nawyków. W przeciwieństwie do tego, motywacja zewnętrzna, taka jak presja rówieśników lub oczekiwania społeczne, może być mniej skuteczna i prowadzić do krótkotrwałych rezultatów. Motywacja wewnętrzna jest bardziej związana z trwałymi zmianami w zachowaniu, co jest ważne dla długoterminowego sukcesu w odchudzaniu (Biggs et al. 2021).

Dodatkowo istotne w procesie przeciwdziałania otyłości znaczenie mają programy edukacyjne, które uczą dzieci i młodzież zdrowych nawyków żywieniowych oraz znaczenia aktywności fizycznej przyczyniając się tym samym do poprawy stylu życia. Działania te odgrywają ważną rolę w procesie redukcji masy ciała, ponieważ zwiększają świadomość dotyczącą zdrowego stylu życia, wzmacniając motywację do zmiany dotychczasowych nawyków (Menor-Rodriguez et al. 2022). Również wykorzystanie nowoczesnych technologii w edukacji zdrowotnej, w tym programów e-learningowych realizowanych za pośrednictwem Internetu, mogą istotnie zwiększać poziom kompetencji zdrowotnych oraz przyczyniać się do poprawy zachowań żywieniowych u nastolatków. Jednocześnie ich wpływ na poziom aktywności fizycznej nie jest jednoznaczny, co sugeruje konieczność uzupełniania interwencji cyfrowych o dodatkowe działania praktyczne i środowiskowe (Dülger et al. 2024).

Następne równie istotne działania obejmują interwencje behawioralne, do których należy m.in. terapia poznawczo-behawioralna, która może być skuteczna w leczeniu problemów ze zdrowiem psychicznym, takich jak depresja, impulsywność i zniekształcony obraz ciała. Zaburzenia te mogą współwystępować z otyłością u dzieci, a zastosowanie terapii pomaga w nauce zdrowych nawyków i technik radzenia sobie ze stresem (Kang and Kwack 2020). Dodatkowo, interwencje behawioralne obejmujące działania związane ze zmianą stylu życia, takie jak modyfikacja diety, zwiększenie poziomu aktywności fizycznej oraz ograniczenie czasu spędzanego w pozycji siedzącej, mogą przyczyniać się do redukcji masy ciała i poprawy ogólnego stanu zdrowia (Li et al. 2025).

W dzisiejszych czasach przydatne wydają się również nowoczesne technologie, takie jak aplikacje do śledzenia diety i aktywności fizycznej, które mogą być skutecznym narzędziem

motywacyjnym dla młodych ludzi. Aplikacje te pomagają młodzieży monitorować postępy i utrzymywać wysoką motywację do odchudzania. Technologia umożliwia także łatwiejszy dostęp do informacji o zdrowym stylu życia. (Schoeppe et al. 2017). Aplikacje zdrowotne mogą dostarczać młodzieży narzędzi do śledzenia postępów, wyznaczania celów i otrzymywania natychmiastowej informacji zwrotnej. Mogą również oferować wsparcie w postaci porad dietetycznych, planów treningowych oraz motywacyjnych wiadomości. Ponadto, technologie te mogą umożliwiać młodym ludziom łączenie się z rówieśnikami, którzy mają podobne cele, co może dodatkowo wzmacniać ich motywację (Peuters et al. 2024).

Pomimo licznych badań dotyczących nadwagi i otyłości w wieku rozwojowym nadal istnieje potrzeba pogłębionej analizy czynników psychologicznych, rodzinnych i behawioralnych wpływających na rozwój oraz utrzymywanie się nadmiernej masy ciała. W szczególności istotne wydaje się uwzględnienie zależności pomiędzy motywacją do redukcji masy ciała, poziomem wsparcia rodzinnego, wykorzystaniem technologii cyfrowych oraz występowaniem objawów zaburzeń odżywiania w populacji dzieci i młodzieży. Z tego względu warto prowadzić badania uwzględniające zarówno czynniki psychospołeczne, jak i ocenę zachowań żywieniowych oraz motywacji do zmiany stylu życia u dzieci i młodzieży.

2. Cele pracy

Ogólny cel pracy stanowi zbadanie mechanizmów motywacyjnych wpływających na zmianę zachowań zdrowotnych wśród dzieci i młodzieży z nadwagą i chorobą otyłościową w populacji województwa podkarpackiego, ze szczególnym uwzględnieniem roli czynników psychospołecznych, środowiskowych oraz rodzinnych, poprzez realizację następujących założeń badawczych:

- analiza poziomu motywacji do zmiany zachowań zdrowotnych - ocena motywacji wewnętrznej i zewnętrznej oraz ich znaczenia w procesie redukcji masy ciała i utrzymania zdrowych nawyków wśród dzieci i młodzieży;
- ocena wpływu czynników psychospołecznych - analiza zależności pomiędzy BMI, samooceną, obrazem ciała oraz emocjami towarzyszącymi zmianie stylu życia;
- ocena roli wsparcia rodziny i środowiska społecznego - określenie znaczenia postaw rodziców, relacji rodzinnych oraz wsparcia społecznego w procesie kształtowania i utrzymywania motywacji do zmiany zachowań zdrowotnych;
- identyfikacja zachowań zdrowotnych i ich uwarunkowań - analiza nawyków żywieniowych, poziomu aktywności fizycznej oraz stylu życia jako czynników związanych z nadwagą i otyłością u dzieci i młodzieży;
- ocena zależności pomiędzy zaburzeniami zachowań żywieniowych a masą ciała. Zbadanie powiązań między wynikami kwestionariusza (ChEDE-Q) a wskaźnikiem BMI oraz identyfikacja wczesnych objawów nieprawidłowych zachowań żywieniowych;
- określenie skutecznych strategii wspierania zmiany zachowań zdrowotnych, analiza znaczenia edukacji zdrowotnej, interwencji behawioralnych oraz wykorzystania narzędzi cyfrowych w procesie redukcji masy ciała i poprawy stylu życia.

W związku z powyższym, cel badań nie ogranicza się jedynie do analizy poziomu motywacji u dzieci i młodzieży z nadwagą i otyłością, lecz obejmuje kompleksową ocenę czynników wpływających na trwałość zmiany zachowań zdrowotnych oraz opracowanie wniosków praktycznych mogących wspierać skuteczne działania profilaktyczne i terapeutyczne w populacji regionalnej.

Pytania badawcze:

- Jakie czynniki motywacyjne odgrywają kluczową rolę w procesie zmiany zachowań zdrowotnych u dzieci i młodzieży z nadwagą i otyłością?
- Jaka jest rola motywacji wewnętrznej i zewnętrznej w utrzymaniu zdrowych nawyków żywieniowych i aktywności fizycznej?
- W jaki sposób wsparcie rodziny wpływa na poziom motywacji oraz skuteczność redukcji masy ciała?
- Czy istnieje zależność pomiędzy BMI a samooceną, obrazem ciała oraz emocjami towarzyszącymi zmianie stylu życia?
- Jakie zachowania żywieniowe i poziom aktywności fizycznej dominują w badanej populacji?
- Czy występuje związek między objawami zaburzeń odżywiania a wskaźnikiem BMI wśród dzieci i młodzieży?
- Jakie bariery utrudniają utrzymanie długoterminowej zmiany zachowań zdrowotnych?
- Jakie formy interwencji (edukacja, wsparcie psychologiczne, technologie) są najbardziej efektywne w zwiększaniu motywacji i trwałości zmiany stylu życia?

3. Materiały i metody:

W ramach złożonego projektu badawczego realizowanego w obszarze nauk o zdrowiu, skoncentrowanego na analizie mechanizmów motywacyjnych zmiany zachowań zdrowotnych wśród dzieci i młodzieży z nadwagą i chorobą otyłościową, przeprowadzono wieloetapowe badanie obejmujące zarówno systematyczny przegląd literatury, jak i badania empiryczne o charakterze ilościowym i jakościowym. Projekt został zrealizowany na terenie województwa podkarpackiego w latach 2023-2024, z uwzględnieniem środowiska edukacyjnego, klinicznego oraz terapeutycznego.

W ramach rozprawy doktorskiej wyodrębniono poszczególne etapy badawcze, które umożliwiły kompleksowe ujęcie analizowanego problemu oraz weryfikację przyjętych założeń badawczych:

- I. Przegląd systematyczny literatury
- II. Badanie empiryczne (ilościowo-jakościowe)
- III. Analiza zachowań zdrowotnych i czynników psychospołecznych
- IV. Analiza psychometryczna narzędzia ChEDE-Q

W pierwszym etapie przeprowadzono systematyczny przegląd literatury zgodnie z wytycznymi PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Protokół przeglądu został uprzednio zarejestrowany w bazie Open Science Framework. Przeszukiwanie literatury przeprowadzono w bazach danych PubMed, Scopus, Web of Science oraz Google Scholar. W procesie wyszukiwania zastosowano kombinacje słów kluczowych, takich jak: childhood obesity, weight loss motivation, mHealth, mobile apps, BMI reduction, self-monitoring, physical activity, z wykorzystaniem operatorów logicznych AND/OR. Do analizy włączono publikacje opublikowane w latach 2011-2024, dostępne w pełnym tekście, dotyczące populacji dzieci i młodzieży w wieku 6-18 lat oraz analizujące wpływ technologii cyfrowych na motywację do redukcji masy ciała i zmianę wskaźnika BMI. Wykluczono prace dotyczące wyłącznie populacji dorosłych, publikacje o charakterze redakcyjnym oraz badania niezawierające komponentu technologicznego. W wyniku przeprowadzonego procesu selekcji, obejmującego analizę 3005 publikacji, do ostatecznej analizy włączono 58 badań spełniających wszystkie kryteria.

Kolejny etap obejmował dwa odrębne badania empiryczne o charakterze przekrojowym. Pierwsze z nich, opisane w pracy dotyczącej psychospołecznych konsekwencji nadmiernej masy ciała oraz znaczenia aktywności fizycznej, objęło 100 respondentów w wieku 9–18 lat rekrutowanych w trzech typach placówek: szkole średniej w Tyczynie, szpitalu klinicznym w Rzeszowie oraz szpitalu uzdrowiskowym w Rymanowie-

Zdroju. Drugie badanie, dotyczące wsparcia rodziny i czynników motywujących do odchudzania, objęło 100 uczestników w wieku 10–18 lat z nadwagą lub otyłością, rekrutowanych w środowisku szkolnym, klinicznym i uzdrowiskowym.

W badaniu dotyczącym psychospołecznych konsekwencji nadmiernej masy ciała do analizy włączono 100 uczestników, w tym 54 dziewczęta i 46 chłopców; 61% badanych pochodziło z miast, a 39% ze wsi. Kryteria włączenia obejmowały wiek 9–18 lat, zdolność do samodzielnego wypełnienia kwestionariusza oraz uzyskanie świadomej zgody. Z badania wykluczano dzieci z ograniczeniami poznawczymi lub fizycznymi uniemożliwiającymi udział w procedurze kwestionariuszowej.

W badaniu dotyczącym wsparcia rodziny i czynników motywujących do odchudzania uczestniczyło 100 osób w wieku 9–18 lat (79 osób w wieku 10–18 lat). Kryteria włączenia obejmowały nadwagę lub otyłość ($BMI \geq 85$. percentyla), regularne uczęszczanie do szkoły oraz zgodę rodzica lub opiekuna prawnego. Kryteria wykluczenia obejmowały choroby przewlekłe, zaburzenia metaboliczne lub genetyczne oraz farmakoterapię mogącą wpływać na masę ciała.

W badaniu zastosowano zestaw narzędzi umożliwiających kompleksową ocenę zachowań zdrowotnych oraz mechanizmów motywacyjnych. Głównym narzędziem był autorski kwestionariusz opracowany na podstawie przeglądu literatury oraz istniejących narzędzi z zakresu psychologii zdrowia. Kwestionariusz obejmował pytania dotyczące danych socjodemograficznych, nawyków żywieniowych, poziomu aktywności fizycznej, jakości snu, percepcji własnego ciała, poziomu samooceny oraz źródeł motywacji i barier w procesie redukcji masy ciała. Odpowiedzi udzielano w skali Likerta, a rzetelność narzędzia oceniono za pomocą współczynnika alfa Cronbacha ($\alpha = 0,72-0,84$).

Motywację do zmiany zachowań zdrowotnych analizowano w oparciu o założenia teorii autodeterminacji (Self-Determination Theory), wyróżniając motywację wewnętrzną, zewnętrzną oraz amotywację. Dodatkowo uwzględniono rolę wsparcia społecznego, w szczególności wsparcia rodzinnego, jako czynnika wpływającego na proces zmiany zachowań zdrowotnych.

W badaniu dotyczącym wsparcia rodziny wykorzystano autorski kwestionariusz oraz elementy wywiadu indywidualnego. Analiza obejmowała m.in. czas utrzymywania zdrowych nawyków, kontrolę jedzenia, samoocenę oraz emocje towarzyszące redukcji masy ciała.

W celu uporządkowania rozbieżności liczbowych występujących w pierwotnej wersji opisu wyników, w niniejszej rozprawie przyjęto dwa poziomy prezentacji odsetków. Analizę podstawową przedstawiono dla pełnej próby $N = 100$ respondentów, zgodnie z liczebnościami zaprezentowanymi na rycinach i w zestawieniach zbiorczych.

Dodatkowo dla wybranych analiz dotyczących zachowań żywieniowych przedstawiono analizę pomocniczą dla $N = 79$, interpretowaną jako analizę po wyłączeniu osób w wieku 9 lat. Ujęcie to wprowadzono w celu zachowania porównywalności z wcześniejszym opisem tekstowym, w którym pojawiały się odsetki odnoszone do mniejszego mianownika.

W tabelach pomocniczych zestawiono liczebności odpowiedzi oraz sposób obliczenia odsetków dla obu mianowników, aby jednoznacznie wyjaśnić źródło wcześniejszych rozbieżności prezentacyjnych.

W odrębnym etapie badania przeprowadzono analizę psychometryczną polskiej wersji kwestionariusza Child and Adolescent Eating Disorder Examination Questionnaire (ChEDE-Q). Badanie to miało charakter pilotażowy i przekrojowy, a jego celem była wstępna ocena właściwości psychometrycznych narzędzia w populacji młodzieży. Do analizy włączono 200 kompletnych kwestionariuszy uzyskanych od uczestników w wieku 10-18 lat, zrekrutowanych w tych samych środowiskach instytucjonalnych.

Kwestionariusz ChEDE-Q służył do oceny postaw i zachowań związanych z jedzeniem oraz obrazu ciała w okresie ostatnich 28 dni, obejmując takie obszary jak restrykcje żywieniowe, utrata kontroli nad jedzeniem, obawy dotyczące masy ciała oraz wpływ wyglądu na samoocenę. W analizie wykorzystano zarówno dane deklaratywne uczestników, jak i pomiary antropometryczne.

Analiza statystyczna została przeprowadzona z wykorzystaniem programów m.in. takich jak: IBM SPSS Statistics 27.0 oraz Microsoft Excel 365. W pierwszym etapie zastosowano statystykę opisową, obejmującą obliczenie średnich, odchyleń standardowych oraz rozkładów częstości. W celu porównania grup zastosowano test chi-kwadrat dla zmiennych jakościowych oraz test t-Studenta lub test U Manna-Whitneya dla zmiennych ilościowych, w zależności od spełnienia założeń normalności rozkładu. Dodatkowo przeprowadzono analizę regresji logistycznej w celu identyfikacji czynników predykcyjnych motywacji oraz zachowań zdrowotnych. Za poziom istotności statystycznej przyjęto $p < 0,05$.

Badanie zostało przeprowadzone zgodnie z zasadami Deklaracji Helsińskiej oraz obowiązującymi przepisami dotyczącymi ochrony danych osobowych (RODO). Projekt uzyskał pozytywną opinię Komisji Bioetycznej - numer zgody: KBET/219/2023. Udział w badaniu był dobrowolny, a dane analizowano w sposób anonimowy i zbiorczy.

Zastosowana metodyka badawcza umożliwiła wieloaspektową analizę mechanizmów motywacyjnych oraz czynników psychospołecznych związanych z nadwagą i otyłością w populacji dzieci i młodzieży, stanowiąc podstawę do dalszych analiz oraz formułowania wniosków praktycznych w zakresie profilaktyki i terapii otyłości.

4. Wyniki

Pierwsza praca wchodząca w skład niniejszej rozprawy doktorskiej dotyczy wpływu technologii cyfrowych na motywację do redukcji masy ciała oraz zmianę wskaźnika BMI w populacji dzieci i młodzieży. Przegląd systematyczny miał na celu scharakteryzowanie roli nowoczesnych narzędzi technologicznych, takich jak aplikacje mobilne, urządzenia typu wearable oraz platformy eHealth i mHealth, w procesie kształtowania zachowań prozdrowotnych. Dane z przeglądanej literatury odnosiły się do skuteczności tych interwencji w zakresie redukcji BMI, poprawy nawyków żywieniowych oraz zwiększenia poziomu aktywności fizycznej, z uwzględnieniem czynników psychospołecznych i środowiskowych. Na podstawie analizy 58 publikacji naukowych wykazano, że technologie cyfrowe mogą skutecznie wspierać proces redukcji masy ciała, szczególnie w przypadku interwencji spersonalizowanych oraz uwzględniających zaangażowanie opiekunów. W pracy przedstawiono również znaczenie czynników takich jak personalizacja, wsparcie rodzinne oraz poziom kompetencji cyfrowych w kontekście efektywności podejmowanych działań. Uzyskane wyniki wskazują, że technologie cyfrowe stanowią istotne narzędzie wspomagające profilaktykę i leczenie otyłości w populacji pediatrycznej, jednak ich skuteczność zależy od kompleksowego podejścia uwzględniającego zarówno aspekty behawioralne, jak i społeczne (Wąsacz et al. 2025a).

Z perspektywy wartości praktycznej za najistotniejsze wyniki całego cyklu publikacji należy uznać: potwierdzenie kluczowej roli wsparcia rodziny w utrzymaniu motywacji do redukcji masy ciała, wykazanie związku wyższych wartości BMI z nasileniem niezadowolenia z własnego ciała i obniżeniem samooceny, stwierdzenie przewagi motywacji zewnętrznej i krótkotrwałych prób zmiany zachowań żywieniowych, wykazanie użyteczności spersonalizowanych technologii cyfrowych oraz potwierdzenie przydatności polskiej wersji kwestionariusza ChEDE-Q jako narzędzia przesiewowego.

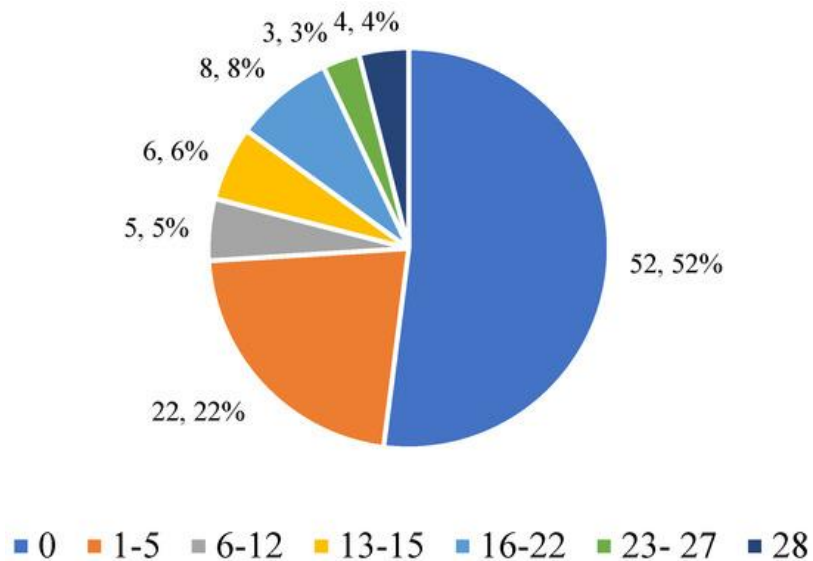
Druga praca wchodząca w skład niniejszej rozprawy doktorskiej dotyczyła psychospołecznych konsekwencji nadmiernej masy ciała oraz znaczenia aktywności fizycznej wśród dzieci i młodzieży. Celem badania była ocena zależności pomiędzy wskaźnikiem BMI a wybranymi aspektami funkcjonowania psychospołecznego, takimi jak obraz ciała, samoocena, zachowania żywieniowe oraz aktywność fizyczna. Badaniem objęto 100 dzieci i młodzieży w wieku 9–18 lat z trzech placówek zlokalizowanych na terenie województwa podkarpackiego; 54% stanowiły dziewczęta, a 61% badanych pochodziło z miast. Analiza struktury badanej populacji wykazała wyraźne różnice pomiędzy ośrodkami pod względem masy ciała, wzrostu oraz rozkładu wartości BMI. Najbardziej zróżnicowaną grupę stanowili

uczestnicy z Uzdrowiska Zimowit, natomiast w grupie uczniów z Tyczyna odnotowano najkorzystniejszy profil wagowy, bez przypadków otyłości (Wąsacz et al. 2025b). Charakterystykę BMI respondentów przedstawiono w Tabeli 1.

Tabela 1. BMI (wskaźnik masy ciała) respondentów (Wąsacz et al. 2025b).

BMI		Szpital uzdrowiskowy	Szpital Kliniczny	Szkoła średnia
głód	< 16,0	0	0	0
wychudzenie	16,0 - 16,9	0	0	0
niedowaga	17,0 - 18,5	0	1	6
prawidłowa masa ciała	18,5 - 24,9	9	11	21
nadwaga	25,0 - 29,9	7	10	11
otyłość I stopnia	30,0 - 34,9	10	6	0
otyłość II stopnia	35,0 - 39,9	5	3	0
otyłość III stopnia	≥ 40	0	0	0
Razem		31	31	38

Analiza wykazała istotne zróżnicowanie badanej populacji pod względem cech antropometrycznych, szczególnie masy ciała i BMI. W zakresie zachowań żywieniowych większość respondentów (52%; n = 52) deklarowała brak epizodów jedzenia w tajemnicy, natomiast 22% (n = 22) zgłaszało takie zachowania sporadycznie (1–5 dni), co zostało ukazane na rycinie 1. Łącznie 48% badanych deklarowało co najmniej epizodyczne jedzenie w tajemnicy, a 4% (n = 4) wskazało takie zachowania codziennie przez 28 dni. Co ciekawe, jednocześnie około 38% badanych nie odczuwało potrzeby posiadania płaskiego brzucha, podczas gdy około 33% deklarowało takie myśli codziennie (Wąsacz et al. 2025b).



Ryc. 1. Odpowiedzi respondentów na pytanie „Czy kiedykolwiek jadłeś w tajemnicy?”

Większość badanych — około 66% — odczuwała niezadowolenie z własnego ciała (w tym około 27% „bardzo często” i około 19% „cały czas”), podczas gdy około 34% deklarowało jego brak lub sporadyczne występowanie. W odniesieniu do aktywności fizycznej stwierdzono, że około 59% badanych nie podejmowało intensywnej aktywności fizycznej w celu kontroli masy ciała (Wąsacz et al. 2025b).

W pracy wykazano również statystycznie istotne zależności pomiędzy kategoriami BMI a wybranymi aspektami funkcjonowania psychospołecznego. Stwierdzono istotne różnice w zakresie wpływu kształtu ciała na sposób myślenia o sobie ($\chi^2 = 17,648$; $df = 18$; $p = 0,0479$) oraz w poziomie niezadowolenia z sylwetki ($\chi^2 = 27,43$; $df = 18$; $p = 0,0287$). U osób z nadwagą i otyłością obserwowano wyższy poziom wpływu wyglądu ciała na samoocenę oraz większe niezadowolenie z własnej sylwetki (Wąsacz et al. 2025b). Zależności te przedstawiono w Tabeli 2 i 3. Ze względu na małą liczebność grupy respondentów z otyłością II stopnia, kategoria ta nie została uwzględniona jako odrębna grupa w analizach porównawczych. Jej wyodrębnienie mogłoby prowadzić do niestabilnych oszacowań i ograniczać wiarygodność wnioskowania statystycznego. W związku z tym analizy przedstawione w Tabeli 2 i 3 przeprowadzono dla 89 osób.

Tabela 2. Odpowiedzi respondentów dotyczące pytania „Czy kształty Twojego ciała wpłynęły na sposób, w jaki myślisz o sobie?” z uwzględnieniem BMI (Wąsacz et al.2025b).

Odpowiedź	Niedowaga n=7	Waga prawidłowa n=44	Nadwaga n=21	Otyłość I n=17	Razem N=89
nigdy	1 (14,29%)	9 (20,45%)	1 (4,76%)	2 (11,76%)	13 (14,61%)
prawie nigdy	1 (14,29%)	1 (2,27%)	1 (4,76%)	2 (11,76%)	5 (5,62%)
bardzo rzadko	1 (14,29%)	9 (20,45%)	1 (4,76%)	2 (11,76%)	13 (14,61%)
rzadko	1 (14,29%)	5 (11,36%)	4 (19,05%)	2 (11,76%)	12 (13,48%)
często	3 (42,86%)	7 (15,91%)	4 (19,05%)	3 (17,65%)	17 (19,10%)
bardzo często	0 (0,00%)	7 (15,91%)	8 (38,10%)	3 (17,65%)	18 (20,22%)
cały czas	0 (0,00%)	6 (13,64%)	2 (9,52%)	3 (17,65%)	11 (12,36%)
Chi-kwadrat $\chi^2 = 17,648$		df=18		p=0,0479	

W całej analizowanej grupie najczęstsze były odpowiedzi „bardzo często” (20,22%) i „często” (19,10%), a łącznie odpowiedzi o wysokim nasileniu wpływu kształtu ciała na myślenie o sobie - czyli „często”, „bardzo często” i „cały czas” - stanowiły 46 z 89 osób, czyli 51,69%. To oznacza, że u ponad połowy badanych wygląd ciała wyraźnie wpływał na samoocenę. Źródłowa analiza wskazuje przy tym na istotność statystyczną zależności między BMI a odpowiedziami: $\chi^2 = 17,648$; $df = 18$; $p = 0,0479$.

W grupie z wagą prawidłową rozkład odpowiedzi był bardziej wyrównany; odpowiedzi o niskim nasileniu wpływu („nigdy”, „prawie nigdy”, „bardzo rzadko”, „rzadko”) stanowiły 54,55%, a odpowiedzi o wysokim nasileniu 45,45%. W grupie z nadwagą udział odpowiedzi wysokiego nasilenia wzrósł do 66,67%, a najczęściej wybieraną kategorią było „bardzo często” (38,10%). W grupie z otyłością I stopnia odpowiedzi wysokiego nasilenia stanowiły 52,94%, co również wskazuje na silny związek obrazu ciała z myśleniem o sobie.

Tabela 3. Odpowiedzi respondentów dotyczące pytania „Czy byłeś niezadowolony ze swoich kształtów ciała?” z uwzględnieniem BMI (Wąsacz et al. 2025b).

Odpowiedź	Niedowaga n=7	Waga prawidłowa n=44	Nadwaga n=21	Otyłość I n=17	Razem N=89
nigdy	3 (42,86%)	9 (20,45%)	1 (4,76%)	1 (5,88%)	14 (15,73%)
prawie nigdy	0 (0,00%)	8 (18,18%)	1 (4,76%)	1 (5,88%)	10 (11,24%)
bardzo rzadko	2 (28,57%)	3 (6,82%)	0 (0,00%)	3 (17,65%)	8 (8,99%)
rzadko	0 (0,00%)	5 (11,36%)	2 (9,52%)	3 (17,65%)	10 (11,24%)
często	1 (14,29%)	8 (18,18%)	6 (28,57%)	2 (11,76%)	17 (19,10%)
bardzo często	1 (14,29%)	5 (11,36%)	8 (38,10%)	3 (17,65%)	17 (19,10%)
cały czas	0 (0,00%)	6 (13,64%)	3 (14,29%)	4 (23,53%)	13 (14,61%)
Chi-kwadrat $\chi^2 = 27,43$			df=18	p=0,0287	

Uzyskane wyniki pozwoliły na identyfikację istotnych zależności pomiędzy wskaźnikiem BMI a wybranymi aspektami funkcjonowania psychospołecznego. Zaobserwowano, że wraz ze wzrostem BMI nasilał się wpływ wyglądu ciała na samoocenę oraz niezadowolenie z własnej sylwetki. W grupach z wyższymi kategoriami BMI częściej występowały odpowiedzi wskazujące na silny wpływ kształtu ciała na samoocenę („często”, „bardzo często”, „cały czas”). Podobną zależność zaobserwowano w przypadku niezadowolenia z sylwetki. Uzyskane wyniki wskazują, że nadmierna masa ciała wiąże się nie tylko z problemami somatycznymi, ale również z istotnymi konsekwencjami psychospołecznymi, w tym obniżoną samooceną oraz negatywnym obrazem własnego ciała. Zależności te mogą mieć istotne znaczenie w planowaniu działań profilaktycznych i terapeutycznych ukierunkowanych na poprawę zdrowia psychicznego i jakości życia dzieci i młodzieży.

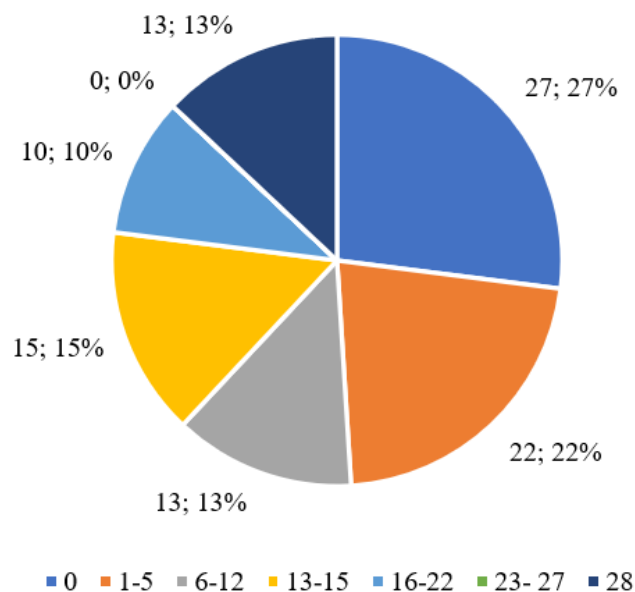
Trzecia publikacja, wchodząca w skład cyklu prac do rozprawy, dotyczy wsparcia rodziny oraz czynników motywujących do odchudzania wśród dzieci i młodzieży z nadwagą i otyłością. W badaniu oceniono wybrane zachowania żywieniowe, emocje związane z jedzeniem i własnym wyglądem oraz zależności pomiędzy BMI a postrzeganiem własnego ciała i samooceną. Uzyskane wyniki pozwoliły na lepsze poznanie psychospołecznych i rodzinnych uwarunkowań zmiany zachowań zdrowotnych w tej grupie badanej (Wąsacz et al. 2025c). Charakterystykę badanej grupy przedstawiono w Tabeli 4.

Tabela 4. Charakterystyka badanej grupy (Wąsacz et al. 2025c).

Parametr	Liceum Ogólnokształcące w Tyczynie	Kliniczny Szpital Wojewódzki Nr 2 w Rzeszowie	Szpital Uzdrowiskowy Zimowit w Rymanowie- Zdroju	Łącznie / Średnia ogólna
Liczba uczestników	38	31	31	100
Średni wiek (lata)	16,5	13,2	14,1	14,6
Liczba dziewcząt	20	18	16	54
Liczba chłopców	18	13	15	46
Liczba osób z miast	21	18	12	51
Liczba osób ze wsi	17	13	19	49
Średnia masa ciała (kg)	79,2	72,8	76,4	76,1
Średni wzrost (cm)	171,3	162,5	165,8	166,5
Średni wskaźnik BMI (kg/m ²)	26,9	27,6	27,8	27,4

W analizie statystycznej wykazano istotną zależność pomiędzy BMI a poziomem niezadowolenia z własnej masy ciała ($p = 0,0261$) oraz pomiędzy BMI a obawą, że inni mogą zobaczyć respondenta podczas jedzenia ($p = 0,0042$). Nie stwierdzono natomiast istotnych różnic w zakresie poczucia utraty kontroli nad jedzeniem, wpływu masy ciała na sposób myślenia o sobie oraz dyskomfortu związanego z własnym ciałem (Wąsacz et al. 2025c).

Wyniki wykazały, że próby ograniczania spożycia pokarmu oraz stosowania zasad dietetycznych były podejmowane przez większość respondentów, jednak najczęściej miały charakter krótkotrwały. W przypadku ograniczania jedzenia największa grupa badanych (27%; $n = 27$) zadeklarowała, że nie podejmowała takich działań wcale, natomiast 22% ($n = 22$) próbowało jeść mniej przez 1–5 dni. Po 13% badanych ($n = 13$) deklarowało zarówno utrzymywanie takich ograniczeń przez 6–12 dni, jak i przez pełne 28 dni (Wąsacz et al. 2025c). Wyniki te przedstawiono na rycinie 2.



Ryc. 2. Wskazania respondentów dotyczące pytania „Czy próbowałeś jeść mniej, aby

Uzyskane wyniki wskazują, że w badanej grupie dominowała motywacja, oparta głównie na presji zewnętrznej, negatywnych emocjach i niezadowoleniu z własnego wyglądu. Podejmowane działania miały najczęściej charakter krótkotrwały, co może świadczyć o trudnościach w utrzymaniu trwałej zmiany zachowań zdrowotnych. Wyniki te podkreślają znaczenie wsparcia emocjonalnego i rodzinnego w procesie redukcji masy ciała u dzieci i młodzieży.

Ostatnia publikacja, stanowiąca część niniejszej rozprawy doktorskiej, dotyczyła oceny właściwości psychometrycznych polskiej wersji kwestionariusza ChEDE-Q oraz analizy jego związku ze wskaźnikiem BMI u młodzieży. Badanie miało charakter przekrojowy i objęło 200 uczestników w wieku 10–18 lat. Wyniki wskazały, że globalny wynik kwestionariusza charakteryzował się wysoką rzetelnością, a rzetelność podskal była od akceptowalnej do wysokiej (Wąsacz et al. 2026).

Analiza czynnikowa potwierdziła wielowymiarowość kwestionariusza, a spośród testowanych modeli najlepsze dopasowanie uzyskał model bifactor, choć żaden z analizowanych modeli nie osiągnął w pełni satysfakcjonującego dopasowania bezwzględnego. Analizy trafności zbieżnej i regresji wykazały dodatni związek pomiędzy globalnym wynikiem ChEDE-Q a BMI z-score. Analiza zmiennych demograficznych nie wykazała istotnych różnic w wynikach ze względu na płeć czy miejsce zamieszkania, natomiast wiek różnicował jedynie poziom obaw związanych z jedzeniem (Wąsacz et al. 2026).

Uzyskane dane sugerują, że polska wersja ChEDE-Q jest wartościowym narzędziem przesiewowym, jednak specyfika jego struktury czynnikowej wymaga zachowania ostrożności przy interpretacji poszczególnych podskal w tej grupie wiekowej.

Syntetyczne ujęcie najważniejszych wyników, które mają największe znaczenie dla prezentacji rozprawy oraz dla praktyki profilaktycznej i terapeutycznej, przedstawiono w Tabeli 5.

Tabela 5. Najistotniejsze wyniki cyklu publikacji i ich znaczenie praktyczne.

Obszar	Najważniejszy wynik	Znaczenie praktyczne
Technologie cyfrowe	Największą skuteczność wykazywały interwencje spersonalizowane i angażujące rodzinę.	Najlepsze efekty przynosi łączenie aplikacji lub narzędzi cyfrowych z edukacją zdrowotną i udziałem rodziców.
Konsekwencje psychospołeczne	Wraz ze wzrostem BMI nasilały się niezadowolenie z sylwetki i wpływ wyglądu na samoocenę.	Redukcja masy ciała powinna być wspierana interwencją psychologiczną, a nie ograniczać się wyłącznie do zaleceń dietetycznych.
Wsparcie rodziny	Wsparcie rodzinne okazało się kluczowym czynnikiem utrzymania motywacji i trwałości zmiany zachowań.	Programy terapeutyczne powinny obejmować rodziców jako aktywnych współuczestników procesu leczenia.
Trwałość motywacji	Dominowała motywacja zewnętrzna i krótkotrwałe próby ograniczania jedzenia.	W praktyce należy wzmacniać motywację wewnętrzną, poczucie sprawstwa i długofalowe strategie zmiany stylu życia.
ChEDE-Q	Polska wersja kwestionariusza charakteryzowała się wysoką rzetelnością globalną i dodatnim związkiem z BMI z-score.	Narzędzie może być wykorzystywane przesiewowo do wczesnej identyfikacji nieprawidłowych zachowań żywieniowych u młodzieży.

5. Wnioski oraz realizacja celów rozprawy doktorskiej

Analiza wyników uzyskanych w ramach niniejszej rozprawy doktorskiej, obejmującej cztery powiązane tematycznie publikacje naukowe, pozwoliła na kompleksową ocenę problemu nadwagi i otyłości w populacji dzieci i młodzieży. Uzyskane wyniki potwierdzają, że nadmierna masa ciała w tej grupie wiekowej ma charakter wieloczynnikowy i wymaga podejścia interdyscyplinarnego, obejmującego działania dietetyczne, psychologiczne oraz środowiskowe.

Efekty uzyskane w pierwszej publikacji pozwalają sformułować następujące wnioski:

- technologie cyfrowe, takie jak aplikacje mobilne, platformy eHealth oraz urządzenia monitorujące aktywność fizyczną, mogą stanowić skuteczne wsparcie w procesie redukcji masy ciała u dzieci i młodzieży;
- największą skuteczność wykazują interwencje spersonalizowane oraz te, które uwzględniają zaangażowanie rodziny;
- utrzymanie długoterminowego zaangażowania użytkowników stanowi istotny warunek skuteczności interwencji cyfrowych;
- integracja nowoczesnych technologii z klasycznymi formami wsparcia (edukacja zdrowotna, opieka specjalistyczna) zwiększa efektywność działań;
- technologie cyfrowe wpływają nie tylko na parametry antropometryczne, ale również na poziom motywacji oraz dobrostan psychiczny dzieci i młodzieży.

Efekty uzyskane w drugiej publikacji pozwalają sformułować następujące wnioski:

- nadwaga i otyłość u dzieci i młodzieży są istotnie związane z pogorszeniem funkcjonowania psychospołecznego oraz niskim poziomem aktywności fizycznej;
- obraz własnego ciała i samoocena pozostają ściśle powiązane z masą ciała, a większość badanych odczuwa niezadowolenie ze swojego wyglądu;
- wraz ze wzrostem BMI nasila się wpływ wyglądu na samoocenę oraz poziom niezadowolenia z własnej sylwetki;
- w badanej grupie obserwuje się nieprawidłowe zachowania żywieniowe, w tym spożywanie posiłków w ukryciu, co wskazuje na trudności emocjonalne;
- ponad połowa respondentów nie podejmuje intensywnej aktywności fizycznej. Dlatego można stwierdzić, że nie jest ona podstawowym elementem strategii redukcji masy ciała;
- skuteczna profilaktyka i terapia powinny obejmować nie tylko dietę i aktywność fizyczną, ale również wsparcie psychologiczne ukierunkowane na poprawę

samooceny i relacji z jedzeniem.

Efekty uzyskane w trzeciej publikacji pozwalają sformułować następujące wnioski:

- dzieci i młodzież podejmują próby zmiany nawyków żywieniowych, jednak mają one najczęściej charakter krótkotrwały;
- trudności w utrzymaniu diety wskazują na niski poziom trwałej motywacji oraz brak konsekwencji w działaniu;
- w procesie odchudzania istotną rolę odgrywają czynniki emocjonalne, takie jak lęk, wstyd czy poczucie winy;
- masa ciała ma ważny wpływ na samoocenę badanych, co potwierdza silny związek między obrazem ciała a funkcjonowaniem psychicznym;
- stwierdzono istotną statystycznie zależność pomiędzy BMI a poziomem niezadowolenia z własnej masy ciała;
- wsparcie rodzinne stanowi kluczowy czynnik sprzyjający utrzymaniu motywacji oraz trwałości zmian stylu życia;
- brak wsparcia ze strony rodziny wiąże się z większym nasileniem negatywnych emocji oraz trudnościami w utrzymaniu zdrowych nawyków.

Efekty uzyskane w czwartej publikacji pozwalają sformułować następujące wnioski:

- kwestionariusz ChEDE-Q charakteryzuje się wysoką rzetelnością i może być skutecznie wykorzystywany w ocenie zaburzeń odżywiania u dzieci i młodzieży;
- stwierdzono istotny związek pomiędzy BMI a nasileniem objawów zaburzeń odżywiania;
- konieczne są dalsze badania w celu rozszerzenia zastosowania narzędzia w praktyce klinicznej i badawczej.

Przebieg badań naukowych opisanych w niniejszej rozprawie doktorskiej obejmował kompleksową analizę mechanizmów motywacyjnych oraz uwarunkowań psychospołecznych, środowiskowych i behawioralnych związanych z nadwagą i otyłością wśród dzieci i młodzieży z populacji województwa podkarpackiego. Przeprowadzone badania wykazały, że pomimo podejmowania prób zmiany stylu życia przez badanych, działania te mają najczęściej charakter krótkotrwały, co wynika przede wszystkim z dominacji motywacji kontrolowanej, opartej na presji zewnętrznej i negatywnych emocjach.

W szczególności badania zwróciły uwagę na istotną rolę czynników psychospołecznych, takich jak samoocena, obraz własnego ciała oraz emocje towarzyszące zmianie zachowań zdrowotnych, które w znacznym stopniu determinują skuteczność

podejmowanych działań. Wykazano, że wraz ze wzrostem wartości wskaźnika BMI nasila się poziom niezadowolenia z własnego ciała oraz obniża się samoocena, co może utrudniać utrzymanie trwałych zmian stylu życia.

W ramach realizacji celów rozprawy dokonano również oceny zachowań zdrowotnych badanej populacji, wskazując na niski poziom aktywności fizycznej oraz obecność nieprawidłowych nawyków żywieniowych. Szczególną uwagę zwrócono na znaczenie środowiska rodzinnego. Środowisko to odgrywa kluczową rolę w procesie kształtowania i utrzymywania motywacji do zmiany zachowań zdrowotnych. Wsparcie emocjonalne i zaangażowanie rodziców sprzyja większej skuteczności podejmowanych działań. Analogicznie - jego brak wiąże się z trudnościami w utrzymaniu zdrowych nawyków. Zrealizowano także cel związany z oceną zależności pomiędzy zaburzeniami zachowań żywieniowych a masą ciała, wykazując istotny związek pomiędzy wynikami kwestionariusza ChEDE-Q a wskaźnikiem BMI.

Warto również podkreślić znaczenie nowoczesnych narzędzi cyfrowych jako elementu wspierającego proces zmiany zachowań zdrowotnych. Uzyskane wyniki wskazują, że ich skuteczność zależy od stopnia personalizacji oraz integracji z działaniami edukacyjnymi, psychologicznymi i środowiskowymi.

Przeprowadzone badania pozwoliły na wskazanie istotnych luk w dotychczasowych działaniach profilaktycznych i terapeutycznych, w szczególności w zakresie długoterminowego utrzymania motywacji oraz kompleksowego podejścia do problemu nadwagi i otyłości u dzieci i młodzieży. Uzyskane wyniki podkreślają konieczność opracowania spójnych, wielokierunkowych strategii interwencyjnych, uwzględniających zarówno czynniki indywidualne, jak i środowiskowe, co może przyczynić się do zwiększenia skuteczności działań profilaktycznych i poprawy stanu zdrowia tej populacji.

6. Treść publikacji wchodzących w skład rozprawy doktorskiej:



Systematic Review

The Impact of Digital Technologies in Shaping Weight Loss Motivation Among Children and Adolescents

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Abstract: Background/Aim: Child and adolescent obesity is currently one of the most pressing public health challenges. Digital technology-based interventions are becoming increasingly important in supporting weight loss motivation and promoting healthy lifestyles. This review aims to assess the effectiveness of technology tools on the BMI (body mass index) and their impact on health attitudes in children and adolescents. Materials and Methods: The study was conducted according to PRISMA guidelines, analysing studies published between 2011 and 2024 on PubMed, Scopus, Web of Science and Google Scholar databases. Of the 1475 articles identified and analysed, 59 met the inclusion criteria. Studies were assessed based on the type of technology used, the type of intervention, family involvement, the level of personalisation and their impact on BMI and motivation. Results: The systematic review showed that digital technologies—in particular mobile apps, wearables and m-health platforms—can effectively support weight reduction and improved eating habits in children and adolescents. The most beneficial results were observed in interventions that were personalised and included caregiver support. In addition, digital technology was shown to have a positive impact on participants' psychological well-being. Conclusions: Digital technology-based interventions can be an effective tool in the prevention and treatment of obesity in children and adolescents. However, their success depends on a comprehensive approach that includes psychological, social and cognitive developmental factors.

Keywords: childhood obesity; digital technologies; motivation; BMI reduction; mobile apps; health



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1. Introduction

Obesity and overweight in children and adolescents represent one of the most serious global health challenges. Epidemiological data indicate that the number of children with excess body weight is steadily increasing, posing a growing public health threat worldwide. Overweight and obesity are defined as abnormal or excessive fat accumulation that poses a health risk [1]. In 2019, the World Obesity Federation estimated that by 2025, 206 million children and adolescents aged 5 to 19 years will be living with obesity, and this number is expected to rise to 254 million by 2030 [2]. Being overweight in childhood and adolescence is a significant risk factor for obesity in adulthood [3]. Beyond traditional strategies such as promoting a healthy diet and physical activity, growing attention is being paid to how digital technologies can support behavioural change and health motivation in young

populations. These strategies should include a well-balanced diet, regular physical activity, adequate sleep hygiene and support from the proximal social environment. Such measures can contribute to long-term health improvement and the development of sustainable health-promoting habits [4].

Although this paper focuses on digital technologies that support weight loss motivation, it is important to note the growing role of Continuous Glucose Monitoring (CGM) systems in adolescents with type 2 diabetes. CGM allows for real-time glucose monitoring, which supports not only medical treatment but also enhances health awareness and behavioural self-regulation. CGM replaces blood glucose (BG) monitoring via traditional glucometers. The use of CGM—both in adults and children with type 2 diabetes—has been associated with achieving and maintaining target HbA1c levels, reducing severe hypoglycaemia, and increasing treatment satisfaction. Since obesity and type 2 diabetes often coexist in adolescents, CGM may serve as an additional motivational component in comprehensive health interventions [5].

One of the key tools used to assess the nutritional status of children and adolescents is the body mass index (BMI), calculated as the ratio of weight (kg) to the square of height (m^2). In the paediatric population, the BMI is interpreted using age- and gender-specific percentile charts. A value above the 85th percentile indicates overweight, while a value above the 95th percentile indicates obesity. Persistently elevated BMI values in childhood increase the risk of being overweight in adulthood and developing serious metabolic conditions such as type 2 diabetes, atherosclerosis, hypertension and lipid disorders [6].

While several systematic reviews have investigated the general effectiveness of digital technologies in addressing childhood obesity, few have specifically examined their influence on motivation. Motivation plays a central role in determining whether children and adolescents adhere to healthy behaviours such as physical activity, dietary changes, or reduced screen time. Understanding how digital technology interventions can foster and maintain motivation is essential for designing more effective, long-lasting strategies for weight management in youth. To assess the outcomes of such interventions, anthropometric measures are commonly used. Among these, the BMI remains the most widely applied metric in paediatric obesity research due to its simplicity and accessibility [7].

The prevalence of obesity continues to rise. The aetiology of obesity in children and adolescents is multifactorial and involves complex interactions between genetic, environmental, behavioural and psychosocial factors. Weight regulation shows considerable biological variability, with some individuals naturally maintaining healthy levels of body fat, while others strive to achieve energy balance throughout life. An important role in the development of obesity is played by the home environment, which shapes the occurrence of certain dietary patterns, such as a high-calorie diet, a lack of regular physical activity, disrupted sleep patterns, and excessive time spent in front of a screen [8]. Studies have shown that children from lower socio-economic backgrounds are significantly more likely to be overweight compared to peers from more affluent families [9]. Other important risk factors include maternal obesity before pregnancy, excessive weight gain during pregnancy and gestational diabetes [10]. Among the most common behaviours contributing to obesity is a high consumption of sugar-sweetened beverages and nutrient-poor foods high in saturated fat [11]. It is therefore important to implement modern digital technology solutions to minimise the risk of obesity by supporting healthy eating habits, promoting physical activity and raising health awareness among children and adolescents (Figure 1).

Childhood Obesity: Risk and Protective Factors

Modifying digital and lifestyle habits may prevent obesity in children

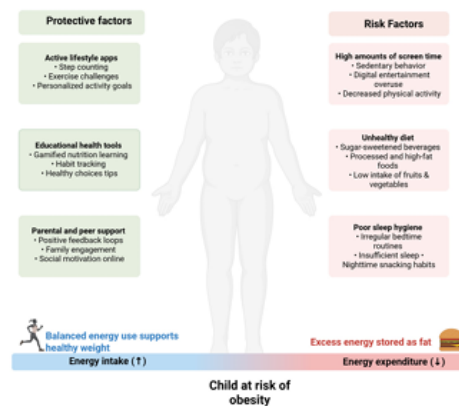


Figure 1. Obesity in children: risk and protective factors. Created with BioRender.com.

The rapid development of digital technologies has led to their increased use in preventive and therapeutic interventions targeting children and adolescents with excessive body weight. Digital tools—including mobile apps, eHealth platforms, educational games, Internet of Things (IoT) systems, wearable devices that monitor physical activity and artificial intelligence-based tools—offer new opportunities to support healthy lifestyles, weight management and improved eating habits [12]. These technologies allow for the personalisation of interventions, monitoring progress in real time, providing feedback and engaging users through gamification elements and social challenges. This significantly increases the motivation and engagement of children and young people in the weight loss process [13].

This review aims to fill the gap in the research by analysing how digital technologies influence weight loss motivation among children and adolescents. To our knowledge, this is the first systematic review that concentrates specifically on how digital technology interventions impact weight loss motivation—rather than general outcomes like the BMI or physical activity—among children and adolescents.

2. Materials and Methods

2.1. Search Strategy

The current review was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for systematic reviews and meta-analyses [14].

The review protocol was pre-registered on the Open Science Framework prior to publication.

This review aims to clarify the current state of knowledge on the impact of digital technologies on weight loss motivation and health-related behaviours among children and adolescents. A comprehensive search of the literature was conducted in four databases: PubMed, Scopus, Web of Science and Google Scholar. The search used a combination of the following keywords: childhood obesity, weight loss motivation, mobile health, BMI reduction, school-aged children, mHealth, mobile apps, wearable devices, serious games, self-monitoring, physical activity. Keywords were combined using AND/OR logical operators and tailored to the specific requirements of each search engine.

2.2. Inclusion and Exclusion Criteria

Publications were included if they met the following criteria:

- They were published between 2011 and 2024;
- They were available in full-text format;
- Their research focus was on the population of children and adolescents of school age (6–18 years);
- The research assessed impact of digital technology on motivation to lose weight and change BMI was investigated;
- They were published in English.

Publications were excluded if they met the following criteria:

- They focused exclusively on adult populations;
- They were editorial comments, letters to the editor or conference abstracts;
- Neither the topic of motivation nor the use of digital technology in weight loss among children and adolescents was directly addressed.

Publications focusing solely on dietary, psychotherapeutic or educational aspects without including a digital technology component (e.g., apps, mobile devices, online interfaces) were excluded. However, studies examining the impact of social media were included, provided that their potential impact on motivation, health behaviour, body image or psychological well-being—factors relevant to the prevention and treatment of obesity—was assessed.

The decision to include only studies focusing on digital technologies was aimed to obtain consistent and comparable results that reflect the potential of these modern tools to address the growing problem of obesity among young people.

2.3. Selection Process

In the first stage, two independent reviewers screened the titles and abstracts of all identified articles ($n = 3005$) for initial relevance, based on predefined inclusion and exclusion criteria. Discrepancies in decisions were resolved through discussion or consultation with a third reviewer.

In the second stage, full texts of the eligible studies ($n = 225$) were retrieved and assessed in detail for methodological quality and relevance. Studies were excluded if they lacked behavioural outcomes, did not involve digital technologies, or failed to target the population of children and adolescents. Full-text review resulted in the exclusion of 47 articles, with 59 meeting all criteria.

Reasons for exclusion at each stage of the process (e.g., lack of digital component, adult population, editorial format) are detailed in the PRISMA flow diagram (Figure 2). No automation tools were used in the screening process.

Four databases were searched: PubMed ($n = 989$), Google Scholar ($n = 1023$), Springer Link ($n = 225$) and Web of Science ($n = 768$). A total of 3005 publications were identified. Prior to the screening stage, 680 duplicates were removed, 150 publications were automatically rejected due to the lack of a full text, and 700 were excluded due to the inappropriateness of the study population (e.g., adult studies), or the lack of a digital component. A total of 1475 publications were shortlisted for the initial screening stage, of which 1020 were rejected after analysis of titles and abstracts. Subsequently, 225 publications were referred for full-text analysis, but 90 could not be retrieved due to limited access. The remaining 135 full-text articles were assessed for compliance with the inclusion criteria. After further analysis, 47 publications were excluded, mainly due to a lack of behavioural outcomes, a lack of digital technologies or poor methodological quality. Ultimately, 59 studies were included in the final review.

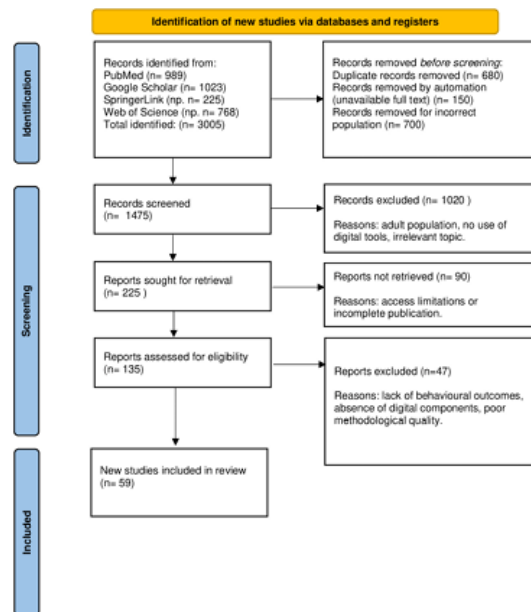


Figure 2. The PRISMA literature search and selection process.

3. Results

Following the literature review, a total of 59 scientific publications that met the predefined inclusion criteria were included in the analysis. These papers focused on cutting-edge technological interventions to support children and adolescents to reduce weight, improve lifestyle and increase motivation to engage in healthy behaviours. In order to organise the collected material, the results were grouped thematically according to the type of technological intervention and the main health effects reported in the studies.

3.1. Personalisation and the Role of the Family in Digital Technologies Interventions

Studies assessing the role of digital technologies in the context of personalising interventions and family involvement in the treatment of obesity in children and adolescents were reviewed. Many of the publications reviewed highlight that the personalisation of the message and caregiver participation significantly increase the effectiveness of health interventions [12,13]. Interventions based on mobile apps, online platforms and smart devices show positive effects on weight management, especially when they combine education, behavioural monitoring and contact with caregivers [15,16]. It has also been pointed out that, while technology alone can facilitate the implementation of health changes, it does not achieve the intended results without adequate support from the family and an educational environment. Importantly, the long-term engagement of users, including adolescents, is enhanced through the personalisation of the message, motivational features and feedback [17]. Although not all studies have shown a statistically significant reduction in BMI, many note positive behavioural changes, such as improved eating habits and increased physical activity [18–21] (Table 1).

Table 1. Personalisation and the role of the family in DT interventions.

Researchers	Aim	Materials and Methods	Results
Altıntaş Başar & Bilici (2023) [12]	To evaluate the impact of digital technologies (DTs) on nutrition education in prevention, with focus on children and adolescents.	Narrative review: Application of mobile apps, web-based interventions, personal digital assistive technologies, interactive computer-based technologies, photo- and video- based tools, wearables, distance education technology and (AI), in nutrition education.	DTs enhance engagement, support nutrition education through easy monitoring, data recording and personalisation.
Kouvari et al. (2022) [13]	To evaluate the effectiveness of technology-based interventions for the treatment of obesity in children and adolescents.	Systematic review and meta-analysis (2000–2021): Application of mobile apps, web platforms and SMS. Included 9 articles (8 studies).	Significant ¹ BMI reduction (SMD = −0.61, $p = 0.01$); effect lost without parental involvement (SMD = −0.36, $p = 0.14$).
Lazorick et al., 2014 [15]	To evaluate the impact of an educational and technological programme on the prevention of obesity in young people.	Longitudinal study: (N = 106). Application of the ² MATCH programme (health-themed lessons, behavioural strategies, web-based resources). Intervention group.	Significant decreases in ¹ BMI z-scores in the intervention group ($p = 0.002$; reduction of 20–12% in weight). At 5-year follow-up, 2% of intervention group and 13% of comparison group had become overweight ($p = 0.02$).
Schoeppe et al. (2016) [16]	To assess the efficacy of app-based interventions for improving diet, physical activity and sedentary behaviour.	Systematic review (2006–2016); 27 studies (70% ³ RCTs); apps used alone or in multi-component programmes.	Apps showed modest effectiveness, especially in multi-component interventions. Higher app usage correlated with better outcomes.
Kaakinen et al., 2018 [17]	To evaluate technology-based counselling to support children and adolescents who are overweight or obese.	Descriptive systematic review (until 2015). Application of e-counselling, interactive multimedia games, CD ROMs, SMS, TV and emails. Included 28 articles (14 ³ RCTs).	No statistically significant changes in ¹ BMI; some studies noted improvements in fruit and vegetable intake and activity.
Quelly et al. (2016) [18]	To evaluate the impact of mobile apps on anthropometric, psychosocial and behavioural indicators associated with obesity in children and adolescents.	Qualitative and quantitative systematic review: Application of mobile apps included 9 articles.	Mixed results: positive effects on motivation and goal-setting behaviours, inconclusive impact on physical activity, dietary habits, and anthropometric measures.
Fowler et al. (2021) [19]	To evaluate of the effectiveness of DT interventions in the treatment and prevention of obesity in children and adolescents.	Systematic review and meta-analysis: Application of mobile apps, web-based programmes, SMS, telemedicine, exergaming, wearables. Included 55 ³ RCTs.	Small but significant effect on weight loss ($d = -0.13$, $p = 0.001$); no effect of prevention interventions ($d = 0.05$, $p = 0.52$).
Bardus et al., 2015 [20]	To evaluate current evidence on the use of mobile and Web 2.0 technologies in prevention.	Systematic scoping review (2004–2014). Use of DTs for promoting behavioural change or measuring behaviour. Included 457 articles.	Mobile technology and Web 2.0 solutions have increasing potential as tools to support change.

Table 1. *Cont.*

Researchers	Aim	Materials and Methods	Results
Holmes et al., 2018 [21]	To evaluate of the effectiveness of digital communication technologies on weight loss maintenance.	Systematic review (2006–February 2018). Application of SMS, email and web-based system. Included 7 ³ RCTs.	Four ³ RCTs reported significant effect on weight loss maintenance in the short term of 3–24 months. One study (in children) found no significant difference in ¹ BMI.
Dobbie et al., 2021 [22]	To evaluate the impact of eHealth interventions on physical activity (PA) and weight reduction.	Narrative review. Application of wearables, phone apps, SMS, and exergaming.	Wearable devices can increase PA and lead to moderate weight loss in middle/older children in the short term (<1). Data for mobile phone, ⁴ SMS, and exergaming interventions are less robust.

Abbreviations: ¹ BMI—body mass index; ² MATCH—Motivating Adolescents with Technology to CHOOSE Health; ³ RCT—randomised clinical trial; ⁴ SMS—short message service.

3.2. Mobile Apps and DTs in the Treatment of Obesity

The results of studies evaluating the effectiveness of mobile apps, interactive features and digital technologies to support obesity prevention and treatment in children and adolescents were analysed. The analysed publications indicate that these technologies can effectively support health behaviour change, especially when they are personalised, provide ongoing feedback and engage the user through gamification, progress monitoring or educational elements [23–32]. Similar conclusions were drawn in the meta-analysis by Kouvari et al., where digital interventions produced significant BMI reduction effects primarily in children with a markedly elevated BMI, suggesting the potentially greater effectiveness of such measures in participants with obesity [13]. Other studies have shown that adolescents with obesity (BMI $\geq$ 97th percentile) achieved greater weight loss than those who were overweight, indicating a higher effectiveness of digital interventions in groups with higher baseline BMI values [31]. Interventions combining applications with specialist counselling and family support proved to be particularly relevant, confirming the high effectiveness of comprehensive approaches. Despite the generally positive results, individual studies highlight the need to further adaptation of the tools to meet the specific needs of the target audience (Table 2).

Table 2. Mobile apps and DTs in the treatment of obesity.

Researchers	Aim	Materials and Methods	Results
Kouvari et al., 2022 [13]	To assess the effectiveness of technology-based interventions for obesity treatment in children and adolescents.	Systematic review and meta-analysis (2000–2021); 8 ⁷ RCTs, 582 participants; most combined tech tools with standard care.	Significant ³ BMI reduction (⁹ SMD = -0.61 , $p = 0.01$); effect not significant without parental involvement (⁹ SMD = -0.36 , $p = 0.01$).
Edwards et al., 2011 [23]	To evaluate teenagers' motivation for physical activity (PA) and their expectations of probe-type technology.	Qualitative study: (¹ N = 12; 6-week); Application of use of two different pedometers, shared online platform for data recording and interaction.	Technology acted as a motivator and helped to achieve the goals set during the down process.

Table 2. Cont.

Researchers	Aim	Materials and Methods	Results
Kim et al., 2022 [24]	To evaluate the effectiveness of information and communication technology (ICT) in the management of obesity and metabolic syndrome.	Application of mobile apps, telemedicine, wearables, web-based platforms, ¹⁰ SMS and AI.	ICT-based interventions are accessible, flexible and efficient.
Chen et al., 2020 [25]	To evaluate the effectiveness of DTs in modifying eating behaviour as a form of obesity prevention.	Systematic review: Application of personal digital assistants, web-based educational tools, video games and mobile apps. Included 15 articles meeting the ⁶ PRISMA guidelines.	Efficacy of DTs increased when combined with counselling and personalised feedback.
Sandri et al., 2019 [26]	An analysis of DTs supporting obesity prevention. Introduction to the ¹¹ STOP project.	Application of wearable devices, chatbots, gamification, data fusion and machine learning.	Highlights the importance of these DTs in delivering personalised, supportive feedback to enhance the effectiveness of health messages and supporting healthy weight.
Gilmore et al., 2014 [27]	Discuss the role of digital technology in successful management programmes.	Narrative review: Application of mobile apps, web-based interventions and ¹⁰ SMS.	Digital technologies enable improved long-term weight management and are cost-effective.
Yien et al., 2021 [28]	To evaluate the effectiveness of mobile health technologies in weight management in obese children.	Systematic review and meta-analysis: Application of mobile apps, telehealth counselling, web-linked activity trackers and gamification elements. Included 9 ⁷ RCT.	The intervention showed no significant effect in reducing ³ BMI (-0.773 ; 95% CI: -1.069 to -0.476).
Martin et al., 2020 [29]	To develop components of an mHealth system to promote healthy lifestyles in adolescents through co-design with users from three countries.	Iterative Co-Design and Feasibility Study: (¹ N = 74; 13–16 years old in Spain, Italy and UK) Application of ⁴ PEGASO F4F mobile apps prototypes.	⁴ PEGASO F4F app should be personalised, age-appropriate, easy to use, goal-oriented, include rewards, and support peer connection.
Hagman et al., 2022 [30]	To evaluate the effectiveness of mHealth digital support system as adjunct to standard care in the treatment of obesity.	Interactive digital: (² AG = 107; ⁸ SG = 321; 4.0–17.9 years old in Sweden). Application of Evira AB app.	At year one, the ² AG showed a greater reduction in ³ BMI than the ⁸ SG (Z-score = -0.15 , $p = 0.012$).
Lei et al., 2021 [31]	To evaluate the effectiveness of a mobile app weight loss programme in overweight children and adolescents.	Observational study: (¹ N = 2825, 10–17 years old in China). Application of MetaWell mobile app.	After 120 days, a reduction in weight (⁵ M = -8.6 kg, $p < 0.001$) and ³ BMI (⁵ M = -8.6 kg, $p < 0.001$; Z-score = -0.42 , $p < 0.001$) was observed.

Table 2. Cont.

Researchers	Aim	Materials and Methods	Results
Likhitweerawong et al., 2021 [32]	To evaluate the effectiveness of a mobile app as a tool to support weight reduction and to promote healthy eating habits in children.	Randomised controlled trial: (AC = 35, ⁸ SG = 35 in Thailand). Application of OBEST mobile app.	No significant between group differences in weight, ³ BMI change or Z-score and waist circumference.
Lei et al., 2021 [31]	To assess the effectiveness of a fully remote digital weight loss programme in adolescents with overweight/obesity.	Observational study; 2825 adolescents (10–17 yrs) in China used a programme combining mobile apps, self-weighing, calorie restriction, and meal replacement.	Significant reductions in weight, ³ BMI, and ³ BMI z-score by day 120. Higher app use and ³ BMI at baseline were linked to greater weight loss. Girls showed better ³ BMI z-score reductions than boys.

Abbreviations: ¹ N = number; ² AG—active-care group; ³ BMI—body mass index; ⁴ PEGASO F4F—Personalised Guidance Services for Optimising lifestyle management in teenagers through awareness, motivation, and engagement in Fit for Future; ⁵ M = mean; ⁶ PRISMA—Preferred Reporting Items for Systematic Reviews and Meta-Analyses; ⁷ RCT—randomised clinical trial; ⁸ SG—standard-care group; ⁹ SMD—standardised mean difference; ¹⁰ SMS—short message service; ¹¹ STOP—Science and Technology in childhood Obesity Policy.

3.3. SMS and Mobile App Limitations

Studies evaluating the effectiveness of short text message (SMS)-based technological interventions and the limitations of mobile apps in the prevention and treatment of obesity among children and adolescents were also included in the analysis. Short text messages, according to parents, are easy to learn and can effectively support children's daily health decisions [33]. However, the results of intervention studies are mixed, with one showing no significant changes in BMI and psychological well-being after SMS Maintenance Treatment (SMSMT). In contrast, other reviews show a moderate effectiveness of mobile apps and e-learning platforms in improving health and psychosocial behaviours in adolescents. Despite an initial increase in motivation associated with wearable technologies (e.g., Fitbit), the effect was short-lived mainly due to social pressure and competition [34]. Importantly, interventions in culturally specific groups—such as among adolescents of Hispanic origin—still need better evaluation of feasibility and long-term effectiveness [35] (Table 3).

Table 3. SMS and mobile app limitations.

Researchers	Aim	Materials and Methods	Results
Sharif et al., 2013 [33]	To evaluate parental acceptability and preferences for using SMS and mobile technologies to support obesity-related behaviour change.	Qualitative study: Application of SMS. Five focus groups (parents ¹ N = 31 of overweight or obese children 6–12 years old).	Parents viewed SMSs as convenient; preferred their child's doctor-endorsed, actionable strategies sent two to three times weekly.
Kerner & Goodyear, 2017 [34]	To evaluate if healthy lifestyle wearable technologies (e.g., Fitbit) impact teenagers' motivation to be active.	Mix methods study: (¹ N = 84, 13–14 years old). Application of Fitbit. Eight-week intervention.	Significant impact on motivational outcome post-treatment across time ($F_{(6, 77)} = 8.72$, $p = 0.00$, $\eta^2 = 0.41$). Declines in competence ($F = 8.5$, $p = 0.005$, $\eta^2 = 0.91$), autonomy ($F = 13.49$, $p = 0.00$, $\eta^2 = 0.14$), relatedness ($F = 5.81$, $p = 0.02$, $\eta^2 = 0.07$), autonomous motivation ($F = 17.00$, $p = 0.00$, $\eta^2 = 0.17$). Increase in amotivation ($F = 38.00$, $p = 0.00$, $\eta^2 = 0.32$). Short-term motivation observed due to novelty, with engagement dropping after 4 weeks.

Table 3. Cont.

Researchers	Aim	Materials and Methods	Results
Soletro et al., 2022 [35]	To evaluate sample and intervention of DT-based interventions to prevent obesity among Hispanic adolescents in the USA.	Scoping review. Application: web-based session, wearable devices (e.g., pedometer), ³ SMS, video gaming. Included 7 ² RCTs.	The review showed that although there are promising technological interventions among Hispanic adolescents, there is still a lack of robust research on their feasibility and effectiveness.

Abbreviations: ¹ N = number; ² RCT—randomised clinical trial; ³ SMS—short message service.

3.4. Socioeconomic Factors Affecting Access to Digital Intervention

Studies on the effectiveness of digital health interventions have shown that individuals with a lower socio-economic status (SES) have limited access to eHealth and lower digital literacy, which negatively impacts the effectiveness of such programmes. Income remains significantly associated with the ability to use digital tools, and universal interventions often fail to meet the needs of this group. Therefore, when developing digital health strategies, it is essential to consider technological, financial, and social barriers to avoid exacerbating existing inequalities. Moreover, research has shown that only a small proportion of participants with a low SES achieved clinically significant weight loss ($\geq 5\%$), and one study did not meet national guidelines for intervention effectiveness. These findings highlight the need for more tailored and effective solutions for this population [36–39] (Table 4).

Table 4. Studies addressing the influence of socioeconomic factors on the effectiveness and accessibility of digital health interventions.

Researchers	Aim	Materials and Methods	Results
Griffin et al., 2018 [36]	To assess the effect of a 12-week text messaging programme (My Quest) on dietary habits, physical activity, and weight in low-income women.	One-group pre-post design; 104 women from 55 Alabama counties (84% rural), mostly overweight/obese. Intervention included 2–3 daily texts with health tips and goal-setting prompts, weekly e-newsletters, and weekly self-weighing.	Statistically significant improvements ($p < 0.05$) in dietary and physical activity behaviours, goal setting, and food environment. Body weight was significantly reduced (no exact kg reported). Intervention was low-cost and feasible for rural, low-income settings.
Kristjánsdóttir et al., 2023 [37]	To assess eHealth literacy domains in parents of children needing paediatric surgery and their correlation with socioeconomic and demographic factors.	Descriptive correlational study; 35 parents in Sweden (30 completed full questionnaires); part of a larger clinical trial. Assessed 7 eHealth literacy domains and 5 socioeconomic/demographic variables.	Parents showed strengths in digital skills, control, and safety; weaknesses in motivation and platform accessibility. Overall literacy was adequate. Monthly income had the strongest positive correlation with eHealth literacy domains.
El Benny et al., 2021 [38]	To examine how digital health interventions (DHIs) assess domains of the eHealth literacy model, and which technologies and health issues they address.	Scoping review of 131 ¹ RCT-based DHIs (2001–2020) from 26 countries. Sources: MEDLINE, CINAHL, Embase, Cochrane. Data charted by country, health condition, technology used, and literacy domains.	61.8% of DHIs were from English-speaking countries; 51.9% were web-based; 43.5% targeted NCDs, 19.8% mental health. 73.2% assessed health literacy, 14.5% digital literacy, 3% basic/media literacy, 0.7% scientific/information literacy. None covered all six domains. Only 5.3% assessed both health and digital literacy.

Table 4. Cont.

Researchers	Aim	Materials and Methods	Results
Cavallo et al., 2021 [39]	To evaluate the feasibility of a 12-week social media-based weight loss intervention for low socio-economic status (SES) overweight/obese adults.	One-group pre-test-post-test pilot; 2 cohorts ($n = 39$, $n = 16$; total $n = 55$); participants used Fitbits and engaged in a private Facebook group moderated with educational content and support.	High retention (86%); 9175 interactions recorded. 96% of completers ($n = 47$) would recommend the programme. Mean weight loss: 1.07 kg (2 SD = 3.96, $p = 0.0498$); increase in dietary social support (mean = 2.47, 2 SD = 5.09, $p = 0.0007$). High engagement suggests feasibility for low SES populations.

Abbreviations: ¹ RCT—randomised clinical trial; ² SD—standard deviation.

3.5. Machine Learning, Educational Games and Robotics in the Treatment of Obesity

A number of studies are devoted to the use of digital technologies—including the Internet of Things (IoT), mHealth applications, machine learning and interactive digital tools—in the prevention and treatment of obesity among children and adolescents. Two studies have shown a positive impact of technology on lifestyle change, including improved physical activity, healthy eating and motivation to maintain a healthy body weight [40,41]. Interventions engaging users through gamification, the personalisation of the message and the co-creation of tools with children and their carers have proven particularly effective. One study highlights the effectiveness of mobile applications based on psychological behaviour models such as the Technology Acceptance Model (TAM), the Theory of Planned Behaviour (TPB), the Theory of Meaningful Behaviour (TMB) and the Big Five personality trait concept. These applications, as demonstrated in the study, can effectively motivate teenagers to engage in physical activity and support the formation of lasting pro-health habits. However, it is worth noting that not all forms of digital technologies bring unequivocal benefits—if used inappropriately, they can encourage a sedentary lifestyle and further exacerbate the problem [42] (Table 5).

Table 5. Machine learning, educational games and robotics in the treatment of obesity.

Researchers	Aim	Materials and Methods	Results
Lam et al., 2022 [40]	To evaluate the use of Internet of Things (IoT) enabled technologies in interventions to reduce childhood obesity.	Systematic review (2010–2019): Application of IoT architecture (sensory, network, service, application layers). Included 23 articles meeting the ⁶ PRISMA guidelines.	Devices: smartphones/apps (78.3%), accelerometers (56.5%), smartwatches (Fitbit in 4 studies). Data types: physical activity (IPA) 65.2%, diet, sleep. Techniques: monitoring (91%), feedback (45%), goal setting (31.8%), gamification (31.8%). Game-based interventions showed better engagement.
Vlachopapadopoulou et al., 2019 [41]	Overview of mHealth solutions for the treatment and monitoring of childhood obesity.	Discussion of the latest mHealth technologies used for self-treatment and health support for children with obesity.	mHealth technologies can support behavioural change and play an important role in weight management for children and adolescents.

Table 5. Cont.

Researchers	Aim	Materials and Methods	Results
Bastida et al., 2023 [42]	Development of the ⁵ OCARIoT platform promoting obesity prevention to support healthy habits in children.	Mixed methods pilot study (Phase 1 prototyping N = 334, Phase 2 intervention N = 127 in 4 schools in Spain, Greece and Brazil). Application of wearables (Fitbit), smart weight scale, ⁴ NFC, IoT air/environmental sensors, ³ DAP, ² API Gateway, DSS, dashboard, gamified app.	Decrease in the prevalence of obesity by 75.5% in the intervention group compared to the baseline and decrease in the percentage of children with thinness to 1.33%.
Zarkogianni et al., 2023 [43]	To evaluate the impact of parenting styles and psychosocial factors on the effectiveness of the ENDORSE programme in reducing BMI in children.	Pilot study: (50 mothers and their children, 6–14 years old) Application of app, wearables (Fitbit), serious games and ¹ AI. 3-month interventions.	Decreased ⁷ BMI (z-score −0.21, $p < 0.001$), fast food intake (−0.22 servings/week, $p = 0.042$), and screen time (−0.47 h/day, $p = 0.005$). Increased fruit (+0.62 servings/day, $p < 0.001$) and vegetables intake (+0.80 servings/day, $p < 0.001$), PA (+24.33 min/day, $p < 0.001$) and sleep (+0.54 h/day, $p = 0.005$).

Abbreviations: ¹ AI—artificial intelligence; ² API—application programming interface; ³ DAP—data acquisition app; ⁴ NFC—near field communication; ⁵ OCARIoT—Smart Childhood Obesity Caring Solution using IoT Potential; ⁶ PRISMA—Preferred Reporting Items for Systemic Reviews and Meta-Analyses; ⁷ BMI—body mass index.

3.6. Technology's Affects on Body Image and Mental Health

The influence of digital technologies on the body image and the mental health of children and adolescents is a topic that is increasingly being addressed in the scientific literature. Systematic reviews and empirical studies show that social media and other forms of digital presence significantly influence the way teenagers perceive their own bodies. The work of Aubrey et al. indicates the significant impact of phenomena such as selfies, photo retouching and fitspiration on increasing appearance pressure. Similar conclusions result from the review by Holland and Tiggemann, where as many as 20 analysed studies indicate the negative impact of using social networking sites (SNSs) on body image and the risk of developing eating disorders [44]. On the other hand, the qualitative study by Papageorgiou et al. shows that girls aged 14–17 experience increased social comparisons, leading to low body satisfaction and increased pressure to modify their appearance [45]. Narrative and theoretical reviews, on the other hand, suggest the need to design digital solutions that not only minimise the risk of worsening mental health, but can also support positive body image [46] (Table 6).

Table 6. Technology’s affects on body image and mental health.

Researchers	Aim	Materials and Methods	Results
Papageorgiou et al. [45]	Exploring the impact of sexualised images on social media on mental health and body perceptions in adolescent girls.	Qualitative study (N = 24, girls 14–17 years old in Australia).	Participants pointed out frequent appearance comparisons, deepening body dissatisfaction; social media increased the pressure to modify appearance.
Pedrouzo & Krynski, 2023 [46]	To evaluate the impact of TikTok use on young people’s physical, mental and behavioural health.	Narrative review (past five years).	TikTok influences behaviour patterns in young people and stimulates the dopaminergic reward system. Excessive use is linked to behavioural addictions, sleep disorders, obesity, decreased cognitive function and academic underperformance.
Demaria et al., 2024 [47]	To evaluate the impact of digital technologies (DTs) on adolescents’ body image perception and psychosocial development in the context of social media and culture.	Narrative review (June 2017–July 2024). Included 14 articles according to ¹ PRISMA guidelines.	The expansion of DTs and social media reinforces a culture of appearance and the thin ideal, contributing to body dissatisfaction and a higher risk of developing eating disorders.
Holland & Tiggemann [48]	To evaluate the effect of social networking sites (SNSs) on the body and disordered eating.	Systematic review (until May 2015). Included 20 articles.	Using social networking sites is linked to negative body image and eating disorders. No effect of gender.

Abbreviations: ¹ PRISMA—Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

4. Discussion

Currently, obesity is a growing public health problem faced by specialists across a variety of fields, including doctors, nutritionists, psychologists, as well as educational and family environments. Due to the rapidly growing number of cases of obesity among children and young people, educational institutions and the media should promptly implement prevention programmes and information campaigns to curb the ever-increasing incidence rate of obesity. The World Health Organisation has indicated that the global scale of obesity has almost tripled since 1975 [1].

This trend is driven by an ongoing advancement of modern technologies, which profoundly shape our daily life—now increasingly characterised by mechanisation, computerisation and automation. As a result, everyday activities that used to require physical activity are now being replaced by intelligent systems that reduce the daily dose of exercise to a minimum [49]. In addition, children and young people increasingly spend their free time on the internet, social media, playing computer games and watching television, which further reduces their level of physical activity. Numerous studies confirm the link between the intensive use of digital media and the risk of obesity [50]. In addition, a lack of control over the time spent in front of a screen can lead to delays in physical development and a reduction in children’s social and cognitive abilities. Nonetheless, digital technologies can effectively support the promotion of a healthy lifestyle and healthy eating habits [51].

Excessive body weight in young people is associated with reduced quality of life, low self-esteem, difficulties in peer relationships and an increased risk of depressive symptoms. The use of health apps can also positively influence the mental well-being of children and

adolescents. One of the primary goals of digital technology is to encourage regular physical activity among young people. Numerous studies confirm that physical exercise has a significant impact on reducing major depressive disorder symptoms. The most substantial benefits are seen in aerobic training sessions lasting 40 to 50 min, carried out three times a week for at least 12 weeks [52–54].

Therefore, the aim of this study is to analyse publications on the impact of digital technologies on shaping the motivational attitude toward weight loss among children and school-age youth. Additionally, in our study, we focused on assessing the utility of these solutions in the context of reducing the BMI and their role in the prevention of obesity in the young population.

4.1. Key Factors Influencing the Effectiveness of Digital Interventions

Currently, a wide range of applications is available, aiming to motivate users to improve their lifestyle. As the results of research by Altıntaş Başar et al. indicates, digital technologies enable not only access to expert knowledge, but also the monitoring and analysis of food consumed, which facilitates the observation of changes taking place in the body [12]. Digital technologies can serve as an effective adjunct to traditional approaches in the treatment of obesity among children and adolescents. It is noteworthy that mobile applications and fitness bands yield particularly positive effects when supported by the active and conscious involvement of parents [13,17–19].

An important factor in shaping healthy eating habits is the provision of adequate health education and early awareness-raising among young people about the principles of healthy lifestyle. In their study, Lazorick et al. implemented the MATCH programme in primary schools, which consisted of an integrated educational approach combining traditional learning with elements of technology to support lifestyle change. The long-term results are promising: the programme participants gained significantly less weight than their peers who did not participate in the programme. This study shows that early health education supported by technology can shape long-lasting healthy habits [15]. Moreover, it is essential that digital technologies used in obesity prevention are tailored to the cognitive development level of young users [17]. Unfortunately, many applications focus mainly on functionality and aesthetics, which can limit their long-term effectiveness [20]. Despite the growing popularity of digital applications, research demonstrates that they cannot replace direct contact with another person. The best results are observed when technologies are used in parallel with the care of a specialist or trainer [21,22].

The effectiveness of digital interventions may depend on participants' baseline body weight status, as confirmed by data from a study involving 2825 Chinese adolescents with overweight or obesity (BMI $\geq$ 85th percentile). After 120 days of a fully remote intervention combining a mobile app, self-weighing, and calorie control, the average weight loss was 8.6 ± 0.63 kg, and the BMI reduction was 3.13 ± 0.21 kg/m². As many as 71.4% of participants achieved a $\geq 5\%$ reduction in body weight, with greater effectiveness observed among those with a BMI ≥ 97 th percentile and among girls, who showed a significantly greater decrease in BMI z-score compared to boys ($p < 0.004$). These results indicate that individuals with a higher baseline BMI benefit more from participating in digital health programmes [33]. Meanwhile, a meta-analysis of eight randomised clinical trials involving 582 children and adolescents demonstrated that technology-based interventions can effectively support weight reduction, especially when used as an adjunct to standard care. Significant BMI-related changes were reported in five of the eight studies, particularly among children with obesity [13].

In a six-week study by Edwards et al., 18 teenagers used two types of pedometers and a shared online platform for data recording and social interaction. The researchers noted

that the ability to share their results with their peers can motivate children and young people, thus encouraging them to be more physically active [23].

The main purpose of digital technology tools is to support, monitor progress and increase the effectiveness of pre-planned weight loss programmes [24]. Internal motivation can be strengthened by using features such as real-time feedback, reward systems or the ability to track progress. For this reason, so-called ‘just-in-time’ interfaces are increasingly used, which enable the dynamic adaptation of health messages to the current behaviour of the user [26]. The most effective applications are those that integrate personalisation, real-time feedback and professional advice, allowing for a more personalised intervention [25]. Gilmore et al. considered a wide range of mobile applications such as MyFitnessPal, Nike Training Club and FitBit, which differ in their range of functions—from monitoring physical activity and nutrition to motivational elements, gamification and the personalisation of goals. Apps such as Couch to 5K and Map My Run enable users to gradually increase their physical activity, while Fooducate and My Meal Mate support better food choices. Thanks to progress tracking, data reporting and phone integration, app users can monitor their progress and specialists can monitor the patient’s health on an ongoing basis [27].

Some studies point to the significant impact of cultural and ethnic factors on the effectiveness of mobile health technologies in reducing BMI in children and adolescents with obesity [28]. An example is the PEGASO Fit for Future (F4F) project—a mobile health application co-created by 74 teenagers from Spain, Italy and the UK. The system, which combines self-monitoring, counselling, entertainment and social support functions, has been adapted to the preferences of young people from different cultural backgrounds. This was the first study to show that a complex mHealth system can be designed in collaboration with young people from different countries [29]. In their study, Hagman et al., used a digital support system with wireless scales connected to an application, along with continued communication with medical staff. In the intervention group (107 children and their families), individually tailored feedback was used, and produced better results than standard care in the control group (321 children) [30]. An interesting platform supporting the treatment of childhood obesity is ETIOBE—an eHealth system comprising three integrated components: the Clinician Support System (CSS) which assists doctors, the Home Support System (HSS) which engages the family, and the Mobile Support System (MSS), a mobile application that facilitates children’s daily self-monitoring and habit formation. An interesting result was obtained in a study by Lei et al. in which 2825 children aged 10–17 used a mobile application connected to a wireless scale. The nutritional programme was tailored to the individual metabolic needs of the participants (BMR according to the Schofield equation). After 120 days, as many as 70% of the children had achieved a weight reduction of $\geq 5\%$ [31]. Although not all studies show a significant reduction in BMI, as in the case of the OBEST app, positive changes in eating behaviour, such as a reduction in the consumption of fast food, have been observed [32].

Another important factor influencing the effectiveness of digital technology interventions is the SES of the target population. Studies have emphasised that individuals with a lower SES often have significantly reduced access to eHealth tools and lower levels of digital literacy, which negatively impacts their engagement and outcomes [55]. Despite the growing popularity of eHealth interventions for promoting healthy lifestyles, their effectiveness among low SES individuals faces major barriers related to technology, finances, and limited user engagement. Research shows that universal digital programmes may be insufficiently tailored to the needs of this group, highlighting the need to design more flexible and customised solutions that include, for example, social support, offline access, and simplified user interfaces [36,56]. Kristjánssdóttir et al. conducted a study in Sweden to determine how socio-demographic factors affect eHealth literacy among parents

of children requiring paediatric surgery. In this study, 30 parents completed the eHealth Literacy Questionnaire along with a survey on education, income, age, gender, and place of residence. Among the variables analysed, monthly income showed the strongest and most positive correlation with eHealth literacy levels across all seven domains assessed. These findings suggest that economic status—more than other demographic factors—plays a pivotal role in shaping individual's ability to use eHealth tools, which is essential for ensuring equitable access to technology-supported healthcare [37,38]. Other authors also note that eHealth literacy is closely linked to SES—those in less-privileged socio-economic positions typically demonstrate lower skills in this area [57]. This was demonstrated in a pilot study involving 55 low SES adults with overweight or obesity, who participated in a 12-week weight loss intervention based on social media (Facebook group + Fitbit). Participants who completed the programme ($n = 47$) lost an average of 1.07 kg ($p = 0.0498$), and 96% said they would recommend the programme to others. These results indicate that such an intervention format is feasible and well-received in low SES groups [39]. Another study involving 104 low-income women (84% from rural areas) found that a text message-based programme effectively increased physical activity, step count, and supported weight loss. The results confirm that such interventions can be effective in resource-limited populations [36]. Similarly, Griffin's 12-week study among 104 low-income, rural women reported significant improvements in dietary behaviour, physical activity, and weight reduction after receiving daily health-related text messages. Participants were more likely to set health goals and monitor their own progress [58].

One of the simpler but equally effective forms of technological support in health interventions is SMS messaging. Regular reminders, motivational messages and short tips sent directly to the user's phone can strengthen engagement and help maintaining healthy habits. The results of the Sharifi study conducted on a group of 31 parents of overweight and obese children show that even simple technology such as SMS messaging can be an effective tool supporting health behaviour change [33].

Furthermore, studies on the use of devices such as Fitbits or other trackers have shown that the technology can sometimes reduce motivation, causing pressure and frustration, especially in children aged 13–14 [34]. Therefore, to maintain the long-term effects of the therapy, it is necessary to combine technology with traditional forms of support—including health education, contact with a guardian and community activities.

A growing body of research indicates that game-based activities are an effective form of support in reducing obesity, especially among children and young people. Research has shown that these types of digital solutions can be more engaging and effective than traditional health apps [40]. An example of this approach is the pilot study by Zarkogianni et al., who presented the ENDORSE platform—an application integrating mHealth technologies, artificial intelligence (AI) and serious games to support the management of childhood obesity. In a three-month intervention involving 50 children, a clinically significant decrease in BMI was achieved [43]. The combination of gamification, motivational approaches and health education can influence changes in health behaviour at an early stage of life [41].

The younger generation is characterised by a high level of digital competence, making it an ideal target group for mobile app-based interventions. Research shows that digital solutions combining physical activity, technology and elements of gamification effectively support the development of positive health attitudes and promote weight loss. This is confirmed by the results of a study by Bastida et al., who implemented an intervention among children aged 9–12 using the OCARIoT application. Thanks to personalised educational missions, support from mentors and the use of a reward system, the application significantly increased the participants' engagement, leading to a reduction in the obesity rate by as much as 75.5% in the intervention group [42].

Digital technologies, particularly social media, play a significant role in shaping body image and self-esteem among children and adolescents. A growing body of research indicates that intensive use of these platforms can negatively impact the perception of one's own appearance and contribute to lower self-esteem [47]. In their literature review Aubrey et al. emphasise the importance of sociocultural theories of social comparison in the context of adolescents' use of digital technologies. The authors analyse factors such as selfies, photo retouching, fitspiration, online forums and general presence in social media as potential contributors to distorted body image among young people [44]. According to the study findings, platforms such as TikTok can significantly impact the behaviour and mental health of young people. Their mechanisms—driven by a system of rewards, likes and social interactions—stimulate the dopaminergic system. Their use has also been associated with a sedentary lifestyle, reduced sleep quality, cognitive and emotional disorders, and lower academic performance [46]. In a systematic review of 20 studies, Holland and Tiggemann demonstrated a clear association between the use of SNSs and body dissatisfaction, as well as symptoms of eating disorders. Activities such as viewing and posting photos proved to be particularly problematic [48]. Moreover, other studies indicate that teenage girls are particularly vulnerable to the influence of social media on their body image perception [45].

Taking the above into account, it is important to note that a distorted body image and reduced psychological well-being can significantly affect the internal motivation of children and adolescents to engage in healthy activities, including weight reduction. Therefore, the design of digital interventions supporting weight loss should consider not only behavioural but also psychological factors, in order to minimise the risk of exacerbating negative emotions while simultaneously fostering a positive relationship with one's own body.

4.2. Clinical and Practical Implications

From a clinical perspective, the findings of this review highlight the potential of digital technologies to complement traditional weight management strategies among children and adolescents. Mobile applications, wearable devices, and gamified platforms can provide personalised feedback, increase motivation, and improve adherence to healthy behaviours, particularly in populations that are difficult to engage through conventional methods.

These tools may be especially useful in school-based programmes, primary care settings, or family interventions, where ongoing monitoring and interactive engagement are key. For healthcare professionals, the integration of digital technologies into obesity prevention and treatment plans may provide scalable and cost-effective means of supporting behaviour change and sustaining long-term outcomes.

4.3. Limitations

Several limitations are evident in the analysed publications. These include methodological differences between the analysed publications in intervention duration, participants age, and the types of technologies employed. Moreover, most studies did not include comparisons between participants with obesity and those with normal body weight, which limits the ability to assess the extent to which baseline BMI influences the effectiveness of digital technology interventions. Additionally, many studies were short-term, making it difficult to evaluate the durability of the effects of using digital technologies in the treatment and prevention of obesity. The literature lacks data on the sustained maintenance of reduced body weight, lifestyle changes, and the impact on mental health following the conclusion of the intervention. A further limitation is that some of the analysed publications were based on small sample size or lacked a control group, which makes it difficult to assess the actual effectiveness of the technological solutions used. An additional limitation is the lack of information, in some studies, regarding the cognitive development level

of children and adolescents, which is important in the context of designing appropriate interfaces and educational content. Cultural differences were also not always adequately considered, despite their potential to significantly affect the effectiveness of technological interventions. Therefore, further and more standardised research, grounded in robust methodology, is needed across diverse populations and settings, taking into account both the short- and long-term effects of the use of digital technologies in the context of childhood and adolescent obesity.

5. Conclusions

Based on the literature review, digital technologies appear to be a promising tool in addressing the growing problem of obesity among children and school-aged youth. Mobile applications, educational games, activity trackers, mHealth platforms and artificial intelligence-based systems can support both the treatment and prevention of obesity. Notably, interventions that incorporate personalisation, feedback and social support tend to be the most effective, particularly when they involve parents or caregivers.

Importantly, the technologies analysed not only contribute to BMI reduction but also positively impact the mental health of children and young people, supporting the development of a positive body image, self-efficacy and self-esteem. Features such as progress tracking, gamification and health education enhance engagement in lifestyle change processes, thereby increasing the sustainability of outcomes achieved.

It is important to emphasise that digital technologies alone are not sufficient; their effectiveness depends on both the context of implementation and the level of young user engagement. Inadequately designed digital technologies carry the risk of contributing to a deterioration in well-being, increased social pressure, or the reinforcement of negative comparison patterns. To address this challenge effectively, future strategies to combat obesity should use technology to support of multidisciplinary initiatives combining medical, psychological, pedagogical and technological knowledge. Developing guidelines for the design and implementation of digital health tools for children and adolescents is also essential, with careful consideration of their cognitive, emotional and social development.

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References

1. Porri, D.; Morabito, L.; Cavallaro, P.; La Rosa, E.; Li Pomi, A.; Pepe, G.; Wasniewska, M. Time to Act on childhood obesity: The use of technology. *Front. Pediatr.* **2024**, *12*, 1359484. [[CrossRef](#)] [[PubMed](#)]
2. Jebeile, H.; Kelly, A.S.; O'Malley, G.; Baur, L.A. Obesity in Children and Adolescents: Epidemiology, Causes, Assessment, and Management. *Lancet Diabetes Endocrinol.* **2022**, *10*, 351–365. [[CrossRef](#)] [[PubMed](#)]

3. Pulgarón, E.R. Childhood Obesity: A Review of Increased Risk for Physical and Psychological Comorbidities. *Clin. Ther.* **2013**, *35*, A18–A32. [\[CrossRef\]](#) [\[PubMed\]](#)
4. Steinbeck, K.S.; Lister, N.B.; Gow, M.L.; Baur, L.A. Treatment of Adolescent Obesity. *Nat. Rev. Endocrinol.* **2018**, *14*, 331–344. [\[CrossRef\]](#)
5. Chesser, H.; Srinivasan, S.; Puckett, C.; Gitelman, S.E.; Wong, J.C. Real-Time Continuous Glucose Monitoring in Adolescents and Young Adults with Type 2 Diabetes Can Improve Quality of Life. *J. Diabetes Sci. Technol.* **2022**, *18*, 911–919. [\[CrossRef\]](#)
6. Velasquez-Mieyer, P.A.; Nieto-Martinez, R.; Neira, C.P.; De Oliveira-Gomes, D.; Velasquez Rodriguez, A.E.; Ugel, E.; Cowan, P.A. Relative Body Mass Index Improves the BMI Percentile Performance for Detection and Monitoring of Excess Adiposity in Adolescents. *Nutrients* **2024**, *16*, 703. [\[CrossRef\]](#)
7. Cardel, M.I.; Atkinson, M.A.; Taveras, E.M.; Holm, J.C.; Kelly, A.S. Obesity Treatment among Adolescents: A Review of Current Evidence and Future Directions. *JAMA Pediatr.* **2020**, *174*, 609–617. [\[CrossRef\]](#)
8. Kwok, K.H.; Lam, K.S.; Xu, A. Heterogeneity of White Adipose Tissue: Molecular Basis and Clinical Implications. *Exp. Mol. Med.* **2016**, *48*, e215. [\[CrossRef\]](#)
9. Vazquez, C.E.; Cubbin, C. Socioeconomic Status and Childhood Obesity: A Review of Literature from the Past Decade to Inform Intervention Research. *Curr. Obes. Rep.* **2020**, *9*, 562–570. [\[CrossRef\]](#)
10. Woo Baidal, J.A.; Locks, L.M.; Cheng, E.R.; Blake-Lamb, T.L.; Perkins, M.E.; Taveras, E.M. Risk Factors for Childhood Obesity in the First 1,000 Days: A Systematic Review. *Am. J. Prev. Med.* **2016**, *50*, 761–779. [\[CrossRef\]](#)
11. Sisson, S.B.; Krampe, M.; Anundson, K.; Castle, S. Obesity Prevention and Obesogenic Behavior Interventions in Child Care: A Systematic Review. *Prev. Med.* **2016**, *87*, 57–69. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Altıntaş Başar, H.B.; Bilici, S. Does Technology Affect Nutrition Education Perspectives? *Artuklu Int. J. Health Sci.* **2023**, *3*, 335–342. [\[CrossRef\]](#)
13. Kouvari, M.; Karipidou, M.; Tsiampalis, T.; Mamalaki, E.; Poulimeneas, D.; Bathrellou, E.; Panagiotakos, D.; Yannakoulia, M. Digital Health Interventions for Weight Management in Children and Adolescents: Systematic Review and Meta-Analysis. *J. Med. Internet Res.* **2022**, *24*, e30675. [\[CrossRef\]](#) [\[PubMed\]](#)
14. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* **2021**, *372*, n71. [\[CrossRef\]](#) [\[PubMed\]](#)
15. Lazoric, S.; Crawford, Y.; Gilbird, A.; Feng, X.; Burr, V.; Moore, V.; Hardison, G.T. Long-Term Obesity Prevention and the Motivating Adolescents with Technology to CHOOSE Health™ Program. *Child. Obes.* **2014**, *10*, 26–34. [\[CrossRef\]](#)
16. Schoeppe, S.; Alley, S.; Van Lippevelde, W.; Bray, N.A.; Williams, S.L.; Duncan, M.J.; Vandelanotte, C. Efficacy of Interventions That Use Apps to Improve Diet, Physical Activity and Sedentary Behaviour: A Systematic Review. *Int. J. Behav. Nutr. Phys. Act.* **2016**, *13*, 127. [\[CrossRef\]](#)
17. Kaakinen, P.; Kyngäs, H.; Kääriäinen, M. Technology-Based Counseling in the Management of Weight and Lifestyles of Obese or Overweight Children and Adolescents: A Descriptive Systematic Literature Review. *Inform. Health Soc. Care* **2018**, *43*, 15–30. [\[CrossRef\]](#)
18. Quelly, S.B.; Norris, A.E.; DiPietro, J.L. Impact of Mobile Apps to Combat Obesity in Children and Adolescents: A Systematic Literature Review. *J. Spec. Pediatr. Nurs.* **2016**, *21*, 106–120. [\[CrossRef\]](#)
19. Fowler, L.A.; Grammer, A.C.; Staiano, A.E.; Fitzsimmons-Craft, E.E.; Chen, L.; Yaeger, L.H.; Wilfley, D.E. Harnessing Technological Solutions for Childhood Obesity Prevention and Treatment: A Systematic Review and Meta-Analysis. *Int. J. Obes.* **2021**, *40*, 123–140. [\[CrossRef\]](#)
20. Bardus, M. Mobile Phone and Web 2.0 Technologies for Weight Management: A Systematic Scoping Review. *J. Med. Internet Res.* **2015**, *17*, e83. [\[CrossRef\]](#)
21. Holmes, W.S.; Moorhead, S.A.; Coates, V.; Bond, R.R.; Zheng, H. Impact of Digital Technologies for Communicating Messages on Weight Loss Maintenance: A Systematic Literature Review. *Eur. J. Public Health* **2019**, *29*, 17–30. [\[CrossRef\]](#) [\[PubMed\]](#)
22. Dobbie, L.J.; Tahrani, A.A.; Alam, U.; James, J.; Wilding, J.; Cuthbertson, D.J. Exercise in Obesity—The Role of Technology in Health Services: Can This Approach Work? *Curr. Obes. Rep.* **2021**, *10*, 19–30. [\[CrossRef\]](#) [\[PubMed\]](#)
23. Edwards, H.M.; McDonald, S.; Zhao, T. Exploring Teenagers' Motivation to Exercise through Technology Probes. In Proceedings of the HCI 2011 The 25th BCS Conference on Human Computer Interaction, Newcastle Upon Tyne, UK, 4–8 July 2011. [\[CrossRef\]](#)
24. Kim, S.; Rhee, S.Y.; Lee, S. Effectiveness of Information and Communications Technology-Based Interventions for Obesity and Metabolic Syndrome. *J. Obes. Metab. Syndr.* **2022**, *31*, 4–15. [\[CrossRef\]](#) [\[PubMed\]](#)
25. Chen, Y.; Perez-Cueto, F.J.A.; Giboreau, A.; Mavridis, I.; Hartwell, H. The Promotion of Eating Behaviour Change through Digital Interventions. *Int. J. Environ. Res. Public Health* **2020**, *17*, 7488. [\[CrossRef\]](#)

26. Sandri, S.; Hemmje, M.; Zheng, H.; Engel, F.; Moorhead, A.; Wang, H.; Bond, R.; McTear, M.; Molinari, A.; Bouquet, P. Is There an Optimal Technology to Provide Personal Supportive Feedback in Prevention of Obesity? In Proceedings of the 2019 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), San Diego, CA, USA, 18–21 November 2019; IEEE: New York, NY, USA, 2019. [\[CrossRef\]](#)
27. Gilmore, L.A.; Duhé, A.F.; Frost, E.A.; Redman, L.M. The Technology Boom: A New Era in Obesity Management. *J. Diabetes Sci. Technol.* **2014**, *8*, 52–60. [\[CrossRef\]](#)
28. Yien, J.-M.; Yien, J.-M.; Wang, H.-H.; Wang, R.H.; Chou, F.H.; Chen, K.H.; Tsai, F.S. Effect of Mobile Health Technology on Weight Control in Adolescents and Preteens: A Systematic Review and Meta-Analysis. *Front. Public Health* **2021**, *9*, 708321. [\[CrossRef\]](#)
29. Martin, A.; Caon, M.; Adorni, F.; Andreoni, G.; Ascolese, A.; Atkinson, S.; Bul, K.; Carrion, C.; Castell, C.; Ciociola, V.; et al. A Mobile Phone Intervention to Improve Obesity-Related Health Behaviors of Adolescents Across Europe: Iterative Co-Design and Feasibility Study. *JMIR mHealth uHealth* **2020**, *8*, e14118. [\[CrossRef\]](#)
30. Hagman, E.; Johansson, L.; Kollin, C.; Marcus, E.; Drangel, A.; Marcus, C.; Danielsson, P. Effect of an Interactive Mobile Health Support System and Daily Weight Measurements for Pediatric Obesity Treatment: A 1-Year Pragmatic Clinical Trial. *Int. J. Obes.* **2022**, *46*, 1527–1533. [\[CrossRef\]](#)
31. Lei, S.; Medina Inojosa, J.R.; Kumar, S.; Lee, A.T.; Scott, C.G.; Lerman, A.; Lerman, L.O.; Senecal, C.G.; Lin, W.; Zhang, X.; et al. Effectiveness of a Weight Loss Program Using Digital Health in Adolescents and Preadolescents. *Child. Obes.* **2021**, *17*, 311–321. [\[CrossRef\]](#)
32. Likhitweerauwong, N.; Boonchooduang, N.; Kittisakmontri, K.; Chonchaiya, W.; Louthrenoo, O. Effectiveness of Mobile Application on Changing Weight, Healthy Eating Habits, and Quality of Life in Children and Adolescents with Obesity: A Randomized Controlled Trial. *BMC Pediatr.* **2021**, *21*, 499. [\[CrossRef\]](#)
33. Sharifi, M.; Dryden, E.M.; Horan, C.M.; Price, S.; Marshall, R.; Hacker, K.; Finkelstein, F.A.; Taveras, E.M. Leveraging Text Messaging and Mobile Technology to Support Pediatric Obesity-Related Behavior Change: A Qualitative Study Using Parent Focus Groups and Interviews. *J. Med. Internet Res.* **2013**, *15*, e2780. [\[CrossRef\]](#) [\[PubMed\]](#)
34. Kerner, C.; Goodyear, V.A. The Motivational Impact of Wearable Healthy Lifestyle Technologies: A Self-determination Perspective on Fitbits with Adolescents. *Am. J. Health Educ.* **2017**, *48*, 168–178. [\[CrossRef\]](#)
35. Soltero, E.G.; Lopez, C.; Hernandez, E.; Arceo, C.; O'Connor, T.M.; Thompson, D.; Hasson, R.E. Technology-Based Obesity Prevention Interventions Among Hispanic Adolescents in the United States: Scoping Review. *JMIR Pediatr. Parent.* **2022**, *5*, e34167. [\[CrossRef\]](#) [\[PubMed\]](#)
36. Griffin, J.B.; Struempfer, B.; Funderburk, K.; Parmer, S.M.; Tran, C.; Wadsworth, D.D. My Quest, a Community-Based mHealth Intervention to Increase Physical Activity and Promote Weight Loss in Predominantly Rural-Dwelling, Low-Income, Alabama Women. *Fam. Community Health* **2020**, *43*, 131–140. [\[CrossRef\]](#)
37. Kristjánsdóttir, Ó.; Welander Tärneberg, A.; Stenström, P.; Castor, C.; Kristensson Hallström, I. eHealth Literacy and Socioeconomic and Demographic Characteristics of Parents of Children Needing Paediatric Surgery in Sweden. *Nurs. Open* **2023**, *10*, 509–524. [\[CrossRef\]](#)
38. El Benny, M.; Kabakian-Khasholian, T.; El-Jardali, F.; Bardus, M. Application of the eHealth Literacy Model in Digital Health Interventions: Scoping Review. *J. Med. Internet Res.* **2021**, *23*, e23473. [\[CrossRef\]](#)
39. Cavallo, D.N.; Martinez, R.; Webb Hooper, M.; Flocke, S. Feasibility of a Social Media-Based Weight Loss Intervention Designed for Low-SES Adults. *Transl. Behav. Med.* **2021**, *11*, 981–992. [\[CrossRef\]](#)
40. Lam, C.; Milne-Ives, M.; Harrington, R.; Jani, A.; van Velthoven, M.H.; Harding, T.; Meinert, E. Internet of Things-Enabled Technologies as an Intervention for Childhood Obesity: A Systematic Review. *PLoS Digit. Health* **2022**, *1*, e0000024. [\[CrossRef\]](#)
41. Vlachopapadopoulou, E.; Georga, E.I.; Fotiadis, D.I. Management of Obese Pediatric Patients in the Digital Era. In *Mobile Health Applications for Quality Healthcare Delivery*; IGI Global Scientific Publishing: Hershey, PA, USA, 2019; pp. 72–97. [\[CrossRef\]](#)
42. Bastida, L.; Cea, G.; Moya, A.; Gallego, A.; Gaeta, E.; Sillaurren, S.; Barbosa, P.; Souto, S.; Rodrigues, E.; Torrego-Ellacuría, M.; et al. Promoting Obesity Prevention and Healthy Habits in Childhood: The OCARIoT Experience. *IEEE J. Transl. Eng. Health Med.* **2023**, *11*, 261–270. [\[CrossRef\]](#)
43. Zarkogianni, K.; Chatzidaki, E.; Polychronaki, N.; Kalafatis, E.; Nicolaides, N.C.; Voutetakis, A.; Chioti, V.; Kitani, R.-A.; Mitsis, K.; Perakis, K.; et al. The ENDORSE Feasibility Study: Exploring the Use of M-Health, Artificial Intelligence and Serious Games for the Management of Childhood Obesity. *Nutrients* **2023**, *15*, 1451. [\[CrossRef\]](#) [\[PubMed\]](#)
44. Aubrey, J.S.; Yan, K.; Gahler, H. Digital Technologies and Adolescents' Body Image. In *Encyclopedia of Child and Adolescent Health*; Elsevier: Amsterdam, The Netherlands, 2023; Volume 3, pp. 248–259. [\[CrossRef\]](#)
45. Papageorgiou, A.; Fisher, C.; Cross, D. "Why Don't I Look like Her?" How Adolescent Girls View Social Media and Its Connection to Body Image. *BMC Women's Health* **2022**, *22*, 261. [\[CrossRef\]](#) [\[PubMed\]](#)
46. Pedrouzo, S.B.; Krynski, L. Hyperconnected: Children and Adolescents on Social Media. The TikTok Phenomenon. *Arch. Argent. Pediatr.* **2023**, *121*, e202202674. [\[CrossRef\]](#) [\[PubMed\]](#)

47. Demaria, F.; Pontillo, M.; Di Vincenzo, C.; Bellantoni, D.; Pretelli, I.; Vicari, S. Body, Image, and Digital Technology in Adolescence and Contemporary Youth Culture. *Front. Psychol.* **2024**, *15*, 1445098. [\[CrossRef\]](#)
48. Holland, G.; Tiggemann, M. A Systematic Review of the Impact of the Use of Social Networking Sites on Body Image and Disordered Eating Outcomes. *Body Image* **2016**, *17*, 100–110. [\[CrossRef\]](#)
49. Westbury, S.; Oyeboode, O.; van Rens, T.; Barber, T.M. Obesity Stigma: Causes, Consequences, and Potential Solutions. *Curr. Obes. Rep.* **2023**, *12*, 10–23. [\[CrossRef\]](#)
50. Robinson, T.N.; Banda, J.A.; Hale, L.; Lu, A.S.; Fleming-Milici, F.; Calvert, S.L.; Wartella, E. Screen Media Exposure and Obesity in Children and Adolescents. *Pediatrics* **2017**, *140* (Suppl. S2), S97–S101. [\[CrossRef\]](#)
51. Liu, Q.; Li, X. The Interactions of Media Use, Obesity, and Suboptimal Health Status: A Nationwide Time-Trend Study in China. *Int. J. Environ. Res. Public Health* **2021**, *18*, 13214. [\[CrossRef\]](#)
52. Rao, W.W.; Zong, Q.Q.; Zhang, J.W.; An, F.R.; Jackson, T.; Ungvari, G.S.; Xiang, Y.; Su, Y.Y.; D'Arcy, C.; Xiang, Y.T. Obesity Increases the Risk of Depression in Children and Adolescents: Results from a Systematic Review and Meta-Analysis. *J. Affect. Disord.* **2020**, *267*, 78–85. [\[CrossRef\]](#)
53. López, K.E.; Salvy, S.J.; Fink, C.; Werner, J.; Wee, C.P.; Hegedus, E.; González, J.; Fox, D.S.; Vidmar, A.P. Executive Functioning, Depressive Symptoms, and Intervention Engagement in a Sample of Adolescents Enrolled in a Weight Management Program. *Child. Obes.* **2021**, *17*, 281–290. [\[CrossRef\]](#)
54. Uzuner, A.; Akman, M.; Bahadır, A.T.; Borekci, N.O.; Viggiano, E. Examination of a Board Game Approach to Children's Involvement in Family-Based Weight Management vs. Traditional Family-Based Behavioral Counseling in Primary Care. *Eur. J. Pediatr.* **2018**, *177*, 1231–1238. [\[CrossRef\]](#)
55. König, L.M.; Krukowski, R.A.; Kuntsche, E.; Busse, H.; Gumbert, L.; Gemesi, K.; Neter, E.; Mohamed, N.F.; Ross, K.M.; John-Akinola, Y.O.; et al. Reducing Intervention- and Research-Induced Inequalities to Tackle the Digital Divide in Health Promotion. *Int. J. Equity Health* **2023**, *22*, 249. [\[CrossRef\]](#) [\[PubMed\]](#)
56. Al-Dhahir, I.; Reijnders, T.; Faber, J.S.; van den Berg-Emons, R.J.; Janssen, V.R.; Kraaijenhagen, R.A.; Visch, V.T.; Chavannes, N.H.; Evers, A.W.M. The Barriers and Facilitators of eHealth-Based Lifestyle Intervention Programs for People with a Low Socioeconomic Status: Scoping Review. *J. Med. Internet Res.* **2022**, *24*, e34229. [\[CrossRef\]](#) [\[PubMed\]](#)
57. Chesser, A.; Burke, A.; Reyes, J.; Rohrberg, T. Navigating the Digital Divide: A Systematic Review of eHealth Literacy in Underserved Populations in the United States. *Inform. Health Soc. Care* **2016**, *41*, 1–19. [\[CrossRef\]](#)
58. Griffin, J.B.; Struempfer, B.; Funderburk, K.; Parmer, S.M.; Tran, C.; Wadsworth, D.D. My Quest, an Intervention Using Text Messaging to Improve Dietary and Physical Activity Behaviors and Promote Weight Loss in Low-Income Women. *J. Nutr. Educ. Behav.* **2018**, *50*, 11–18.e1. [\[CrossRef\]](#)

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Article

Psychosocial Consequences of Excess Weight and the Importance of Physical Activity in Combating Obesity in Children and Adolescents: A Pilot Study

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Abstract: **Introduction:** Overweight and obesity among children and adolescents are a growing public health problem. The aim of this study was to determine the impact of overweight and obesity on the psychosocial functioning and physical activity levels of children and adolescents. **Methods:** This study was conducted among 100 children and adolescents aged 9–18 from three institutions in the Podkarpackie Province: a primary school, a hospital ward, and a health resort. An original questionnaire was used, containing questions about body image, emotions related to eating, self-esteem, and physical activity. All participants were classified into appropriate BMI categories based on anthropometric data. **Results:** The analysis showed that 48% of respondents admitted to eating meals in secret, and 5% did so every day for a month. As many as 65.82% of participants stated that their body shape affects the way they think about themselves, and more than two-thirds felt frustrated with their figure. Statistically significant differences were observed in the perception of one's own body and the level of its acceptance depending on the BMI category. In addition, 58.58% of respondents did not engage in physical activity to control their weight. **Conclusions:** The results of this study confirm that overweight and obesity in children and adolescents are associated with a negative body image, low self-esteem, unhealthy eating habits, and low levels of physical activity. The obtained results can be used by medical personnel, educators, and educational institutions to develop effective prevention programs aimed at counteracting the negative consequences of overweight and obesity in children and adolescents.

Keywords: overweight; obesity; children; adolescents; physical activity; self-esteem; mental health

1. Introduction

A healthy, balanced diet plays a key role in the health and proper functioning of the body, both physically and mentally, in every human being. Children and young people are a special group whose eating habits have an impact on their health in adulthood. Regular physical activity is also an important element of the proper development of the younger generation, as it has a positive impact on the functioning of the body. Low levels of

physical activity, a sedentary lifestyle, and sleepiness play a key role in the development of obesity [1,2]. Currently, the prevalence of overweight children and adolescents is increasing dramatically, which can lead to adverse health consequences such as type II diabetes, hypertension, and obstructive sleep apnoea. In addition, overweight and obesity can contribute to negative consequences in the psychosocial functioning of young people [3].

An increase in the number of cases of overweight and obesity is observed almost worldwide, leading to alarming statistics and forcing action to be taken at various levels, from family to international [4–6]. In terms of physical health, overweight and obesity increase the risk of many chronic diseases, such as type 2 diabetes, hypertension, cardiovascular disease, and musculoskeletal problems. These problems can appear as early as childhood, but most often become more severe in adulthood, leading to premature death and a reduced quality of life [7].

The psychological aspects should not be forgotten either. Overweight or obese children and adolescents often struggle with low self-esteem, depression, and social isolation, which negatively affects their emotional and social development. The stigma associated with being overweight can lead to difficulties in peer relationships and learning problems. The causes of overweight and obesity are multifactorial and include both genetic predisposition and environmental factors such as poor eating habits, physical inactivity, and the influence of the media and advertising. The role of the family, school, and the wider social environment is crucial in shaping healthy habits and preventing overweight and obesity [8].

Body image plays a crucial role in the psychosocial development of children and adolescents. Negative body image is frequently associated with low self-esteem, unhealthy eating behaviours, and reduced physical activity, all of which contribute to the development and maintenance of overweight and obesity. Exposure to unrealistic body ideals through media and peer comparisons exacerbates these issues, particularly during adolescence, a period characterized by increased sensitivity to appearance-related concerns [9].

Obesity is a complex health problem that can be divided into two main categories: simple obesity and secondary obesity. In most cases, children and adolescents are affected by simple obesity, the main cause of which is a positive energy balance—consuming more calories than are burned. Simple obesity is the most common form of obesity in children and adolescents. One of the key causes of this form of obesity is excessive calorie intake, which is directly related to an inadequate diet. Ready meals and fast food, which contain large amounts of sugar and saturated fats and are low in vitamins and micronutrients, promote the growth of adipose tissue. In addition, irregular meals and excessive portions also contribute to overweight and obesity. Children often eat too much and too often, which leads to a calorie surplus [10,11].

Another important factor is physical inactivity. Modern children and young people spend a lot of time watching television, playing computer games, and using social media. These types of entertainment are replacing traditional forms of physical activity such as walking, cycling, and playing games. In addition, fewer children spend time playing actively with their peers, as most interactions take place online. A sedentary lifestyle accompanies children from an early age, leading to gradual weight gain. Poor family relationships also influence the development of obesity in children and adolescents. Children who experience difficult family situations, such as parental divorce, sexual abuse, or excessive demands, often seek comfort in food. In such cases, eating becomes a mechanism for coping with stress, leading to eating disorders and weight gain. Children may treat food as a reward for surviving stressful situations, which further disrupts their healthy eating habits [12]. It should be noted that in recent years, the problem of overweight and obesity in children in Poland has become the subject of numerous studies and analyses. One of the main factors influencing abnormal body weight in children is poor eating habits shaped

by their parents. Parents often do not control how much time their children spend in front of TV screens, computers, or phones, which limits their physical activity. In addition, some parents excuse their children from physical education classes, which is a mistake, as exercise is crucial for maintaining a healthy weight [13].

Solving this problem requires integrated action on many levels, from health education and the creation of conditions conducive to physical activity to appropriate nutritional and medical policies. Only through coordinated efforts is it possible to halt the increase in the number of overweight and obese children and adolescents and improve the health of future generations [5,6].

Physical activity plays an important role in prevention and weight loss, enabling increased energy expenditure and supporting the maintenance of healthy eating habits [14,15]. What is more, regular exercise brings a number of health benefits, including improved cardiovascular function, support for the development of the musculoskeletal system, and a positive impact on the mental health and self-esteem of children and young people [16–18]. Engagement in physical activity often becomes an important motivator for young people to change their lifestyle and strive to achieve or maintain a slim figure. Participation in sports activities not only improves physical fitness but also builds a sense of effectiveness and belief in one's own abilities, which strengthens the determination to continue health-promoting activities [19,20]. It is worth noting that various educational programmes implemented in schools, such as SPARK and Planet Health, have proven highly effective in increasing the level of physical activity among students and reducing the incidence of overweight and obesity [21,22]. The influence of the social environment is also significant. Support from family and peers, as well as favourable environmental conditions, can clearly encourage children and young people to be more physically active. The presence of positive role models and joint activities with loved ones help to reinforce healthy habits [23,24]. Furthermore, especially during adolescence, the motivation to participate in sports often stems from the need to improve physical appearance, which further encourages young people to take action to reduce their body weight [25]. In view of the growing problem of low physical activity, increasingly referred to as a pandemic, it is important to take comprehensive measures to promote physical activity among children and adolescents. Physical activity can not only support weight loss but also be a key motivating factor for making lasting lifestyle changes [26,27].

Physical activity brings numerous health benefits in physical, mental, and social dimensions. Regular exercise improves cardiovascular fitness, strengthens muscles and bones, positively influences mood, and enhances self-esteem. The World Health Organization (WHO) recommends that children and adolescents aged 5–17 engage in at least 60 min of moderate or vigorous physical activity daily [28]. According to the Active Healthy Kids Poland 2022 report, most physical activity indicators for children and adolescents in Poland received moderate or poor ratings (from C+ to D), and two key areas—overall physical activity and active play—were assessed as incomplete due to a lack of data. These trends are consistent with global data, which show that more than 80% of adolescents worldwide do not meet WHO recommendations [29]. These patterns highlight the need to analyse psychosocial and behavioural determinants of physical inactivity, particularly among adolescents with excessive body weight. This article aims to determine the impact of overweight and obesity on the psychosocial functioning and physical activity levels of children and adolescents. In the face of the growing prevalence of obesity among children and adolescents, the development of effective, multi-faceted prevention programs that address both the physical and mental health aspects of young people is becoming increasingly important. The obtained results provide valuable insights into the need for designing interventions that include nutritional counselling, the promotion of regular physical ac-

tivity, and psychological support based on scientific evidence, aimed at improving body image and self-esteem [3]. The involvement of families and local stakeholders is crucial in strengthening positive health habits and creating a supportive environment that fosters long-term behavioural changes. At the same time, prevention strategies must address the widespread influence of digital media, which perpetuates unrealistic beauty standards, contributing to the deterioration of mental health and the development of maladaptive coping mechanisms [30]. Effective programs should be based on proven theories, such as the Health Belief Model and the Self-Determination Theory, which support lasting pro-health attitudes and behaviours [31].

It is worth noting that this study is not a direct continuation of previous research but aims to deepen the understanding of the relationship between BMI and the psychosocial functioning of children and adolescents (including body image, self-esteem, and motivation), taking into account different types of institutions, which has rarely been analysed so far. Although the general consequences of overweight and obesity are well known, there is still a lack of data on how specific BMI categories affect motivation for physical activity and self-esteem in children and adolescents. A better understanding of these relationships will help develop more effective preventive and therapeutic strategies.

2. Materials and Methods

2.1. Participants and Recruitment Process

A total of 100 respondents from three units in south-eastern Poland took part in the study: the Health Resort Hospital ($n = 31$), the provincial clinical hospital ($n = 31$), and the General Secondary School ($n = 38$). Although 110 individuals were initially invited to participate in this study, 7 did not provide consent or withdrew before completing the questionnaire. Additionally, 3 questionnaires were excluded due to missing data, which made it impossible to calculate BMI or perform psychometric analysis. As a result, the final study sample consisted of 100 participants. The research group was diverse in terms of gender, age, body weight, height, BMI, and place of residence. In terms of sex distribution, girls made up 54% of the sample and boys 46%. The age range of the respondents was 9 to 18 years. An analysis of place of residence showed that 61% of respondents came from cities and 39% from rural areas. In summary, the study group was well diversified and representative of young people from different backgrounds and institutions. The greatest diversity in health parameters was observed at the Health Resort Hospital, while the most homogeneous group was high school students. The sample was selected deliberately and in cooperation with three educational and medical institutions located in the Podkarpackie Province. The study participants were recruited from three different types of institutions based on their specific characteristics and the potential to obtain representative data on eating habits, health attitudes, and motivation for weight loss among children and adolescents. Each of these institutions represented different age and health groups, allowing for a diverse analysis of the results. The secondary school was selected due to its access to students at an age when eating habits and motivation for weight control are being formed. The clinical hospital ward provided data on patients with chronic conditions related to obesity and metabolic diseases, enabling analysis of how these illnesses influence dietary attitudes and motivation for a healthy lifestyle. In turn, the health resort hospital allowed for the collection of information on the impact of a health-promoting environment on patients' health and motivation in the weight loss process. The sample was selected using purposive sampling, as each institution represented a distinct group of participants, which made it possible to gather data from various perspectives on eating habits, weight loss motivation, and the influence of health status on these attitudes. Participants were contacted directly through the institutions

they attended or where they were staying for treatment or rehabilitation. Participation in this study was entirely voluntary. Inclusion criteria included age between 9 and 18 years, the ability to complete the questionnaire, and the provision of informed consent. Children with cognitive or physical limitations that prevented questionnaire participation were excluded. Consent was obtained from the management of the institutions, and then information activities were carried out aimed at potential participants and their parents or legal guardians. Written informed consent to participate in the study was obtained from all participants aged 16 to 18 years. In the case of younger children (under 16 years of age), written consent was provided by their parents or legal guardians, and the children themselves gave verbal assent to participate in this study.

This study was cross-sectional and was carried out in 2023–2024. Respondents completed an anonymous questionnaire and underwent basic anthropometric measurements (weight, height), on the basis of which BMI was calculated. Recruitment, data collection, and analysis were carried out in accordance with applicable ethical standards. The study design was approved by the Bioethics Committee of the District Medical Chamber in Rzeszów (78/2022/B). Informed consent to participate in this study was obtained from all respondents (or their legal guardians).

2.2. Research Questionnaire and Data Collection Procedures

All participants completed a proprietary Child Nutrition Questionnaire, which was one of the basic research tools used in this project. This tool was developed specifically for this study and based on concepts related to nutritional behaviours and body image assessment. The form was anonymous and single-use, and its purpose was to collect data on eating habits, body image, attempts to control weight, and emotions associated with eating. It is worth noting that anthropometric measurements were conducted in person, but no data allowing the identification of participants were recorded, including questionnaire results and body measurements. The data collected through the questionnaires were anonymized after collection, and body measurements were coded using individual ID numbers without any identifying information. The database did not store names, surnames, or any other personal data that could allow participant identification. All data were anonymized at the stage of entering them into the research database, which prevents the identification of individuals in subsequent analyses. The questionnaire included questions about, among other things, the frequency of overeating, dietary restrictions, body image concerns, physical activity undertaken to control weight, as well as self-perception and body image. The language of the questionnaire was adapted to be age-appropriate and understandable for children and adolescents. For younger participants, simplified explanations of selected terms were provided if necessary. If participants encountered difficulties in understanding certain items, trained research assistants or parents provided clarification, particularly for children under the age of 12.

The measurements were carried out by members of the research team who had been properly prepared and trained. The measurements were taken using standardized equipment in conditions ensuring the comfort and privacy of the participants, following uniform procedures regardless of the location, whether in a hospital or an educational facility. Measurement data were recorded immediately after each measurement on paper coding sheets that contained only the participant's individual ID number, without any personal information.

After the completion of the measurement process, the sheets were handed over to a designated research team member responsible for data digitization. Data entry into the database was performed manually. The database was properly secured and accessible only to authorized members of the research team. The data recording and entry process was

designed to prevent participant identification while ensuring the consistency and reliability of the collected information.

The collected responses were used to assess eating behaviours and their potential links to overweight, obesity, and motivational and psychosocial factors in children and adolescents. This tool provided a detailed picture of the respondents' relationship with food and their own bodies. Selected elements of Self-Determination Theory (SDT) by Deci and Ryan were used to assess the level of motivation to reduce body weight, taking into account both internal and external motivation as well as lack of motivation (amotivation [32]. Reference was also made to the Stages of Change Model, which allows the level of participants' readiness to act to be determined. The average time required to complete the questionnaire was approximately 15–20 min, ensuring that participants remained engaged and attentive throughout the process.

2.3. Measurements and BMI Classification

In order to obtain empirical data, a questionnaire developed specifically for this study was used, which contained closed-ended questions. The questionnaire was supplemented by anthropometric measurements taken in counselling and school settings. Height was measured to the nearest 0.1 cm using a SECA 213 height gauge, and weight was measured using a SECA 813 electronic scale (accuracy 0.1 kg). The measurements were taken in light clothing, without shoes, in accordance with standardization rules—each value was recorded twice and the average value was used for analysis. On this basis, the BMI (Body Mass Index) was calculated. For BMI classification, age- and sex-specific percentile charts developed by the World Health Organization (WHO) were used for participants under 18 years of age. For adolescents aged 18 years, adult BMI categories defined by WHO were applied. In addition, in order to obtain a more in-depth picture of psychosocial factors, individual interviews were conducted with a selected subgroup of respondents ($n = 50$) whose results indicated a particularly low or high level of motivation to change their body weight.

2.4. Statistical Analysis Methods

The collected data were analysed using IBM SPSS Statistics (version 27.0) and Microsoft Excel 365. Descriptive statistics were first used to present the characteristics of the study group, including calculations of means, medians, standard deviations, and value ranges and frequencies for categorical data. To compare differences between groups based on gender, place of residence, or BMI category, appropriate inferential statistical tests were applied. Pearson's chi-square test was used to analyse qualitative variables. For continuous variables, the Student's *t*-test for independent samples was used if normal distribution assumptions were met, and the Mann–Whitney U test was used when those assumptions were not fulfilled. The analysis focused primarily on descriptive statistics and group comparisons using chi-squared tests and non-parametric methods.

The internal consistency of the measurement tools, including scales assessing motivation and health-related behaviours, was tested using Cronbach's alpha coefficient. The reliability of the instruments was confirmed, with alpha values ranging from 0.72 to 0.84. In instances where answers were missing—never exceeding 3% within any dataset—listwise deletion was used to preserve the overall integrity of the data. All statistical tests were conducted using a significance level of $\alpha = 0.05$, with *p*-values below 0.05 considered statistically significant. Where appropriate, measures of effect size, such as Cramér's *V* or eta-squared, were also calculated to provide context for the practical importance of the results. This comprehensive statistical approach aimed not only to test group-level differ-

ences but also to explore complex relationships between body weight, physical activity, self-perception, and psychosocial variables across a diverse adolescent population.

3. Results

3.1. Basic Characteristics of the Population Covered by This Study

An analysis of the structure of the study group ($N = 100$) revealed clear differences between the three units in terms of demographic and anthropometric characteristics. The largest differences were mainly in body weight, height, and BMI distribution, which reflect both the specific nature of the institutions and the diverse health needs of their residents. Despite a relatively even gender distribution in the entire sample (55% girls vs. 45% boys), in individual terms, there was a predominance of girls in educational (Tyczyn) and health resort (Zimowit) facilities, while in the clinical hospital (Rzeszów), the gender ratio was more balanced, with a slight predominance of boys. In terms of average age, the group from the General Secondary School stood out clearly—it was homogeneous in age, with a predominance of 18-year-olds. In contrast, the Health Resort and Provincial Clinical Hospital had a wider age range (9–18 years), which may be due to the openness of these facilities to younger patients, who are often undergoing treatment or rehabilitation. Respondents from Rymanów-Zdrój differed significantly from the others—their body weight was on average more than 16 kg higher than that of young people from the secondary school. The standard deviation in this group was also the highest, which indicates a high degree of heterogeneity in terms of weight and probably the presence of both underweight and significantly obese individuals. The highest height was achieved by participants from Tyczyn, who also showed the least variation in this trait, which may indicate a relatively homogeneous lifestyle and level of physical development in this population. In the other two groups (hospitalized), the distribution of height was more dispersed, which may be the result of health or age differences. Analysis of the BMI index allowed three distinct profiles of individuals to be identified (Table 1):

- Zimowit: greatest diversity, presence of cases of obesity I and II, high percentage of overweight and obese people (22 people in total);
- Rzeszów: moderate diversity, predominance of overweight (10 people) and normal weight, presence of obesity I and II;
- Tyczyn: healthiest weight profile—no obesity, predominance of normal body weight (55%), limited number of cases of underweight and overweight.

Table 1. BMI (Body Mass Index) of respondents.

	BMI	Health Resort Hospital	Clinical Hospital	Secondary School
starvation	<16.0	0	0	0
emaciation	16.0–16.9	0	0	0
underweight	17.0–18.5	0	1	6
normal weight	18.5–24.9	7	9	21
overweight	25.0–29.9	7	10	4
obesity class I	30.0–34.9	11	6	0
obesity class II	35.0–39.9	5	3	0
obesity class III	≥ 40	0	0	0

3.2. Dietary Behaviour and Physical Activity Related to Weight Control

3.2.1. Eating in Secret

In order to assess the extent of secret eating, participants were asked how many days in the last month they had eaten meals in secret (Figure 1). The majority of respondents ($n = 52$; 65.82%) declared that they had never engaged in such behaviour, which may indicate a healthy relationship with food. Sporadic cases (1–5 days) were reported by 27.85% of respondents ($n = 22$), while regular or intense food hiding (more than 6 days) was reported by approximately 15% of participants. Particularly worrying were the responses of 4 people (5.06%) who declared that they ate in secret for the entire month. Although this problem did not affect the majority, the data indicate the presence of risky behaviours in part of the group, which may require further psychodietetic assessment.

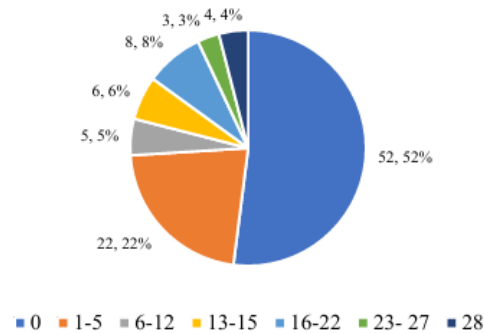


Figure 1. Respondents' answers to the question "Have you ever eaten in secret?".

3.2.2. The Desire to Have a Flat Stomach

Figure 2 illustrates how often respondents felt the desire to have a completely flat stomach during the last month. The largest group (37.97%) said they never felt this way, which may indicate less pressure to look good in this group. On the other hand, 32.91% of respondents said they thought about having a flat stomach every day for 28 days, suggesting significant pressure related to body image. The remaining responses ranged from sporadic (1–5 days) to regular occurrence of this desire (up to 27 days), indicating varying levels of commitment to changing one's figure.

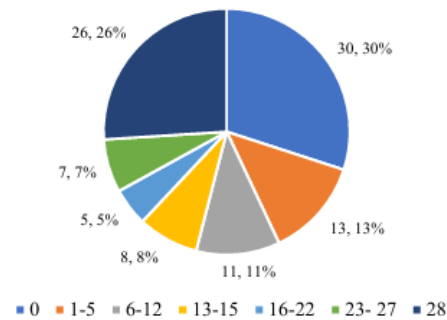


Figure 2. Respondents' answers to the question "Did you want your stomach to be completely flat?".

3.2.3. The Influence of Body Shape on Self-Perception

Figure 3 shows the distribution of respondents' answers to the question concerning the impact of perceived body shapes on the way they think about themselves, which allows for an assessment of the strength of the relationship between body image and self-esteem.

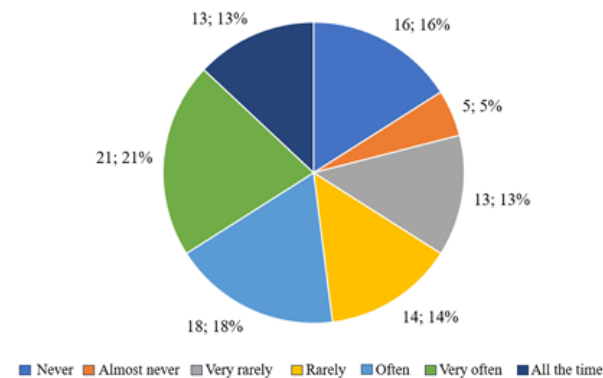


Figure 3. Respondents' answers to the question "Has your body shape affected the way you think about yourself?".

The results show that 65.82% of respondents declared that their body shape significantly affects how they feel about themselves, indicating answers ranging from "often" to "all the time." In particular, 21 people (26.58%) selected "very often" and 13 respondents (16.46%) selected "all the time", which may indicate a strong link between body shape and identity and self-esteem. In addition, 18 people (22.78%) declared that this influence occurs "often", confirming the significant role that physical appearance plays in the daily self-perception of a large proportion of the respondents.

In contrast, 14 people (17.72%) responded that body shape "rarely" influences how they perceive themselves, and 13 people (16.46%) indicated "very rarely". Five respondents (6.33%) also declared a sporadic influence ("almost never"), while sixteen people (20.25%) considered that body shape did not influence their self-esteem at all ("never").

In summary, for more than two-thirds of respondents, perceived appearance, including body shape, has a real impact on how they think about themselves, which may be significant in the context of further analyses of self-esteem, motivation to lose weight, and emotional factors related to body weight. For 34.18% of respondents, this aspect played a marginal or no role, which may indicate a greater distance from the pressure of physical appearance.

3.2.4. Dissatisfaction with One's Body

Figure 4 presents the participants' responses regarding dissatisfaction with their body shape. Over two-thirds of respondents (66.09%) declared that they felt frustration with their body shape to varying degrees, ranging from "often" to "all the time". The most common responses were "very often" (26.58%) and "all the time" (18.99%), which may indicate strong and regular dissatisfaction with appearance. In contrast, 33.91% of respondents reported that they rarely or never felt such discomfort. These responses may indicate a greater distance from the pressure associated with physical appearance or a more positive self-esteem related to body image.

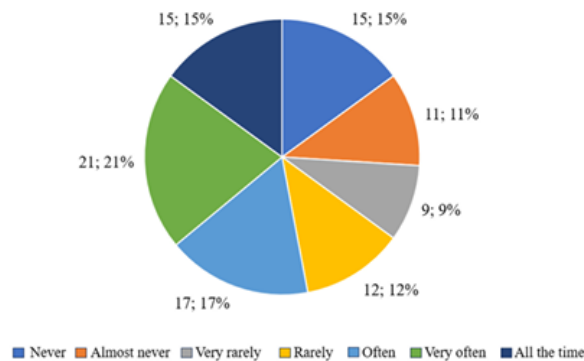


Figure 4. Respondents' answers to the question "Were you dissatisfied with your body shape?".

3.2.5. Physical Activity as a Means of Weight Control

Figure 5 shows the responses to the question about physical exercise undertaken to prevent weight gain in the last four weeks. Over half of the respondents (58.58%) declared that they did not exercise intensively, which suggests that physical activity was not their main method of weight control. On the other hand, 41.42% of respondents reported that they exercised regularly to maintain their weight, indicating that for a significant proportion of respondents, exercise was an important part of preventing weight gain.

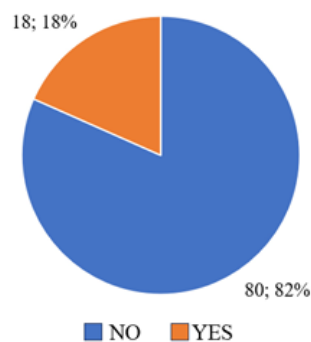


Figure 5. Respondents' answers to the question "Have you exercised a lot in the last four weeks to avoid gaining weight? If so, how often?".

3.3. Psychological Variability Depending on BMI

3.3.1. Respondents' Answers to the Question "Has Your Body Shape Affected the Way You Think About Yourself?" Taking into Account BMI

An analysis of responses to the question about the impact of body shape on self-perception, taking into account BMI categories, revealed significant differences between the groups ($\chi^2 = 17.648$; $df = 18$; $p = 0.0479$) (Table 2).

In the underweight group, the most common response was "often" (43%), while among people with normal body weight, the responses "never" and "very rarely" dominated (20% each). In the overweight group, most respondents (38%) admitted that this influence occurs "very often". In people with grade I and II obesity, the responses were evenly

distributed between “often”, “very often,” and “all the time”, which may indicate a strong and persistent influence of body appearance on self-esteem in these groups.

Table 2. Respondents’ answers to the question “Has your body shape affected the way you think about yourself?” taking into account BMI.

Has Your Body Shape Affected the Way You Think About Yourself?	BMI							
	Underweight		Normal Weight		Overweight		Obesity Class I	
	n	%	n	%	n	%	n	%
never	1	14%	9	20%	1	5%	2	12%
almost never	1	14%	1	2%	1	5%	2	12%
very rarely	1	14%	9	20%	1	5%	2	12%
rarely	1	14%	5	11%	4	19%	2	12%
often	3	43%	7	16%	4	19%	3	18%
very often	0	0%	7	16%	8	38%	3	18%
all the time	0	0%	6	14%	2	10%	3	18%
Chi-square	$\chi^2 = 17.648$		$df = 18$		$p = 0.0479$			

3.3.2. Answers to the Question “Were You Dissatisfied with Your Body Shape?” Taking into Account BMI

The results of the analysis of responses to the question about dissatisfaction with body shape, broken down by BMI categories, showed statistically significant differences between the groups ($\chi^2 = 27.43$; $df = 18$; $p = 0.0287$).

Underweight respondents most often declared no dissatisfaction (“never”—43%), while in the overweight group, the most common responses were “often” (29%) and “very often” (38%). Among people with stage I and II obesity, the highest percentage of responses was “all the time” (24%), which indicates persistent and intense dissatisfaction with their body shape in these groups (Table 3).

Table 3. Respondents’ answers to the question “Were you dissatisfied with your body shape?” taking into account BMI.

Have You Been Unhappy with Your Body Shape?	BMI							
	Underweight		Normal Weight		Overweight		Obesity Class I	
	n	%	n	%	n	%	n	%
never	3	43%	9	20%	1	5%	1	6%
almost never	0	0%	8	18%	1	5%	1	6%
very rarely	2	29%	3	7%	0	0%	3	18%
rarely	0	0%	5	11%	2	10%	3	18%
often	1	14%	8	18%	6	29%	2	12%
very often	1	14%	5	11%	8	38%	3	18%
all the time	0	0%	6	14%	3	14%	4	24%
Chi-square	$\chi^2 = 27.43$		$df = 18$		$p = 0.0287$			

4. Discussion

The results of this study confirm the significant impact of overweight and obesity on the psychosocial functioning of children and adolescents. Analysis of the respondents' answers showed that approximately 48% of those surveyed admitted to eating meals in secret, with 5% declaring that they engaged in this type of behaviour every day for a month. The phenomenon of eating in secret can be seen as a potential indicator of eating disorders, and its increased frequency may indicate the presence of deeper emotional problems, such as shame, guilt, or lack of control over eating. In a study by Kass et al., about one-fifth of adolescents admitted to eating in secret [33]. Other studies have reported the prevalence of this phenomenon ranging from 18.1% to 34% [34,35]. The individuals exhibiting this type of behaviour also showed higher levels of eating-related psychopathology [36]. It is worth noting that children and adolescents are characterized by high emotional sensitivity and susceptibility to environmental influences, which increases the risk of behavioural disorders and difficulties in regulating emotions. Overeating can serve as a mechanism for coping with tension, stress, rejection, or low mood, as evidenced by previous studies [37–41].

Among the participants in this study, approximately 33% of respondents reported daily thoughts about having a flat stomach in the last 28 days, and 65.82% indicated that their body shape significantly affects how they feel about themselves. In addition, more than two-thirds of the respondents felt frustrated with their body shape. These results indicate that physical appearance plays a key role in the process of self-image formation in young people and can significantly affect their mental well-being. Similar results were obtained by Ballarin et al., where as many as 84.6% of obese teenagers were dissatisfied with their bodies [42]. Both previous studies and the results of the presented project confirm that overweight and obese young people have difficulties accepting their appearance. Self-esteem in this group varies according to gender, with girls experiencing lower self-esteem more often than boys [43]. This may be related not only to psychosocial factors but also to biological differences in body composition between sexes. Girls, especially during adolescence, tend to accumulate more body fat, which, combined with increased sensitivity to appearance-related concerns, leads to lower self-esteem and greater body dissatisfaction. Boys, on the other hand, are more focused on muscularity and physical strength, which can result in different patterns of body image concerns. Overweight and obesity are also associated with a lower quality of life, which may result from a lack of acceptance by those around them and feelings of exclusion and powerlessness [44,45]. Children and adolescents struggling with overweight and obesity are prone to behavioural problems, anxiety, behavioural disorders, and depression. Obesity and depression are both public health problems. The relationship is two-way, with the occurrence of one condition increasing the risk of the other [46]. Both girls and boys of school age with a high BMI indicating overweight or obesity tend to be more depressed than their normal-weight peers [47–50].

Additionally, our study observed clear differences in psychosocial functioning between children (aged 9–12 years) and adolescents (aged 13–18 years). Adolescents exhibited significantly higher levels of body dissatisfaction and stronger internalization of sociocultural ideals of thinness. This group also more frequently engaged in behaviours aimed at weight control, such as restrictive dieting and excessive physical activity, motivated primarily by appearance concerns rather than health reasons. These findings are consistent with the Self-Determination Theory, which suggests that external motivations, such as social and peer pressure related to physical appearance, intensify during adolescence [32]. Exposure to unrealistic beauty standards through social media further exacerbates these issues, leading to emotional distress, lowered self-esteem, and an increased risk of developing eating disorders [31]. In contrast, younger children showed lower levels of body

dissatisfaction and engaged in physical activity primarily for enjoyment rather than to control their appearance. It should be emphasized that the observed differences were identified through qualitative data analysis and not through separate statistical analyses comparing age groups. Therefore, the conclusions drawn should be treated as preliminary observations requiring further verification in future studies. Developmental differences highlight the need for age-appropriate intervention strategies. Prevention programs for children should focus on promoting an intuitive approach to eating and building a positive relationship with physical activity, while interventions for adolescents should address sociocultural pressures, support emotional resilience, and develop cognitive-behavioural skills to counteract negative body image [51].

It is worth noting that people with abnormal BMI, who are overweight and obese, have lower self-esteem, which is largely due to dissatisfaction with their own bodies, resulting in feelings of discomfort, for example. In our study, the analysis of responses showed statistically significant differences in body image perception depending on BMI category. In overweight and obese individuals, the influence of body shape on self-perception was clearly stronger and more frequent than in groups with normal body weight or underweight ($\chi^2 = 17.648$; $p = 0.0479$). Similar relationships were observed in terms of dissatisfaction with appearance—the highest percentage of “all the time” responses was recorded among obese individuals ($\chi^2 = 27.43$; $p = 0.0287$), confirming the entrenched negative perception of body shape in this group. A study conducted as part of the NutriNet-Santé cohort showed that the relationship between self-esteem and BMI depends on baseline body weight—in people with normal BMI, higher self-esteem was associated with its stability, while in people with grade II and III obesity, higher self-esteem correlated with lower BMI [52].

The results of this study can be interpreted in light of the Self-Determination Theory (SDT), which is one of the most commonly used theoretical approaches in designing interventions and programs aimed at adolescents. According to this theory, individuals have a natural tendency for psychological growth. To support well-being and strengthen intrinsic motivation, it is necessary to meet three key psychological needs: autonomy, competence, and relatedness. Participants with higher BMI levels demonstrated lower intrinsic motivation for physical activity, which may be associated with reduced feelings of competence and autonomy [53].

Moreover, the observed body dissatisfaction may result from social comparisons, in line with the Social Comparison Theory. Adolescents often compare their appearance to idealized images promoted in the media and among their peers, which negatively affects their self-esteem and motivation [54].

The results show that 58.58% of respondents did not engage in intense physical activity to control their body weight, while 41.42% exercised regularly, considering exercise an important part of preventing overweight. Regular physical activity not only helps to control body weight but also contributes to overall improvement in physical and mental health [16]. Strong et al. recommend that children and adolescents engage in moderate to vigorous physical activity for at least 60 min per day. According to the results of the study, children who met these recommendations had significantly lower BMI and better cardiometabolic health indicators [27]. In addition, physically active children have lower levels of obesity, better physical fitness, and lower stress levels compared to children who lead a sedentary lifestyle [14].

Effective prevention of overweight and obesity in children and adolescents requires an integrated approach that combines dietary changes with regular physical activity. Intervention programmes should include both nutrition education and the promotion of physical activity, involving both children and their families. Joint efforts can lead to lasting lifestyle changes that will promote the healthy development of children and adolescents [55,56].

Encouraging daily activity and planning regular sports activities, such as dance classes or group training, helps to introduce structure and routine, which is particularly important for young people [57]. In addition, regular physical activity leads to improved cardiovascular health, better weight control, stronger muscles and bones, and has a positive impact on mental health [58–60].

Other researchers have pointed to the need to create public spaces that promote an active lifestyle and to involve local communities in promoting physical activity among young people [61]. It should be emphasized that physical activity in early childhood is crucial for preventing excessive weight gain. Kindergartens and family homes should create conditions conducive to physical activity, and parents should actively participate in encouraging their children to engage in physical play. The findings suggest that early habits related to physical activity can have a long-term impact on health and reduce the risk of obesity [30,62]. Studies conducted in Poland also confirm that interventions combining health education with practical activity yield the best results [29,63]. Other researchers have demonstrated the effectiveness of school programmes promoting physical activity, especially in reducing sedentary lifestyles [64,65]. The results of the study suggest a significant association between overweight or obesity and negative body image, low self-esteem, and limited physical activity among children and adolescents, based on observed group-level differences.

Despite the significant results obtained, this study has some limitations. Firstly, the use of a self-report questionnaire involves the risk of cognitive errors and response bias, resulting, among other things, from the desire to present oneself in a favourable light (the so-called social approval effect). Secondly, the cross-sectional nature of this study prevents causal conclusions from being drawn. In addition, the research sample was limited geographically and demographically, which may limit the generalizability of the results to the entire population of children and adolescents in Poland. Finally, environmental and family factors were not analysed in depth, which could have provided a broader context for the identified phenomena. Although preliminary reliability tests (e.g., Cronbach's alpha) were conducted, the applied questionnaire has not undergone formal validation. However, one of the strengths of this study is its comprehensive approach to the issue of overweight and obesity among children and adolescents, covering both psychological and behavioural aspects, such as body image, self-esteem, and physical activity. In addition, the use of standardized measurement tools increases the reliability and comparability of the results with other studies in this field.

Finally, it is worth noting that a key strength of this study is the simultaneous consideration of both somatic and psychosocial variables, which allows for a comprehensive approach to the problem. Moreover, by including different age groups, this study enables an analysis of psychosocial changes across various stages of development. Although this study provided many important insights into the emotional state of young people aged 9 to 18, there is a need for further research to obtain a more complete understanding of the situation. Longitudinal studies would make it possible to assess the sustainability of the observed effects, particularly in the context of educational interventions. The results of this study may have significant practical implications, especially in the field of health education and prevention. In the context of health policy, the obtained findings may serve as a basis for developing support programs for parents and teachers that promote healthy habits in children. Additionally, it should be emphasized that this study did not analyse differences between boys and girls across various age groups, which should be addressed in future research to better understand the distinct developmental and behavioural factors.

5. Conclusions

This study highlights the complexity of the problems faced by overweight and obese children and adolescents. Both body image and self-perception are closely related to body weight, which manifests itself, among other things, in frequent thoughts about the ideal body shape, feelings of frustration, and low self-esteem. Eating meals in secret may indicate developing emotional difficulties and eating disorders that require special attention and psychological support. In addition, the low level of physical activity in the study group may indicate a need to intensify educational and promotional activities promoting a healthy lifestyle from an early age. In the context of the results obtained, it is necessary to implement comprehensive prevention programmes which, in addition to dietary aspects, will also include work on a positive body image and a healthy relationship with food. These programs should be coordinated by national and local public health and education authorities, with implementation in schools supported by health professionals and NGOs. Funding could be provided through local and national budgets and European Union resources. Moreover, this study did not assess differences in overweight, obesity, and body image perception between children and adolescents or between girls and boys, which should be addressed in future research.

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References

1. Ługowska, K.; Krzeczio-Nieczyporuk, E.; Trafialek, J.; Kolanowski, W. The Impact of Increased Physical Activity at School on the Nutritional Behavior and BMI of 13-Year-Olds. *Nutrients* **2024**, *16*, 4329. [\[CrossRef\]](#) [\[PubMed\]](#)
2. Miguel-Berges, M.L.; De Miguel-Etayo, P.; Larruy-García, A.; Jimeno-Martínez, A.; Pellicer, C.; Moreno Aznar, L. Lifestyle Risk Factors for Overweight/Obesity in Spanish Children. *Children* **2022**, *9*, 1947. [\[CrossRef\]](#) [\[PubMed\]](#)
3. Daniels, S.R.; Arnett, D.K.; Eckel, R.H.; Gidding, S.S.; Hayman, L.L.; Kumanyika, S.; Robinson, T.N.; Scott, B.J.; St Jeor, S.; Williams, C.L. Overweight in children and adolescents: Pathophysiology, consequences, prevention, and treatment. *Circulation* **2005**, *111*, 1999–2012. [\[CrossRef\]](#) [\[PubMed\]](#)
4. Cole, T.J.; Bellizzi, M.C.; Flegal, K.M.; Dietz, W.H. Establishing a standard definition for child overweight and obesity worldwide: International survey. *BMJ* **2000**, *320*, 1240–1243. [\[CrossRef\]](#)
5. Schroeder, K.; Schuler, B.R.; Kobulsky, J.M.; Sarwer, D.B. The association between adverse childhood experiences and childhood obesity: A systematic review. *Obes. Rev.* **2021**, *22*, e13204. [\[CrossRef\]](#)
6. Cunningham, S.A.; Hardy, S.T.; Jones, R.; Ng, C.; Kramer, M.R.; Narayan, K.M.V. Changes in the Incidence of Childhood Obesity. *Pediatrics* **2022**, *150*, e2021053708. [\[CrossRef\]](#)
7. Horeish, A.; Tsur, A.M.; Bardugo, A.; Twig, G. Adolescent and Childhood Obesity and Excess Morbidity and Mortality in Young Adulthood—A Systematic Review. *Curr. Obes. Rep.* **2021**, *10*, 301–310. [\[CrossRef\]](#)

8. Caprio, S.; Santoro, N.; Weiss, R. Childhood Obesity and the Associated Rise in Cardiometabolic Complications. *Nat. Metab.* **2020**, *2*, 223–232. [\[CrossRef\]](#)
9. Pothiraj, P.; Shamal, C.; Krishnan, V. Body Image Dissatisfaction, Depression, and Health-Related Quality of Life Amongst Indian Obese School Children: A Cross-Sectional Study. *J. Indian Assoc. Child Adolesc. Ment. Health* **2022**, *18*, 63–72. [\[CrossRef\]](#)
10. Mannino, A.; Sarapis, K.; Moschonis, G. The Effect of Maternal Overweight and Obesity Pre-Pregnancy and During Childhood in the Development of Obesity in Children and Adolescents: A Systematic Literature Review. *Nutrients* **2022**, *14*, 5125. [\[CrossRef\]](#)
11. Masood, B.; Moorthy, M. Causes of Obesity: A Review. *Clin. Med.* **2023**, *23*, 284–291. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Duis, J.; Butler, M.G. Syndromic and Nonsyndromic Obesity: Underlying Genetic Causes in Humans. *Adv. Biol.* **2022**, *6*, e2101154. [\[CrossRef\]](#) [\[PubMed\]](#)
13. Makles, P. Kultura zdrowotna w profilaktyce otyłości jako sposób spędzania wolnego czasu przez dzieci w wieku szkolnym w Polsce. (Health Culture in Obesity Prevention as a Way of Spending Free Time by School-Age Children in Poland). *Kult. Przemiany Eduk.* **2022**, *11*, 138–151. [\[CrossRef\]](#)
14. Sacks, G.; Swinburn, B.A.; Lawrence, M.A. A Systematic Policy Approach to Changing the Food System and Physical Activity Environments to Prevent Obesity. *Aust. N. Z. Health Policy* **2008**, *5*, 13. [\[CrossRef\]](#) [\[PubMed\]](#)
15. Trost, S.G.; Kerr, L.M.; Ward, D.S.; Pate, R.R. Physical Activity and Determinants of Physical Activity in Obese and Non-Obese Children. *Int. J. Obes.* **2001**, *25*, 822–829. [\[CrossRef\]](#)
16. Janssen, I.; Leblanc, A.G. Systematic Review of the Health Benefits of Physical Activity and Fitness in School-Aged Children and Youth. *Int. J. Behav. Nutr. Phys. Act.* **2010**, *7*, 40. [\[CrossRef\]](#)
17. Andersen, L.B.; Riddoch, C.; Kriemler, S.; Hills, A.P. Physical Activity and Cardiovascular Risk Factors in Children. *Br. J. Sports Med.* **2011**, *45*, 871–876. [\[CrossRef\]](#)
18. Boreham, C.; Riddoch, C. The Physical Activity, Fitness and Health of Children. *J. Sports Sci.* **2001**, *19*, 915–929. [\[CrossRef\]](#)
19. Hills, A.P.; King, N.A.; Armstrong, T.P. The Contribution of Physical Activity and Sedentary Behaviours to the Growth and Development of Children and Adolescents: Implications for Overweight and Obesity. *Sports Med.* **2007**, *37*, 533–545. [\[CrossRef\]](#)
20. Pate, R.R.; Davis, M.G.; Robinson, T.N.; Stone, E.J.; McKenzie, T.L.; Young, J.C. Promoting Physical Activity in Children and Youth: A Leadership Role for Schools—A Scientific Statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Physical Activity Committee) in Collaboration with the Councils on Cardiovascular Disease in the Young and Cardiovascular Nursing. *Circulation* **2006**, *114*, 1214–1224. [\[CrossRef\]](#)
21. Kropfski, J.A.; Keckley, P.H.; Jensen, G.L. School-Based Obesity Prevention Programs: An Evidence-Based Review. *Obesity* **2008**, *16*, 1009–1018. [\[CrossRef\]](#) [\[PubMed\]](#)
22. Gortmaker, S.L.; Peterson, K.; Wiecha, J.; Sobol, A.M.; Dixit, S.; Fox, M.K.; Laird, N. Reducing Obesity via a School-Based Interdisciplinary Intervention among Youth: Planet Health. *Arch. Pediatr. Adolesc. Med.* **1999**, *153*, 409–418. [\[CrossRef\]](#) [\[PubMed\]](#)
23. Davison, K.K.; Lawson, C.T. Do Attributes in the Physical Environment Influence Children's Physical Activity? A Review of the Literature. *Int. J. Behav. Nutr. Phys. Act.* **2006**, *3*, 19. [\[CrossRef\]](#)
24. Wrottesley, S.V.; Bosire, E.N.; Mukoma, G.; Motlathledi, M.; Mabena, G.; Barker, M.; Hardy-Johnson, P.; Fall, C.; Norris, S.A. Age and Gender Influence Healthy Eating and Physical Activity Behaviours in South African Adolescents and Their Caregivers: Transforming Adolescent Lives through Nutrition Initiative (TALENT). *Public Health Nutr.* **2021**, *24*, 5187–5206. [\[CrossRef\]](#)
25. Sallis, J.F.; Prochaska, J.J.; Taylor, W.C. A Review of Correlates of Physical Activity of Children and Adolescents. *Med. Sci. Sports Exerc.* **2000**, *32*, 963–975. [\[CrossRef\]](#)
26. Kohl, H.W., III; Craig, C.L.; Lambert, E.V.; Inoue, S.; Alkandari, J.R.; Leetongin, G.; Kahlmeier, S.; Lancet Physical Activity Series Working Group. The Pandemic of Physical Inactivity: Global Action for Public Health. *Lancet* **2012**, *380*, 294–305. [\[CrossRef\]](#)
27. Strong, W.B.; Malina, R.M.; Blimkie, C.J.; Daniels, S.R.; Dishman, R.K.; Gutin, B.; Hergenroeder, A.C.; Must, A.; Nixon, P.A.; Pivarnik, J.M.; et al. Evidence Based Physical Activity for School-Age Youth. *J. Pediatr.* **2005**, *146*, 732–737. [\[CrossRef\]](#)
28. World Health Organization (WHO). *Guidelines on Physical Activity and Sedentary Behaviour*; WHO: Geneva, Switzerland, 2020; Available online: <https://www.who.int/publications/i/item/9789240015128> (accessed on 8 May 2025).
29. Zembura, P.; Korcz, A.; Nalecz, H.; Cieśla, E. Results from Poland's 2022 Report Card on Physical Activity for Children and Youth. *Int. J. Environ. Res. Public Health* **2022**, *19*, 4276. [\[CrossRef\]](#)
30. Tomayko, E.J.; Tovar, A.; Fitzgerald, N.; Howe, C.L.; Hingle, M.D.; Murphy, M.P.; Muzaffar, H.; Going, S.B.; Hubbs-Tait, L. Parent Involvement in Diet or Physical Activity Interventions to Treat or Prevent Childhood Obesity: An Umbrella Review. *Nutrients* **2021**, *13*, 3227. [\[CrossRef\]](#)
31. Tiggemann, M.; Slater, A. NetGirls: The Internet, Facebook, and Body Image Concern in Adolescent Girls. *Int. J. Eat. Disord.* **2014**, *47*, 630–643. [\[CrossRef\]](#)
32. Deci, E.L.; Ryan, R.M. *Intrinsic Motivation and Self-Determination in Human Behavior*; Springer: New York, NY, USA, 1985.
33. Kass, A.E.; Wilfley, D.E.; Eddy, K.T.; Boutelle, K.N.; Zucker, N.; Peterson, C.B.; Le Grange, D.; Celio-Doyle, A.; Goldschmidt, A.B. Secretive Eating among Youth with Overweight or Obesity. *Appetite* **2017**, *114*, 275–281. [\[CrossRef\]](#) [\[PubMed\]](#)

34. Stice, E.; Agras, W.S.; Hammer, L.D. Risk Factors for the Emergence of Childhood Eating Disturbances: A Five-Year Prospective Study. *Int. J. Eat. Disord.* **1999**, *25*, 375–387. [\[CrossRef\]](#)
35. Sonnevile, K.R.; Rifas-Shiman, S.L.; Haines, J.; Gortmaker, S.; Mitchell, K.F.; Gillman, M.W.; Taveras, E.M. Associations of Parental Control of Feeding with Eating in the Absence of Hunger and Food Sneaking, Hiding, and Hoarding. *Child. Obs.* **2013**, *9*, 346–349. [\[CrossRef\]](#) [\[PubMed\]](#)
36. Fairburn, C.G.; Cooper, Z.; Shafran, R. Cognitive Behaviour Therapy for Eating Disorders: A “Transdiagnostic” Theory and Treatment. *Behav. Res. Ther.* **2003**, *41*, 509–528. [\[CrossRef\]](#)
37. Favieri, F.; Marini, A.; Casagrande, M. Emotional Regulation and Overeating Behaviors in Children and Adolescents: A Systematic Review. *Behav. Sci.* **2021**, *11*, 11. [\[CrossRef\]](#)
38. Braet, C.; Claus, L.; Goossens, L.; Moens, E.; Van Vlierberghe, L.; Soetens, B. Differences in Eating Style between Overweight and Normal-Weight Youngsters. *J. Health Psychol.* **2008**, *13*, 733–743. [\[CrossRef\]](#)
39. van Strien, T.; Cebolla, A.; Etchemendy, E.; Gutiérrez-Maldonado, J.; Ferrer-García, M.; Botella, C.; Baños, R. Emotional Eating and Food Intake after Sadness and Joy. *Appetite* **2013**, *66*, 20–25. [\[CrossRef\]](#)
40. Heatherton, T.F.; Baumeister, R.F. Binge Eating as Escape from Self-Awareness. *Psychol. Bull.* **1991**, *110*, 86–108. [\[CrossRef\]](#)
41. Kowalkowska, J.; Hamulka, J.; Wadolowska, L.; Górnicka, M.; Czarniecka-Skubina, E.; Gutkowska, K. Restrained Eating and Disinhibited Eating: Association with Diet Quality and Body Weight Status Among Adolescents. *Nutrients* **2024**, *16*, 3601. [\[CrossRef\]](#)
42. Ballarin, G.; Gallè, F.; Dinacci, L.; Liberti, F.; Cunti, A.; Valerio, G. Self-Perception Profile, Body Image Perception and Satisfaction in Relation to Body Mass Index: An Investigation in a Sample of Adolescents from the Campania Region, Italy. *Children* **2024**, *11*, 805. [\[CrossRef\]](#)
43. Latzer, Y.; Stein, D. A Review of the Psychological and Familial Perspectives of Childhood Obesity. *J. Eat. Disord.* **2013**, *1*, 7. [\[CrossRef\]](#) [\[PubMed\]](#)
44. Pont, S.J.; Puhl, R.; Cook, S.R.; Slusser, W.; Section on Obesity; Obesity Society. Stigma Experienced by Children and Adolescents with Obesity. *Pediatrics* **2017**, *140*, e20173034. [\[CrossRef\]](#) [\[PubMed\]](#)
45. O’Keeffe, M.; Flint, S.W.; Watts, K.; Rubino, F. Knowledge Gaps and Weight Stigma Shape Attitudes Toward Obesity. *Lancet Diabetes Endocrinol.* **2020**, *8*, 363–365. [\[CrossRef\]](#) [\[PubMed\]](#)
46. Alberti, A.; Araujo Coelho, D.R.; Vieira, W.F.; Moehlecke Iser, B.; Lampert, R.M.F.; Traebert, E.; Silva, B.B.D.; Oliveira, B.H.; Leão, G.M.; Souza, G.; et al. Factors Associated with the Development of Depression and the Influence of Obesity on Depressive Disorders: A Narrative Review. *Biomedicine* **2024**, *12*, 1994. [\[CrossRef\]](#)
47. Sánchez Arenas, J.J.; Ruiz Martínez, A.O. Relationship between Self-Esteem and Body Image in Children with Obesity. *Rev. Mex. Trastor. Aliment.* **2015**, *6*, 38–44. [\[CrossRef\]](#)
48. Pakpour, A.H.; Chen, C.Y.; Lin, C.Y.; Strong, C.; Tsai, M.C.; Lin, Y.C. The Relationship between Children’s Overweight and Quality of Life: A Comparison of Sizing Me Up, PedsQL and Kid-KINDL. *Int. J. Clin. Health Psychol.* **2019**, *19*, 49–56. [\[CrossRef\]](#)
49. Erickson, S.J.; Robinson, T.N.; Haydel, K.F.; Killen, J.D. Are Overweight Children Unhappy? Body Mass Index, Depressive Symptoms, and Overweight Concerns in Elementary School Children. *Arch. Pediatr. Adolesc. Med.* **2000**, *154*, 931–935. [\[CrossRef\]](#)
50. Chen, L.; Liu, Q.; Xu, F.; Wang, F.; Luo, S.; An, X.; Chen, J.; Tang, N.; Jiang, X.; Liang, X. Effect of Physical Activity on Anxiety, Depression and Obesity Index in Children and Adolescents with Obesity: A Meta-Analysis. *J. Affect. Disord.* **2024**, *354*, 275–285. [\[CrossRef\]](#)
51. Stice, E.; Presnell, K. Prevention of Eating Disorders: A Review of Programs and Their Effectiveness. *Clin. Psychol. Rev.* **2007**, *27*, 263–284. [\[CrossRef\]](#)
52. Robert, M.; Allès, B.; Gisch, U.A.; Shankland, R.; Hercberg, S.; Touvier, M.; Leys, C.; Péneau, S. Cross-Sectional and Longitudinal Associations between Self-Esteem and BMI Depends on Baseline BMI Category in a Population-Based Study. *BMC Public Health* **2024**, *24*, 230. [\[CrossRef\]](#)
53. Walters, K.; Chard, C.; Castro, E.; Nelson, D. The Influence of a Girls’ Health and Well-Being Program on Body Image, Self-Esteem, and Physical Activity Enjoyment. *Behav. Sci.* **2023**, *13*, 783. [\[CrossRef\]](#) [\[PubMed\]](#)
54. Fardouly, J.; Diedrichs, P.C.; Vartanian, L.R.; Halliwell, E. Social comparisons on social media: The impact of Facebook on young women’s body image concerns and mood. *Body Image* **2015**, *13*, 38–45. [\[CrossRef\]](#) [\[PubMed\]](#)
55. Birch, L.L.; Ventura, A.K. Preventing Childhood Obesity: What Works? *Int. J. Obes.* **2009**, *33* (Suppl. S1), S74–S81. [\[CrossRef\]](#)
56. Summerbell, C.D.; Waters, E.; Edmunds, L.D.; Kelly, S.; Brown, T.; Campbell, K.J. Interventions for Preventing Obesity in Children. *Cochrane Database Syst. Rev.* **2005**, *3*, CD001871. [\[CrossRef\]](#)
57. Armstrong, N.; Balding, J.; Gentle, P.; Kirby, B. Patterns of Physical Activity among 11 to 16 Year Old British Children. *BMJ* **1990**, *301*, 203–205. [\[CrossRef\]](#)
58. Migueles, J.H.; Cadenas-Sanchez, C.; Lubans, D.R.; Henriksen, P.; Torres-Lopez, L.V.; Rodriguez-Ayllon, M.; Plaza-Florido, A.; Gil-Cosano, J.J.; Henriksen, H.; Escolano-Margarit, M.V.; et al. Effects of an Exercise Program on Cardiometabolic and Mental

- Health in Children with Overweight or Obesity: A Secondary Analysis of a Randomized Clinical Trial. *JAMA Netw. Open* **2023**, *6*, e2324839. [\[CrossRef\]](#)
59. Jerome, G.J.; Fink, T.; Brady, T.; Young, D.R.; Dickerson, F.B.; Goldsholl, S.; Findling, R.L.; Stepanova, E.A.; Scheimann, A.; Dalcin, A.T.; et al. Physical Activity Levels and Screen Time among Youth with Overweight/Obesity Using Mental Health Services. *Int. J. Environ. Res. Public Health* **2022**, *19*, 2261. [\[CrossRef\]](#)
 60. Sampasa-Kanyinga, H.; Colman, I.; Goldfield, G.S.; Janssen, I.; Wang, J.; Podinic, I.; Tremblay, M.S.; Saunders, T.J.; Sampson, M.; Chaput, J.P. Combinations of Physical Activity, Sedentary Time, and Sleep Duration and Their Associations with Depressive Symptoms and Other Mental Health Problems in Children and Adolescents: A Systematic Review. *Int. J. Behav. Nutr. Phys. Act.* **2020**, *17*, 72. [\[CrossRef\]](#)
 61. Deatrick, J.A.; Klusaritz, H.; Atkins, R.; Bolick, A.; Bowman, C.; Lado, J.; Schroeder, K.; Lipman, T.H. Engaging with the Community to Promote Physical Activity in Urban Neighborhoods. *Am. J. Health Promot.* **2019**, *33*, 718–726. [\[CrossRef\]](#)
 62. Wysznińska, J.; Ring-Dimitriou, S.; Thivel, D.; Weghuber, D.; Hadjipanayis, A.; Grossman, Z.; Ross-Russell, R.; Dereń, K.; Mazur, A. Physical Activity in the Prevention of Childhood Obesity: The Position of the European Childhood Obesity Group and the European Academy of Pediatrics. *Front. Pediatr.* **2020**, *8*, 535705. [\[CrossRef\]](#)
 63. Wolnicka, K.; Charzewska, J.; Taraszewska, A.; Czarniecka, R.; Jaczewska-Schuetz, J.; Bieńko, N.; Olszewska, E.; Wajszczyk, B.; Jarosz, M. Intervention for Improvement of the Diet and Physical Activity of Children and Adolescents in Poland. *Rocz. Państw. Zakł. Hig.* **2020**, *71*, 383–391. [\[CrossRef\]](#) [\[PubMed\]](#)
 64. Hynynen, S.T.; van Stralen, M.M.; Sniehotta, F.F.; Araújo-Soares, V.; Hardeman, W.; Chinapaw, M.J.M.; Vasankari, T.; Hankonen, N. A Systematic Review of School-Based Interventions Targeting Physical Activity and Sedentary Behaviour among Older Adolescents. *Int. Rev. Sport Exerc. Psychol.* **2016**, *9*, 22–44. [\[CrossRef\]](#) [\[PubMed\]](#)
 65. Hegarty, L.M.; Mair, J.L.; Kirby, K.; Murtagh, E.; Murphy, M.H. School-Based Interventions to Reduce Sedentary Behaviour in Children: A Systematic Review. *AIMS Public Health* **2016**, *3*, 520–541. [\[CrossRef\]](#) [\[PubMed\]](#)

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Family support and motivational factors in weight loss among children and adolescents—a cross-sectional study

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Damian Frej⁴ and Marta Koparska^{1*}¹Department of Medical Psychology, Faculty of Medicine, Collegium Medicum, University of Rzeszów, Rzeszów, Poland, ²Faculty of Health Sciences and Psychology, Medical College, University of Rzeszów, Rzeszów, Poland, ³Student Research Club "Reh-Tech", Medical College of Rzeszów University, Rzeszów, Poland, ⁴Department of Automotive Engineering and Transport, Kielce University of Technology, Kielce, Poland**Introduction:** Childhood and adolescent obesity is an increasing public health concern. The effectiveness of overweight treatment in this population depends on multiple factors, including the level of motivation, emotions associated with behavioral change, and family support.**Aim:** The aim of this study was to analyze the levels of motivation, emotions, and self-esteem among overweight and obese children and adolescents, and to identify the potential role of family support in the process of changing dietary habits.**Materials and methods:** The study involved 100 participants aged 10 to 18, recruited from three settings: school, hospital, and rehabilitation health resort environments (sanatoria). Inclusion criteria comprised overweight or obesity (BMI $\geq$ 85th percentile), regular school attendance, and parental consent. Exclusion criteria included chronic illness, metabolic or genetic disorders, and pharmacotherapy affecting body weight. A custom-designed questionnaire was used, along with elements of individual interviews. We hypothesized that higher levels of family support would be associated with greater motivation and longer maintenance of healthy lifestyle changes. The analysis focused on the duration of maintaining healthy habits, eating control, self-esteem, and emotions accompanying weight loss. Statistical analysis included significance tests and group comparisons.**Results:** Most participants reported short-term attempts to change habits (1–5 days), and only 16% maintained a diet for 28 days. A significant portion experienced negative emotions such as anxiety, shame, or guilt, particularly among high school students. Additionally, 67% of respondents stated that their body weight influenced their self-perception. A statistically significant relationship was found between BMI category and dissatisfaction with one's weight ($p = 0.0261$). The interviews revealed the critical role of parental attitudes in sustaining the child's motivation.**Conclusion:** The findings highlight the need to include emotional and family-related components in overweight and obesity treatment programs for children. A comprehensive, individualized approach increases the likelihood of lasting lifestyle changes and improved psychological well-being in young patients.

KEYWORDS

childhood obesity, overweight, motivation, family support, self-esteem, healthy eating habits, emotions, health interventions

1 Introduction

Childhood overweight and obesity are currently one of the most serious public health threats in the world, both in highly developed and developing countries. According to the World Health Organisation (WHO), since the 1970s, the rate of obesity among children and young people has increased more than tenfold – from 11 million in 1975 to 124 million in 2016, with an additional 213 million children being overweight (1). It is predicted that by 2050, 15.6% (186 million) of children and adolescents aged 5 to 14 and 14.2% (175 million) of people aged 15 to 24 worldwide will struggle with excess body weight, especially obesity (2). This problem also affects Poland – according to national and European studies, almost 30% of school-age children in our country are overweight or obese (3). These include increased likelihood of developing metabolic syndrome, type 2 diabetes, hypertension and cardiovascular complications, as well as psychosocial consequences such as low self-esteem, depressive symptoms and eating disorders, which may impair social functioning (1, 2).

Childhood obesity is not only an aesthetic or social problem, but above all a significant health risk that can lead to serious and long-term consequences. The most common health effects include type 2 diabetes, hypertension, dyslipidaemia, insulin resistance, cardiovascular disease, obstructive sleep apnoea, and liver and osteoarticular diseases (4–7). What is important is that many of these conditions, which until recently were only seen in adults, are now being diagnosed in children and adolescents. Studies show that overweight children show signs of hypertension, fatty liver and psychosocial complications (8).

In addition to the physical aspects, obesity has a huge impact on the mental and social health of a child. Low self-esteem, stigmatisation, depression, anxiety and social exclusion are just some of the emotional problems that overweight children have to face (9, 10). These phenomena have a negative impact on the socialization and education process, can lead to self-destructive behavior and even suicidal thoughts (11, 12). Childhood obesity also correlates with lower educational and professional achievements in adulthood, as well as with a lower quality of life.

The scientific literature clearly indicates that the causes of childhood obesity are multifactorial and complex. Genetic, environmental, psychological, cultural and behavioral factors are among the main determinants. The lifestyle of the whole family also plays an important role – diet, level of physical activity, family relationships and even sleep patterns (13–15). Risk factors already appear in the prenatal period – these include gestational diabetes, maternal obesity before pregnancy, caesarean section, as well as the use of antibiotics during pregnancy (16). In infancy and preschool age, the impact is influenced by the method of feeding (breastfeeding vs. formula feeding), the quality of the diet, sleep and the rate of weight gain (17).

In the later stages of a child's life, the development of overweight and obesity is influenced by, among other things, poor eating habits (skipping breakfast, snacking, high consumption of sugar and

saturated fats), low physical activity, a sedentary lifestyle and spending long periods of time in front of a screen (18, 19). Peer pressure, food advertising and social media content have also been shown to influence the health choices of children and adolescents (20). The family, school, local environment and health policies form a system of influences that can both support and sabotage efforts to prevent obesity (21).

The problem of obesity does not only affect the national population, but also requires regional analyses. One example is the Podkarpackie Voivodeship, which, despite a relatively low level of urbanization, has alarming rates of overweight and obesity in children. According to reports from the Supreme Audit Office, the problem affects more than 22% of children aged 2–18 (22). In the context of therapeutic and preventive measures, increasing importance is being attached to the issue of motivation. Weight loss, especially in childhood, cannot be achieved solely through restrictive diets or externally imposed physical activity. Effective and lasting changes require the child's emotional involvement, their internal motivation and support from adults – parents, teachers, doctors, psychologists (23, 24). Literature indicates that the higher the level of internal motivation, the greater the chances of success in the weight loss process and maintaining a new lifestyle (25).

Motivation in children is not a homogenous phenomenon – it can be cognitive, emotional or social. Effective motivational strategies include goal-setting techniques, reward systems, adult modelling, group support, multimedia interventions and health apps (26). Social campaigns, school programs and the availability of infrastructure that promotes physical activity (e.g., sports fields, cycle paths, healthy canteens) are also important (27).

Research into the effectiveness of interventions to date shows that the best results are achieved by comprehensive programs lasting at least 6 months, based on cooperation between the family, school and healthcare system. Unfortunately, Poland lacks a nationwide, coherent strategy to combat childhood obesity. Local programs, such as the project for the prevention and early detection of overweight among third-grade primary school pupils, which has been implemented in Rzeszów since 2024, have great potential, but their effectiveness will depend on many factors, including access to specialists, continuity of activities and the level of family involvement.

This study focuses on the analysis of effective methods of shaping the motivation to lose weight among children and adolescents from the Podkarpackie Voivodeship. The aim of the study was to identify the most important factors influencing motivation, to assess the effectiveness of various strategies and to develop practical recommendations for prevention and therapeutic programs. The research was interdisciplinary and included the analysis of medical, psychological, educational and social aspects.

The problem of childhood obesity requires a comprehensive approach that takes into account dietary and physical activity interventions as well as psychological and environmental factors. Strengthening the child's motivation, sense of agency, and engagement in the process of change is of particular importance. Systemic support from the family, school, and professionals can contribute to more

effective prevention and treatment of overweight and obesity among children and adolescents. The present study was designed to investigate motivational and emotional factors connected with weight reduction among overweight and obese children and adolescents, with particular emphasis on the role of family support in this process. The research combined quantitative and qualitative approaches: the quantitative part examined the relationship between BMI, motivation, self-esteem and emotions, while the qualitative part explored the experiences of children and adolescents regarding parental involvement, emotions and barriers to maintaining lifestyle changes. It was assumed that a higher level of family support would be related to greater motivation, longer maintenance of healthy habits and higher self-esteem in overweight and obese children and adolescents.

The aim of the study was to identify motivational factors conducive to weight reduction in 100 children and adolescents with overweight or obesity. The article is structured as follows. The Materials and Methods section describes the study design, research settings, participants, applied tools and statistical procedures. The Results section presents the main findings concerning motivational factors, emotions, self-esteem and the role of family support. In the Discussion, these findings are interpreted in the context of previous literature, with particular attention to the practical implications for prevention and treatment of childhood obesity. The article ends with Conclusions, which summarize the most important results, indicate limitations of the study and outline directions for future research.

The theoretical framework of this study was grounded in Self-Determination Theory (SDT), which differentiates between autonomous and controlled motivation. Autonomous motivation arises from internalized values, personal growth, and perceived competence, whereas controlled motivation is driven by external pressures, expectations, or the desire for approval. According to SDT, behaviors regulated autonomously are more sustainable and adaptive, as they stem from internal commitment rather than external reinforcement. In addition, elements of Social Cognitive Theory (SCT) were considered, emphasizing the role of modeling, self-efficacy, and social support in behavior change. The integration of these perspectives provides a comprehensive understanding of how motivational regulation and family support interact in shaping health-related behaviors among children and adolescents.

2 Materials and methods

The study was designed as a cross-sectional, observational and quantitative-qualitative study. The main objective was to determine the factors influencing the motivation to lose weight in children and adolescents and to assess the effectiveness of selected motivational strategies. Due to the nature of the problem and the need to reach a large group of participants, the method of field research carried out in educational and medical institutions in the Podkarpackie Voivodeship was chosen. The choice of the Podkarpackie Voivodeship was dictated by both the availability of the studied population and the reported high rates of overweight and obesity among children in this region (1). The field research was conducted in primary and secondary schools, pediatric clinics and community centers in Rzeszów and neighboring districts.

The research project took into account the diversity of environments - participants were recruited from both urban and rural

areas, which allowed for a comparison of the impact of socio-economic factors on motivation and health behaviors.

2.1 Ethical aspects

The study was conducted in accordance with all ethical and formal standards. Before the start of the study, the project received a positive opinion from the Bioethics Committee at the Medical University of Rzeszów (approval number: KBET/219/2023). All research procedures were in accordance with the principles of the Helsinki Declaration. Consent to participate in the study was a two-step process: (1) written consent from a parent or legal guardian, and (2) verbal and/or written consent from the child. Participants were informed about the purpose of the study, its course, the possibility of withdrawing at any time, and the guarantee of anonymity. Data was collected and stored in accordance with GDPR regulations, and the results were analyzed in aggregate form.

2.2 Participants

The study was cross-sectional, observational and quantitative-qualitative. It was carried out in 2023–2024 in the Podkarpackie Voivodeship, in south-eastern Poland. The aim of the study was to identify motivational factors conducive to weight reduction among overweight or obese children and adolescents. The participants were recruited from three different environments – educational, clinical and therapeutic – which allowed for a multifaceted analysis of health behaviors and motivation in different socio-health contexts. Participants were recruited and assessed in three different institutional settings, which also served as the research sites: (1) the Secondary School in Tyczyn (educational environment), (2) the 2nd Paediatrics, Endocrinology and Paediatric Diabetology Clinic of the Clinical Regional Hospital No. 2 in Rzeszów (clinical environment), and (3) the Zimowit Health Resort in Rymańów-Zdrój (therapeutic/rehabilitation environment). No participants with chronic illnesses, eating disorders, or pharmacological treatment affecting weight were included.

In each of these facilities, anthropometric measurements and questionnaire surveys were conducted on site, using the same portable, standardized equipment and following identical procedures. This ensured methodological consistency and allowed for valid comparison across settings, while still capturing the diversity of socio-health environments in which children and adolescents function.

Anthropometric measurements were conducted by trained medical staff using portable, standardized equipment (calibrated scales and stadiometers), and the data collection took place in classrooms specially prepared for this purpose. Questionnaires were administered in the same setting immediately after the measurements, under the supervision of the research team, which guaranteed comparable conditions for all participants regardless of recruitment source. This procedure ensured methodological consistency and addressed potential concerns about differences between research sites.

Children and adolescents aged 10 to 18 years were qualified for the study, who met the inclusion criteria:

1. BMI index $\geq$ 85th percentile for age and gender according to WHO standards.

2. No diagnosed metabolic diseases (e.g., type 1 diabetes) or genetic obesity syndromes (e.g., Prader-Willi syndrome).
3. No use of pharmacotherapy affecting body weight.
4. Informed consent by parents/legal guardians and by the child.

Although inclusion targeted youth ≥ 85 th percentile by WHO charts, post-hoc BMI categorisation identified a small subset near the cut-off that fell into normal weight on age/sex-specific recalculation. These cases were retained for comparative tables (Tables 1–5); sensitivity checks restricted to ≥ 85 th percentile yielded the same conclusions.

Ultimately, 100 people (54 girls and 46 boys) were selected for the study, with an average age of 14.6 years ($SD = 2.4$). All 100 participants were included in the subsequent statistical analyses; no cases were excluded due to missing data. The participants came from both urban (51%) and rural areas (49%), which enabled an analysis of the impact of the environment on health behavior. Anthropometric measurements were taken in accordance with current standards – height was measured to the nearest 0.1 cm using a SECA 213 stadiometer, and body weight to the nearest 0.1 kg using a SECA 813 electronic scale. Based on the data obtained, BMI was calculated and compared to the WHO centile charts.

All participants completed a self-developed questionnaire covering sociodemographic information, eating habits, level of physical activity, sleep quality, body image and sources of motivation for weight reduction. In addition, semi-structured interviews were conducted with a subgroup of 50 participants whose answers indicated extremely high or low levels of motivation, in order to deepen the qualitative analysis.

2.3 Process

All measurements were carried out by a qualified and trained team of nutritionists with experience in working with children and young people and in conducting public health research. In order to collect empirical data, a set of standardized research tools was used to

enable a comprehensive assessment of the factors influencing the motivation to lose weight and the lifestyle of the participants.

The main research tool was an original questionnaire developed on the basis of scientific literature and existing, previously verified tools in the field of public health and health psychology. The questionnaire included closed single- and multiple-choice questions, semi-open questions and statements rated on a five-point Likert scale. The questionnaire covered sociodemographic data (age, gender, place of residence, family's financial status, parents' education), lifestyle (eating habits, physical activity, sleep), perception of one's own body weight, level of self-esteem, as well as sources of motivation and barriers in the process of losing weight.

In addition, anthropometric measurements were taken to supplement and verify the declarative data. Height was measured to the nearest 0.1 cm using a SECA 213 stadiometer, and body weight was measured to the nearest 0.1 kg using a SECA 813 electronic scale. The measurements were carried out in all three research settings (school, hospital, rehabilitation center), in light clothing and without shoes, in accordance with measurement standards – the measurements were taken twice and then the results were averaged. The body mass index (BMI) was calculated using the formula: $\text{body mass [kg]} / (\text{height [m]})^2$ and interpreted according to WHO standards – overweight: $\text{BMI} \geq 85$ th percentile, obesity: $\text{BMI} \geq 95$ th percentile.

In order to enrich the quantitative data with qualitative context, semi-structured individual interviews were conducted with a selected group of participants ($n = 50$) who were found to have extremely high or low levels of motivation. These interviews focused on topics such as family and peer relationships, body image, emotional experiences and the perceived effectiveness of weight loss efforts. The combination of quantitative and qualitative methods enabled data triangulation and a more comprehensive understanding of the phenomenon under study.

2.4 Research questionnaire

The questionnaire contained closed questions with single and multiple choice, semi-open questions, and a set of statements

TABLE 1 Respondents' answers to the question "In those moments when you really ate too much, did you ever have the feeling that you could no longer control what and how much you ate?" taking into account BMI.

On those occasions when you have really eaten too much, have you ever had the feeling that you can no longer control what and how much you have eaten?	BMI							
	Underweight		Normal weight	Overweight		Class I obesity		Class II obesity
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Yes	7	100%	37	84%	14	67%	12	71%
No	0	0%	7	16%	7	33%	5	29%
Chi-square	$\chi^2 = 5.12$			$df = 3$			$p = 0.162$	

n – number of participants; χ^2 – Chi-square value; *df* – degrees of freedom; *p* – significance level; all tests two-tailed.

TABLE 2 Respondents' answers to the question "Does your weight affect the way you think of yourself?" taking into account BMI.

Does your weight affect the way you think of yourself?	BMI							
	Underweight		Normal weight	Overweight	Class I obesity		Class II obesity	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Never	1	14%	7	16%	2	10%	1	6%
Hardly ever	2	29%	6	14%	2	10%	2	12%
Very rarely	1	14%	4	9%	2	10%	3	18%
Rarely	0	0%	6	14%	1	5%	1	6%
Often	1	14%	9	20%	8	38%	4	24%
Very often	1	14%	7	16%	4	19%	1	6%
All the time	1	14%	5	11%	2	10%	5	29%
Chi-square	$\chi^2 = 8.841$			<i>df</i> = 15			<i>p</i> = 0.883	

n = number of participants; χ^2 = Chi-square value; *df* = degrees of freedom; *p* = significance level; all tests two-tailed.

TABLE 3 Respondents' answers to the question "Were you dissatisfied with your weight?" taking into account BMI.

Were you unhappy with your weight?	BMI							
	Underweight		Normal weight	Overweight	Class I obesity		Class II obesity	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Never	1	14%	6	14%	1	5%	0	0%
Hardly ever	3	43%	7	16%	1	5%	1	6%
Very rarely	0	0%	0	0%	1	5%	2	12%
Rarely	1	14%	8	18%	0	0%	0	0%
Often	0	0%	9	20%	7	33%	5	29%
Very often	2	29%	12	27%	6	29%	4	24%
All the time	0	0%	2	5%	5	24%	5	29%
Chi-square	$\chi^2 = 31.326$			<i>df</i> = 18			<i>p</i> = 0.0261	

n = number of participants; χ^2 = Chi-square value; *df* = degrees of freedom; *p* = significance level; all tests two-tailed.

TABLE 4 Respondents' answers to the question "Were you afraid that others would see you eating?" taking BMI into account.

Were you afraid that others would see you eating?	BMI							
	Underweight		Normal weight	Overweight	Class I obesity		Class II obesity	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Never	6	86%	22	50%	1	5%	6	35%
Hardly ever	0	0%	4	9%	1	5%	1	6%
Very rarely	0	0%	3	7%	0	0%	2	12%
Rarely	1	14%	3	7%	2	10%	1	6%
Often	0	0%	7	16%	6	29%	4	24%
Very often	0	0%	1	2%	8	38%	1	6%
All the time	0	0%	4	9%	3	14%	2	12%
Chi-square	$\chi^2 = 21.574$			<i>df</i> = 18			<i>p</i> = 0.0042	

n = number of participants; χ^2 = Chi-square value; *df* = degrees of freedom; *p* = significance level; all tests two-tailed.

rated on a five-point Likert scale, allowing the degree of agreement with the presented statements to be determined. It covered the following topics: sociodemographic data (age, gender, place of residence, family's financial situation, parents' level of education),

lifestyle (daily eating habits, regularity of meals, level of physical activity, length and quality of sleep), health behavior (time spent in front of a screen, participation in sports, dieting), perception of one's own body weight, level of self-esteem, and the main

TABLE 5 Respondents' answers to the question "Did you ever feel uncomfortable or shy about looking at your own body? For example in the mirror, in shop windows, when undressing, or when taking a bath or shower" including BMI.

Did you ever feel uncomfortable or shy about your own body? For example, in the mirror, in a shop window, when undressing or when taking a bath or shower.	BMI							
	Underweight		Normal weight	Overweight	Class I obesity		Class II obesity	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Never	4	57%	11	25%	2	10%	3	18%
Hardly ever	1	14%	4	9%	2	10%	0	0%
Very rarely	0	0%	4	9%	4	19%	3	18%
Rarely	1	14%	6	14%	3	14%	1	6%
Often	0	0%	10	23%	5	24%	3	18%
Very often	0	0%	5	11%	1	5%	3	18%
All the time	1	14%	4	9%	4	19%	4	24%
Chi-square	$\chi^2 = 16,716$			<i>df</i> = 18			<i>p</i> = 0,535	

n – number of participants; χ^2 – Chi-square value; *df* – degrees of freedom; *p* – significance level; all tests two-tailed.

sources of motivation and barriers to taking health-promoting action.

The questionnaire was developed specifically for the purposes of this research but was not entirely custom-made. Its construction was based on a comprehensive review of the scientific literature and existing validated tools in health psychology and research on health behavior in children and adolescents. In particular, the Eating Disorder Examination Questionnaire (EDE-Q), validated and widely applied in Belgium, served as a conceptual and structural reference. Thus, the present study constitutes an initial step toward the cultural and linguistic adaptation of the EDE-Q for the Polish context. In addition, items were formulated to reflect constructs described in theoretical frameworks such as Self-Determination Theory and previous empirical findings on motivational and family-related factors in weight reduction.

Internal consistency of the scales in the present sample was satisfactory (Cronbach's $\alpha = 0.72-0.84$), which indicates acceptable reliability of the instrument. Nevertheless, as the Polish version of the questionnaire has not yet undergone full formal validation, this should be considered a methodological limitation, and the findings should be interpreted with caution.

2.5 Assessment of motivation to lose weight

Adapted elements of the Self-Determination Theory (SDT) developed by Deci and Ryan (6) were used to assess the level of motivation. The following motivations were examined:

- Internal (desire to improve health, well-being, appearance),
- External (pressure from parents, doctors, school environment),
- Amotivation (lack of willingness to take action).

The reference point was the self-assessment scale and the declared readiness to change (stages of change model). Social support (from

parents, peers and school) was also assessed as a potential moderator of the level of motivation. Motivation was assessed in three dimensions: internal motivation, external motivation and amotivation. These were not single answer options, but thematic scales, each consisting of a set of statements rated on a five-point Likert scale (from "strongly disagree" to "strongly agree"). The final score for each dimension was calculated as the arithmetic mean of the relevant items, which allowed us to differentiate between the dominant type of motivation among participants. This approach ensured that motivation was treated as a continuous construct rather than a categorical variable.

Family support was assessed using a set of items completed by parents or legal guardians on behalf of their children. This approach allowed for a consistent and reliable description of the child's family environment and parental involvement in the process of behavior change. The measure covered three dimensions: emotional (expressions of acceptance, understanding and encouragement), practical (joint meal preparation, shared eating and support for physical activity) and informational (providing knowledge and discussions about healthy eating and lifestyle). The overall family support score was calculated as the mean of all items, with higher values indicating stronger parental engagement in supporting the child. This parent-reported measure provided an objective reflection of the actual level of family involvement in promoting healthy behavior change.

2.6 Statistical analysis

All data collected during the study was subjected to statistical analysis using IBM SPSS Statistics version 27.0 and Microsoft Excel 365 spreadsheet. Descriptive statistics were analyzed first, aimed at characterizing the studied population in terms of sociodemographic variables, lifestyle, health attitudes and level of motivation. Arithmetic means, medians, standard deviations, minimum and maximum values, as well as the frequency of

occurrence of individual characteristics were calculated. Categorical data were analyzed by determining percentage distributions.

In order to compare the results between groups (e.g., boys vs. girls, pupils from cities vs. villages, different BMI levels), appropriate statistical tests were used. For qualitative variables, Pearson's chi-square test was used, while for quantitative variables meeting the criteria of normal distribution, the Student's t-test for independent samples was used. In cases where the normality assumption was not met, non-parametric alternative tests were used, such as the Mann–Whitney U test.

In a further step, a logistic regression analysis was carried out to identify independent predictive factors for selected dependent variables, such as the level of motivation to lose weight (high vs. low) and the effectiveness of weight reduction (reduction vs. no reduction). Variables such as age, gender, level of physical activity, social support, self-esteem, time spent in front of a screen, emotional factors and place of residence were taken into account. The results of the regression analysis were presented in the form of odds ratios (OR) with 95% confidence intervals.

The reliability and internal consistency of the scales and sets of questions used to assess motivation and health attitudes were verified using Cronbach's alpha coefficient. The obtained values ranged from 0.72 to 0.84, which indicates the high reliability and usefulness of the research tools. In the case of missing data (the percentage of which did not exceed 3% in any set of questions), the listwise deletion method was used, which allowed for consistency of analyses and avoided errors resulting from data imputation.

All statistical tests were performed with an accepted significance level of $\alpha = 0.05$. The results were considered statistically significant if the p -value was less than 0.05. Where appropriate, the strength of the relationship (e.g., Cramér's V or eta-squared) and effect size were also reported to better interpret the practical significance of the results.

In addition to descriptive statistics and chi-square tests, regression modelling was applied to account for the limited cell sizes in contingency tables. Logistic regression analyses were used to identify predictors of motivation and the effectiveness of weight reduction, treating motivation type and selected behavioral outcomes as dependent variables. This approach allowed for a more robust assessment of the relationships between family support, BMI, self-esteem and other variables. Chi-square tests were therefore used

primarily for preliminary exploration of associations, whereas regression models provided the main basis for statistical inference.

3 Results

3.1 Characteristics of the test group

A total of 100 people aged between 10 and 18 years old took part in the study. The analyses presented in the following subsections were therefore carried out on the entire group of 100 participants. For the sake of clarity and accessibility of the presented data, the full wording of selected survey questions is repeated in the Results section. This approach was adopted deliberately to ensure that all readers, regardless of their familiarity with the questionnaire, can easily interpret the finding. They met the inclusion criteria, which included being diagnosed as overweight or obese according to the WHO classification (BMI above the 85th percentile for a given age and gender). It should be noted that in the present analysis BMI values were used as the primary anthropometric indicator. However, in pediatric populations, BMI z-scores or BMI percentiles are more appropriate measures as they account for age- and sex-specific developmental trajectories. These indices were not included in the current analysis but will be incorporated in future work to provide a more accurate assessment of weight status in children and adolescents.

The largest group consisted of 38 students from the Secondary School in Tyczyn (38% of the total sample). The other two groups were equal in terms of the number of respondents – 31 people each came from the Clinical Regional Hospital No. 2 in Rzeszów and the Zimowit Spa Hospital in Rymanów-Zdrój. The characteristics of the respondents according to the facility are presented in Table 6.

The average age of the participants was 14.6 years (SD = 2.4). The youngest participants in the study were 10 years old (mainly in the group of hospital patients), while the oldest were 18 years old (in the high school group). Broken down by institution, the high school students were on average 16.5 years old, the patients in the hospital in Rzeszów 13.2 years old, and the people staying at the health resort 14.1 years old. These data show that the study covered key developmental periods, such as late childhood, adolescence and early youth, which are particularly important in shaping eating habits and attitudes towards health.

TABLE 6 Characteristics of respondents by site.

Parameter	Secondary school in Tyczyn	Clinical Regional Hospital No. 2 in Rzeszów	Zimowit Health Resort Hospital in Rymanów-Zdrój	Total/Overall average
Number of participants	38	31	31	100
Average age (years)	16.5	13.2	14.1	14.6
Number of girls	20	18	16	54
Number of boys	18	13	15	46
Number of people from cities	21	18	12	51
Number of people from villages	17	13	19	49
Average body weight (kg)	79.2	72.8	76.4	76.1
Average height (cm)	171.3	162.5	165.8	166.5
Average BMI (kg/m ²)	26.9	27.6	27.8	27.4

Fifty-four girls (54%) and 46 boys (46%) took part in the study. The gender ratio was relatively balanced in all facilities, which enabled intergroup comparisons without significant distortions due to unequal numbers. Girls slightly dominated the hospital and spa group, while the high school had an almost equal proportion of both genders.

The respondents came almost equally from urban (51%) and rural (49%) areas, which allowed for an analysis of the impact of the living environment on eating habits, the level of physical activity and the perception of the need to change body weight. The group of high school students was dominated by city dwellers, while in the spa town there was a noticeable predominance of patients from rural areas, which may be due to the profiles of the children referred there.

The average body weight of the subjects was 76.1 kg, with a minimum value of 58.5 kg and a maximum value of 103.4 kg. The highest average body weight was recorded among high school students (79.2 kg), which may be related to their more advanced age and puberty. In contrast, the lowest average body weight was recorded for hospitalized children at 72.8 kg.

The average height of the participants was 166.5 cm, with the tallest being high school students (171.3 cm) and the shortest being patients at the hospital in Rzeszów (162.5 cm), which is consistent with the age of the participants.

The average BMI for the whole group was 27.4 kg/m², which qualifies as overweight according to WHO standards, bordering on obesity. In the individual groups, the BMI values were slightly higher in the medical facilities than in the secondary school, which may be related to the more severe severity of the problem among children referred for treatment or rehabilitation. The highest average BMI was recorded in the spa group - 27.8, which may indicate the presence of cases of morbid obesity.

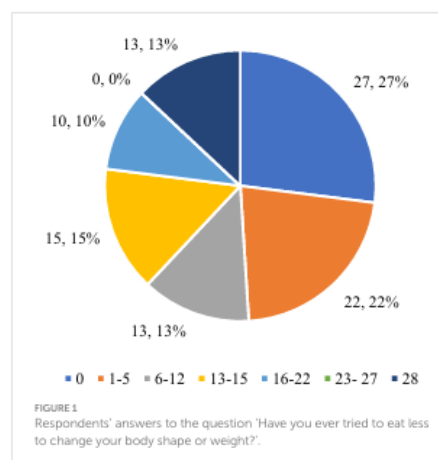
3.2 Respondents' answers

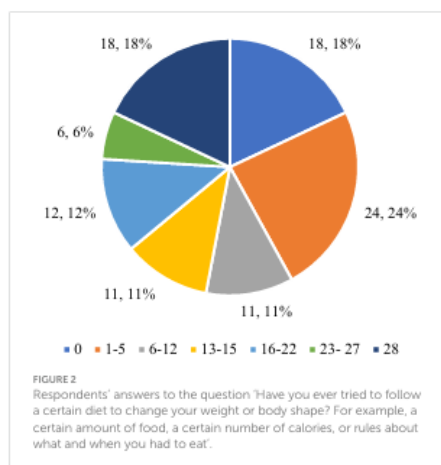
When asked, "Have you ever tried to eat less to change your figure or lose weight?" the respondents gave a variety of answers, which can be analyzed in detail both numerically and in percentage terms. The largest group, 27 people (34.18%), answered that they had not tried to eat less at all. This means that more than a third of the respondents did not take any dietary measures to change their figure or weight. This may suggest a lack of awareness of the problem, lack of motivation, or a preference for methods other than reducing the amount of food consumed. Another significant group are people who have tried to restrict their food intake for 1–5 days – 22 respondents (27.85%). This result suggests that almost one third of the respondents made attempts to reduce their food intake, but these were short-term interventions that probably did not have lasting effects. Thirteen people (16.46%) declared that they tried to eat less for 6–12 days. This indicates that some respondents made moderate efforts to change their figure, but these attempts were also not very long-lasting, which may indicate difficulties in maintaining motivation. The group that restricted food for 13–15 days consisted of 15 people (18.99%). Compared to previous results, these people took more decisive action towards changing their diet, which may suggest greater commitment to the weight loss process. Ten respondents (12.66%) tried to limit food intake for 16–22 days, which shows even greater consistency in their actions. Although they represent a smaller part of the surveyed group, it can be seen that these efforts were more persistent. It is worth noting that

none of the respondents (0%) declared that they had tried to restrict food for 23–27 days, which indicates a clear break in the number of days of the attempts.

Among the participants, 13 individuals (16.46%) declared that they had restricted food intake for a full 28 days, which represented the longest period of using this strategy within the studied group and indicates a relatively high level of consistency in their actions. The majority of respondents (around 66%) have attempted to restrict their food intake, however, these were mostly short-term interventions (up to 15 days). Only 16.46% of respondents consistently restricted their food intake for a whole month, which indicates the difficulty of maintaining a long-term diet. These results show that although there is motivation to reduce food intake in order to change one's body shape, it is often short-lived and inconsistent. Figure 1 shows the respondents' indications regarding the question "Have you tried to eat less to change your body shape or weight?"

The analysis of the respondents' answers to the question "Have you tried to follow certain dietary rules to change your weight or body shape?" For example, a certain amount of food, a certain number of calories, or rules about what and when you had to eat" provides information on the respondents' attempts to follow dietary rules. The respondents' answers to the question "Have you tried to follow certain dietary rules to change your weight or body shape?" For example, a certain amount of food, a certain number of calories, or rules about what and when you had to eat" They are presented in Figure 2. The results allow for numerical and percentage analysis. Eighteen respondents (22.78%) stated that they had not tried to follow any dietary rules (0 days). This is a relatively small proportion of the respondents, which indicates that the majority of people took measures to follow certain dietary rules in order to change their weight or figure. This means that a large proportion of respondents were aware of the need to change their eating habits. Twenty-four people (30.38%) stated that they had tried to follow dietary rules for 1–5 days. This is the largest group, which suggests that a significant proportion of respondents made short-term attempts to introduce





dietary rules, but lacked the consistency to continue them for a longer period of time. Eleven people (13.92%) followed the nutritional rules for 6–12 days. This result indicates a moderate commitment of this group to the application of nutritional rules, although these were not long-term attempts. Eleven respondents (13.92%) declared that they had followed the rules for 13–15 days, which indicates a similar number of people as in the group following the rules for 6–12 days. This means that a certain proportion of the respondents made more consistent attempts to change their eating habits. Twelve respondents (15.19%) tried to follow the rules for 16–22 days, which indicates greater consistency in adhering to the nutritional rules than for shorter periods. Six people (7.59%) declared that they followed the rules for 23–27 days. This is a relatively small group, but it shows that some people managed to persevere for a longer period of time. Eighteen people (22.78%) answered that they followed the nutritional rules for a full 28 days, which is the second largest group after people who followed the rules for 1–5 days. This result indicates that almost 23% of the respondents were able to consistently follow certain dietary rules for a whole month, which proves their motivation and commitment to the process of changing their body shape.

The largest proportion of respondents (30.38%) tried to follow the nutritional rules for a short period (1–5 days), which may indicate initial motivation that quickly faded. However, a similarly large group (22.78%) was able to maintain the dietary rules for a full 28 days, which shows that some respondents were very consistent and motivated to change their eating habits. The other groups that declared adherence to the rules for longer periods (6–12, 13–15, 16–22 days) together make up about 42.03% of the respondents, which suggests that many people took action but had difficulty maintaining it for a whole month. The 7.59% of respondents who persevered for 23–27 days indicates that a small group was very close to fully implementing the rules, but for various reasons was unable to persevere to the end. Overall, the data shows that most of the participants tried to follow the nutritional rules, but only a small

group was motivated enough to follow these rules for a longer period of time.

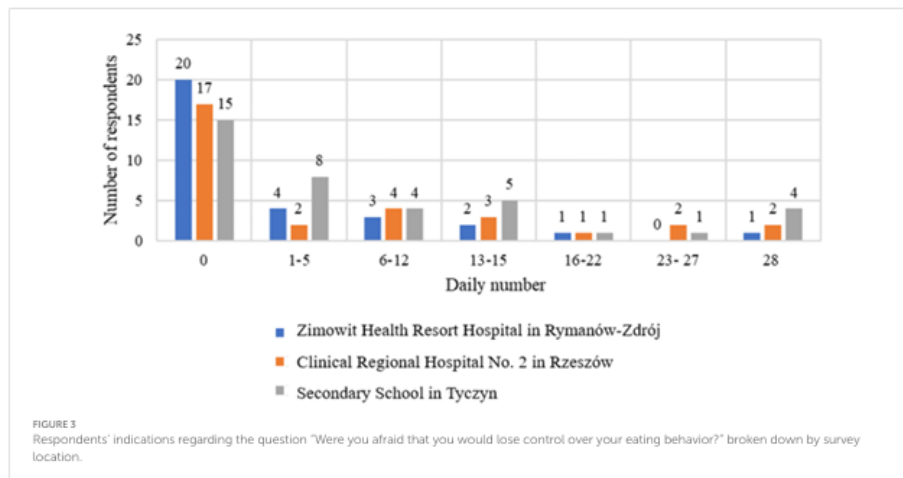
Figure 3 shows the respondents' answers to the question "Were you afraid of losing control over your eating behavior?" broken down into three survey locations: the Zimowit Health Resort Hospital in Rymanów-Zdrój, the Clinical Regional Hospital No. 2 in Rzeszów and the Secondary School in Tyczyn. The analysis of the results shows differences in the perceived fears of losing control over eating in individual groups. In the Zimowit Health Resort Hospital in Rymanów-Zdrój, 20 respondents (58.82%) declared that they were not afraid of losing control over their eating behavior (0 days). This means that the majority of patients felt confident in managing their eating habits and had no serious fears of losing control. Four people (11.76%) feared losing control for 1–5 days, which indicates occasional, short-term fears. Three people (8.82%) had these fears for 6–12 days, and two people (5.88%) stated that they had these fears for 13–15 days, which indicates longer but shorter episodes of anxiety. One person (2.94%) feared losing control for 16–22 days, and one person (2.94%) struggled with these fears for a full 28 days.

At the Clinical Regional Hospital No. 2 in Rzeszów, 17 respondents (53.13%) declared that they did not fear losing control over their eating behavior (0 days), which suggests that more than half of the patients from Rzeszów did not have significant fears related to losing control over eating. Two people (6.25%) were afraid for 1–5 days and four people (12.50%) for 6–12 days, which suggests moderate anxiety in this group. Three people (9.38%) had fears for 13–15 days, and one person (3.13%) struggled with fears for 16–22 days. Two people (6.25%) had fears for 23–27 days, and two people (6.25%) for a full 28 days, which indicates more intense anxiety in some patients.

At the Secondary School in Tyczyn, 15 respondents (40.54%) declared that they were not afraid of losing control over their eating behavior (0 days). This is the lowest percentage among the surveyed groups, which suggests that the majority of students had some concerns about controlling their eating habits. Eight people (21.62%) had concerns for 1–5 days, and 4 people (10.81%) for 6–12 days, which indicates moderate anxiety in this group. Five people (13.51%) had concerns for 13–15 days, which indicates more frequent anxiety among students. One person (2.70%) feared losing control for 16–22 days, and one person (2.70%) had concerns for 23–27 days. Four people (10.81%) declared that they feared losing control for a full 28 days, which is the highest percentage in this category among all groups.

The highest number of people who were not afraid of losing control over their eating behavior came from the Zimowit Health Resort Hospital in Rymanów-Zdrój (58.82%) and the Clinical Regional Hospital No. 2 in Rzeszów (53.13%), which suggests that patients from these facilities were less likely to experience fears of losing control over their eating. At the Secondary School in Tyczyn, only 40.54% of students did not have such fears, which suggests that students were more likely to experience fears of losing control over their eating behavior. The highest number of people who feared losing control for a full 28 days came from Tyczyn (10.81%), which indicates that the students at this school more often struggled with intense fears regarding their eating habits compared to hospital patients, where such fears were less common.

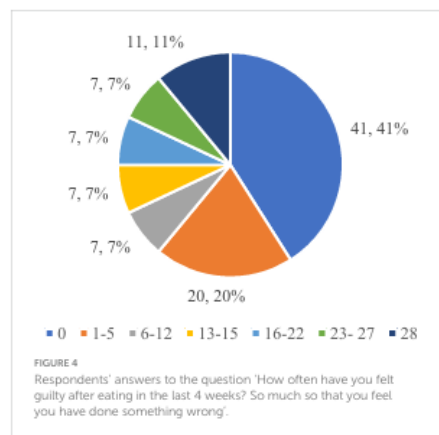
Figure 4 shows the respondents' answers to the question "How often in the last 4 weeks have you felt guilty after eating? So much so that you felt you had done something wrong," which allows us to



assess how often the respondents felt guilty after eating. Forty-one respondents (51.90%) stated that they never felt guilty after eating (0 days). This is the largest group, which suggests that for the majority of respondents, eating did not involve feelings of guilt or a sense of having done something wrong. This means that food was not a source of emotional difficulties for this group. Twenty people (25.32%) admitted that they felt guilty for 1–5 days, which means that for this group guilt occurred occasionally and was not a regular problem. These people had such thoughts rarely and they were not a dominant element of their eating experiences. 7 respondents (8.86%) admitted to feeling guilty for 6–12 days, which suggests that for this group, guilt after eating was a more noticeable problem, although not an everyday one. Seven people (8.86%) said they felt guilty for 13–15 days, which means that these thoughts were more regular and occurred for almost half a month. Seven people (8.86%) admitted to feeling guilty for 16–22 days, which indicates that for this group, feeling guilty after eating was a problem lasting for most of the month. Seven people (8.86%) stated that they felt guilty for 23–27 days, which means that for this group, feeling guilty after eating was an almost daily problem. The largest group after those who never felt guilty is made up of 11 people (13.92%) who admitted that they felt guilty after eating every day for a full 28 days. This means that for this group, eating caused a constant feeling of guilt, which may indicate more serious emotional problems related to eating and the perception of their weight.

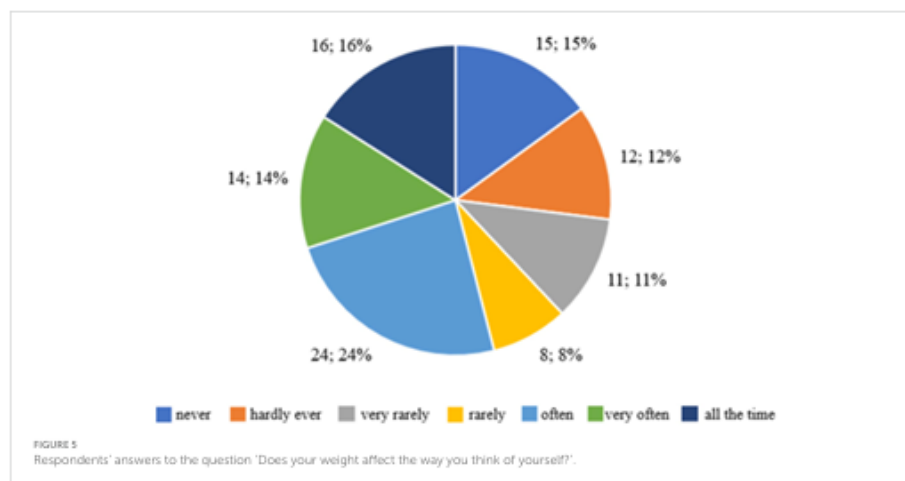
The largest proportion of respondents (51.90%) never felt guilty after eating, suggesting that food was not a source of stress or a sense of doing something wrong for them. However, 13.92% of respondents felt guilty after eating every day for a full 28 days, indicating strong and regular emotional difficulties related to food. The remaining people felt guilty with varying frequency (1–27 days), which suggests that for many respondents, eating was associated with guilt, albeit to varying degrees and with varying intensity.

Figure 5 shows the respondents' answers to the question "Does your weight influence the way you think of yourself?", which allows us to assess how often body weight affects respondents' self-esteem



and thoughts about themselves. Fifteen respondents (19%) answered that their weight never influences how they think of themselves, which means that for this group, weight does not play a role in their self-perception. Twelve people (15%) admitted that weight almost never affects their self-esteem, which means that weight has little impact on how they think of themselves. Eleven respondents (13.92%) stated that weight very rarely affects their self-image, which suggests that although weight does play a role in their self-esteem, it is not a frequent one. Eight people (10.13%) answered that weight rarely influences their thoughts, which means a moderate impact of weight on self-perception.

However, 24 people (30.38%) admitted that weight often influences the way they think about themselves, which means that for this group, weight is an important element of their self-esteem.



Fourteen respondents (17.72%) stated that weight very often influences their thoughts, which indicates that weight has a regular and significant impact on their self-esteem. Furthermore, 16 people (20.25%) admitted that weight influences their self-perception all the time, which means that for this group, weight is the dominant factor shaping their self-esteem.

The majority of respondents (67.72%) stated that weight affects their thoughts about themselves to varying degrees – from 'often' to 'all the time'. This means that for many respondents, body weight plays an important role in shaping their self-esteem. On the other hand, 32.28% of respondents declared that weight affects their self-image rarely or never, which indicates that for this group, weight is not a key element in the context of their self-perception.

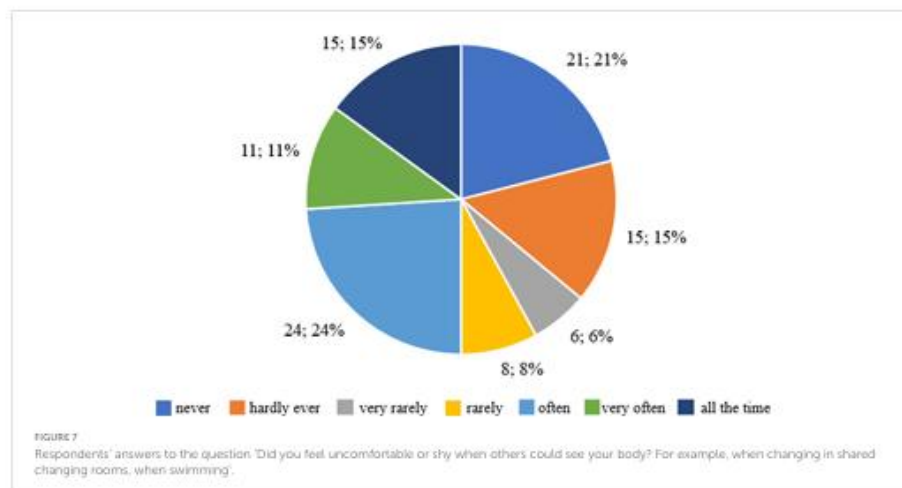
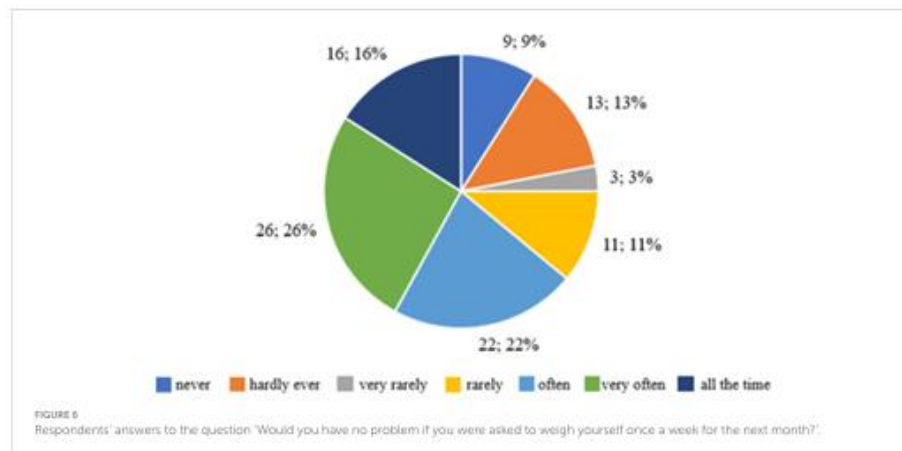
Figure 6 shows the respondents' answers to the question "Would you have no problem if you were asked to weigh yourself once a week for the next month?" which allows us to assess how the respondents perceive regular weighing and any possible discomfort associated with it. Nine respondents (11.39%) stated that they would never have a problem with weighing themselves regularly once a week for a month, which means that for this group, weight control would not cause any difficulties. Thirteen people (16.46%) admitted that they would almost never have a problem with it, which suggests that weighing would only cause occasional discomfort. Three respondents (3.80%) stated that they would very rarely have difficulties with weighing, which means that the impact of this activity would be minimal. Eleven people (13.92%) declared that they would rarely have a problem with regular weighing, which indicates a moderate level of discomfort. Twenty-two people (27.85%) admitted that they would often have difficulties with regular weighing, which suggests that for this group, weekly weighing would cause significant stress. Twenty-six respondents (32.91%) declared that they would very often have a problem with weighing themselves, which indicates that they would regularly struggle with discomfort during this activity. Finally, 16 people (20.25%) stated that they would have a problem weighing themselves once a week for a

month, which means that for this group, regular weighing would be a constant source of stress and discomfort.

The majority of respondents (72.78%) admitted that regular weighing would make them feel uncomfortable to varying degrees – from 'often' to 'all the time'. This means that many of the respondents would find it difficult to monitor their weight regularly. On the other hand, 27.22% of the respondents stated that weighing would not be a problem for them or would cause only slight discomfort.

Figure 7 shows the respondents' answers to the question about the level of discomfort associated with the perception of their own body in various situations, such as looking at themselves in the mirror, while bathing or undressing. Twenty-one respondents (26.58%) declared that they had never felt uncomfortable or shy about seeing their own body. This means that for this group, the appearance of the body does not cause negative emotions or problems with self-acceptance. Fifteen people (18.99%) admitted that they almost never had such feelings, which suggests that occasional situations of uncertainty may occur, but in general the appearance of the body is not a source of discomfort for them. Six respondents (7.59%) stated that they very rarely felt uncomfortable with their body, which means that negative feelings occurred rarely and were of little importance. Eight people (10.13%) stated that they rarely felt uncomfortable with their body image, which suggests moderate problems with accepting their appearance. Twenty-four respondents (30.38%) admitted that they often felt uncomfortable or shy, which indicates clear difficulties with accepting their own body in this group. Eleven people (13.92%) stated that they had these feelings very often, and 15 respondents (18.99%) said that they felt uncomfortable all the time, which means that for this group, the perception of their own body was a constant source of uncertainty and discomfort.

The majority of respondents, 63.29%, felt discomfort related to the perception of their body to varying degrees – from 'often' to 'all the time'. This suggests that for a significant proportion of respondents, body image is a source of negative emotions and difficulties in accepting themselves. On the other hand, 36.71% of respondents said



that such feelings occurred rarely or not at all, which means that for this group, body image was not a cause for insecurity.

3.3 Statistical analysis of the respondents' indications

In order to analyze the impact of the body mass index (BMI) on various aspects related to food control, physical activity and self-perception, the BMI was calculated for all respondents. The study examined how BMI affects responses regarding: difficulty in controlling the amount of food consumed at times when the

respondent felt that they had eaten too much; the frequency of feeling a lack of control over eating in the last 4 weeks; the intensity of physical exercise in the last 4 weeks to avoid gaining weight; the impact of weight on the way they think about themselves; the impact of body shape on the way they think about themselves; the comfort of regularly weighing oneself over the next month; the level of dissatisfaction with one's own weight; the level of dissatisfaction with one's body shape; the fear that others might see one eating; and the comfort or shyness of seeing one's own body in different situations, such as in a mirror, in a shop window, while bathing or changing. For each of these issues, statistical analyses were carried out using the chi-square test, which was calculated using a statistical program. The

purpose of these analyses was to investigate whether there are significant differences in responses depending on the BMI category and to understand how different BMI values affect the perception of one's own body and behaviors related to food control and physical activity.

Table 1 shows the responses regarding the feeling of losing control over the amount of food depending on BMI. The analysis shows that in the group of underweight people, all respondents (100%) felt a loss of control when they ate too much. In the group of people with a normal weight, 84% answered 'YES' and 16% 'NO'. In the overweight group, 67% of respondents felt a loss of control, while 33% did not. In the groups with obesity grades I and II, 71% of the people in both groups felt a loss of control, and 29% did not. It should be noted that 3 people with grade III obesity were assigned to the grade II obesity group because the size of the individual groups was too small to perform a statistical analysis. The results of the Chi-square test showed a value of $\chi^2 = 5.12$ with $df = 3$ and $p = 0.162$. The p -value is greater than the standard significance level of 0.05, which means that the differences in the perception of loss of control over food intake depending on BMI are not statistically significant. This means that although there are differences in the proportions of people experiencing a loss of control in different BMI groups, they are not strong enough to be considered statistically significant.

In the underweight group, the distribution of answers was as follows: 14% answered 'never', 29% 'almost never', 14% 'very rarely', 0% 'rarely', 14% 'often', 14% 'very often' and 14% 'all the time'. In the group with a normal weight, 16% answered 'never', 14% 'almost never', 9% 'very rarely', 14% 'rarely', 20% 'often', 16% 'very often' and 11% 'all the time'. In the overweight group, 10% answered 'never', 10% 'almost never', 10% 'very rarely', 5% 'rarely', 38% 'often', 19% 'very often' and 10% 'all the time'. In the group with grade I obesity, 6% answered 'never', 12% 'almost never', 18% 'very rarely', 6% 'rarely', 24% 'often', 6% 'very often' and 29% 'all the time'. Similarly, in the group with grade II obesity, 6% answered 'never', 12% 'almost never', 18% 'very rarely', 6% 'rarely', 24% 'often', 6% 'very often', and 29% 'all the time'. The Chi-square test showed a value of $\chi^2 = 8.841$ with $df = 15$ and $p = 0.883$. The p -value is greater than the standard significance level of 0.05, which means that the differences in the impact of weight on the way of thinking about oneself depending on BMI are not statistically significant. Despite the noticeable differences in responses between BMI groups, there is insufficient evidence that BMI has a significant impact on the way people think about themselves in relation to their weight.

Table 3 shows the responses to the question about dissatisfaction with one's weight, taking into account different BMI categories. In the underweight group, 14% of respondents stated that they were 'never' dissatisfied with their weight, 43% answered 'almost never', 0% 'very rarely', 14% 'rarely', 0% 'often', 29% 'very often', and 0% 'all the time'. In the group of people with a normal weight, 14% answered 'never', 16% 'almost never', 0% 'very rarely', 18% 'rarely', 20% 'often', 27% 'very often', and 5% 'all the time'. The highest percentage of answers in this group was 'very often' and 'often'. In the group of overweight people, 5% of respondents answered 'never', 5% 'almost never', 5% 'very rarely', 0% 'rarely', 33% 'often', 29% 'very often' and 24% 'all the time'. In this group, the answers 'often', 'very often' and 'all the time' are dominant. In the group with grade I obesity, 0% answered 'never', 6% 'almost never', 12% 'very rarely', 0% 'rarely', 29% 'often', 24% 'very often', and 29% 'all the time'. The majority of people in this group chose the answers 'often',

'very often' and 'all the time'. In the group with grade II obesity, 0% answered 'never', 6% 'almost never', 12% 'very rarely', 0% 'rarely', 29% 'often', 24% 'very often' and 29% 'all the time'. In this group, the answers 'often', 'very often' and 'all the time' are also dominant.

The Chi-square test showed a value of $\chi^2 = 31.326$ with $df = 18$ and $p = 0.0261$. The p -value is less than the standard significance level of 0.05, indicating statistically significant differences in dissatisfaction with one's weight depending on BMI. This means that the level of dissatisfaction with weight varies significantly depending on the BMI category.

Table 4 shows the answers to the question about the fear of others seeing the respondent eating, broken down into different BMI categories. In the underweight group, 86% of respondents said they were 'never' they were worried about others seeing them eat, 0% answered 'almost never', 0% 'very rarely', 14% 'rarely', 0% 'often', 0% 'very often', and 0% 'all the time'. In the group of people with a normal weight, 50% answered 'never', 9% 'almost never', 7% 'very rarely', 7% 'rarely', 16% 'often', 2% 'very often', and 9% 'all the time'. In the group of overweight people, 5% of the respondents answered 'never', 5% 'almost never', 0% 'very rarely', 10% 'rarely', 29% 'often', 38% 'very often' and 14% 'all the time'. In the group with grade I obesity, 35% answered 'never', 6% 'almost never', 12% 'very rarely', 6% 'rarely', 24% 'often', 6% 'very often', and 12% 'all the time'. In the group with grade II obesity, 35% answered 'never', 6% 'almost never', 12% 'very rarely', 6% 'rarely', 24% 'often', 6% 'very often', and 12% 'all the time'.

The Chi-square test showed a value of $\chi^2 = 21.574$ with $df = 18$ and $p = 0.0042$. The p -value is less than the standard significance level of 0.05, indicating that the differences in concerns about whether others will see the respondent eating, depending on BMI, are statistically significant. This means that the level of concern about eating in front of others varies significantly depending on the BMI category.

Table 5 shows the answers to the question about comfort and confidence with one's own body, taking into account the different BMI categories. In the underweight group, 57% of respondents said they 'never' never felt uncomfortable or shy about their body, 14% answered 'almost never', 0% 'very rarely', 14% 'rarely', 0% 'often', 0% 'very often', and 14% 'all the time'. In the group of people with a normal weight, 25% answered 'never', 9% 'almost never', 9% 'very rarely', 14% 'rarely', 23% 'often', 11% 'very often', and 9% 'all the time'. In the group of overweight people, 10% of respondents answered 'never', 10% 'almost never', 19% 'very rarely', 14% 'rarely', 24% 'often', 5% 'very often' and 19% 'all the time'. In the group with grade I obesity, 18% answered 'never', 0% 'almost never', 18% 'very rarely', 6% 'rarely', 18% 'often', 18% 'very often', and 24% 'all the time'. In the group with grade 2 obesity, 18% answered 'never', 0% 'almost never', 18% 'very rarely', 6% 'rarely', 18% 'often', 18% 'very often', and 24% 'all the time'. The Chi-square test showed a value of $\chi^2 = 16.716$ with $df = 18$ and $p = 0.535$. The p -value is greater than the standard significance level of 0.05, which means that the differences in perceived comfort and body confidence according to BMI are not statistically significant. This means that there are no significant differences in the level of discomfort or shyness associated with one's own body depending on the BMI category.

Due to the relatively small cell sizes in some of the cross-tabulations, chi-square tests were applied only as an exploratory tool. To strengthen statistical inference, logistic regression models were additionally estimated, which allowed for identifying predictors of motivation and weight-related behaviors. Future studies with larger

samples will make it possible to apply more advanced modelling strategies (e.g., multilevel regression, structural equation modelling).

To sum up, it should be noted that the study assessed the types of motivation to change eating behavior on the basis of selected items of the author's questionnaire developed on the basis of the assumptions of the Self-Determination Theory (SDT). According to this concept, three main types of motivation are distinguished: autonomous (internal), controlled (external) and amotivation, understood as a lack of readiness to act. The analyzed questions made it possible to determine to what extent decisions regarding weight loss and maintaining healthy eating habits resulted from an internal need for change, and to what extent they were the result of environmental pressure or negative emotions related to body weight. Controlled motivation indicators were considered to be items in which the aim of the action was primarily to improve appearance, reduce body weight or avoid negative evaluation. Questions about trying to eat less or adhering to certain dietary rules reflected externally controlled behaviors, resulting from the need to obtain approval or fear of criticism. This group also included questions related to the fear of losing control over food and the readiness to weigh yourself regularly. The high level of anxiety or discomfort that accompanies these activities indicates the advantage of external regulation over autonomic regulation, in which emotions and social pressure dominate instead of a sense of agency.

Autonomous motivation includes actions taken of one's own free will, resulting from the need for self-development, health and well-being. In this study, it was manifested mainly in questions related to adherence to dietary rules, which for some participants could be an expression of a conscious, planned approach to the process of weight reduction. Motivation understood in this way reflects an internal belief in the meaning of the actions taken, but in the analyzed group it had a limited scope and was often displaced by controlled motives.

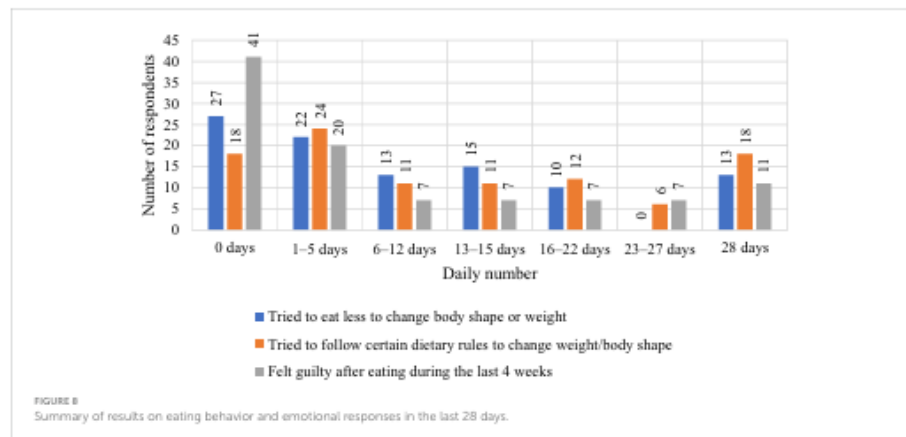
Amotivation, i.e., the lack of an inner sense of influence and meaning of the efforts made, was revealed in questions about the feeling of guilt after eating and the belief that there is no control over one's own eating behavior. Such emotional reactions indicate a low

level of internal regulation and can lead to the perpetuation of a negative cycle of restrictions, frustration and re-breaking the rules.

The answers obtained indicate that in the studied group of overweight and obese children and adolescents, controlled motivation prevailed, i.e., an externally conditioned need to change appearance and avoid negative emotions. Elements of autonomic motivation appeared less frequently and were associated with planned attempts to modify lifestyle. The co-occurrence of amotivation in the form of guilt and helplessness in the face of food, on the other hand, explained the short-term nature of the actions taken and the difficulty in maintaining new habits. The profile of the obtained results confirms that an effective intervention in the field of weight reduction in children requires not only dietary control, but above all strengthening intrinsic motivation and emotional support from the family.

Figure 8 shows the distribution of responses for three variables assessed in terms of the number of days over the past 28 days, including attempts to eat less to change weight or figure, adherence to specific dietary rules, and frequency of experiencing guilt after eating. In the case of attempts to restrict food, 27 people, 27%, did not take any action, 22 people, 22%, declared this behavior for 1–5 days, and only 13 people, 13%, maintained it for the entire month. Similar trends were recorded for dietary adherence – 18 people, 18%, did not follow any rules, 24 people, 24%, followed them for a short time, and only 18 people, 18%, maintained them for 28 days. These data indicate that the majority of participants attempted change only occasionally and for a short time, reflecting the dominance of controlled motivation, based on external pressure and the need for a quick effect. With regard to the emotions that accompany food, 41 people, 41%, never felt guilt after eating a meal, 20 people, 20%, experienced it occasionally, and 11 people, 11%, experienced it daily. A total of 59% of respondents admitted that the feeling of guilt appeared at least once a month, which indicates the presence of amotivation, i.e., a lack of internal regulation and a reduced sense of agency.

To sum up, the data confirm that in the studied group of overweight and obese children and adolescents, controlled motivation, characterized by unstable and short-term involvement, prevailed.



Autonomic motivation, based on the inner need for change and care for health, appeared rarely, while the presence of amotivation in the form of guilt additionally weakened the durability of the actions taken. These results indicate the need to strengthen intrinsic motivation and emotional and family support, which can be conducive to the long-term maintenance of health-promoting habits.

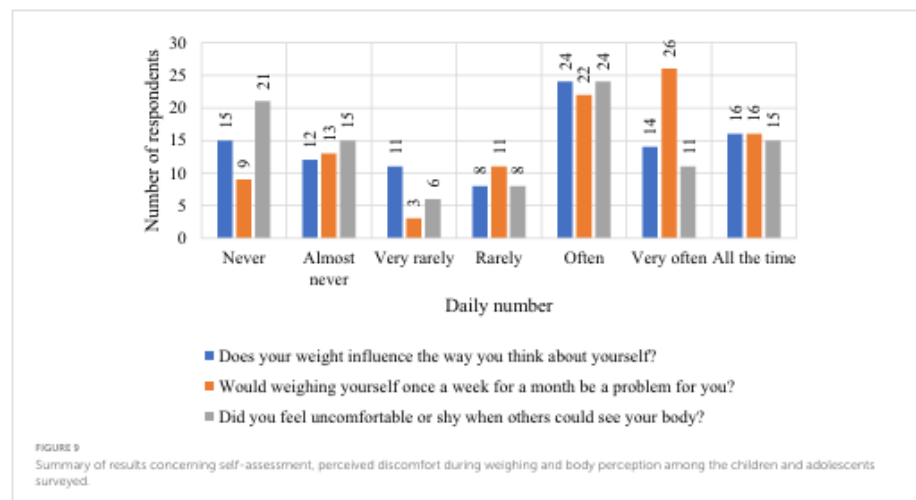
Figure 9 shows the distribution of responses for three variables assessed on the seven-point Likert scale, including the effect of body weight on the way you think about yourself, the discomfort associated with regular weighing, and the feeling of shyness in situations where others could see the respondent's body. When asked about the impact of weight on self-esteem, 15 people, 15%, indicated that weight never affects the way they think about themselves, while 24 people, 24%, said it happens often, 14 people, 14%, very often, and 16 people, 16%, all the time. In total, more than half of the respondents, 54%, felt the impact of body weight on self-esteem, indicating a strong presence of controlled motivation dependent on external evaluation.

When asked about weighing themselves, 9% said it would not be a problem for them, while 64% said they had varying degrees of discomfort, with 26% saying very often and 16% all the time. These results confirm that weight control was associated with negative emotions and tension, typical of extrinsic motivation. When asked about feeling shyness about their own body, 21 people, 21%, had never experienced this condition, while 50% of respondents indicated the answers "often" or "very often." This means that half of the respondents felt discomfort related to body exposure, which also confirms the dominance of controlled motivation of a social nature.

To sum up, the data confirm the predominance of extrinsic motivation in the studied group, based on assessment and environmental pressure, with a limited share of autonomic motivation. The results indicate the need to strengthen intrinsic motivation and psychological activities aimed at reducing emotional tension and improving self-acceptance.

4 Discussion

Our study of the motivation to lose weight among overweight and obese children and adolescents, conducted in three different environments (educational, clinical and spa), identified a number of important relationships. According to the results obtained, most participants made attempts to restrict food and follow dietary rules, but these actions were often short-term. Only 16% of the subjects maintained their diet for a full 28 days, which suggests a limited durability of motivation. Differences in emotional experience were also observed depending on the environment. High school students were more likely to report fear of losing control, feelings of guilt after eating and discomfort with their bodies than medical patients. Over 72% of participants felt uncomfortable with regular weighing and as many as 68% of respondents admitted that their body weight affects the way they perceive themselves. The results of our survey indicate that overweight and obese children have difficulty maintaining healthy eating habits – as many as 31% of respondents said they gave up trying after a few days. This may indicate a low level of internal motivation and a lack of support from the environment, as many of the children's statements also revealed frustration, shame and a lack of belief in their own abilities, which may indicate a low level of internal motivation. In addition, some children indicated that they are unable to follow dietary recommendations without parental support, which emphasizes the role of family relationships in the treatment process. Although statistical analysis showed a significant relationship only between BMI and the level of dissatisfaction with weight ($p = 0.0261$), qualitative results indicate the possible role of emotional support from the family as a protective factor. During individual interviews, participants often spontaneously pointed out the influence of their parents' attitude on their commitment and well-being, which may be a starting point for further research in this area. Therefore, it can be seen that emotional support from parents can play a key role in encouraging children and



adolescents to adopt and maintain healthy eating habits. Children who feel accepted and understood by their loved ones can engage more openly in the process of lifestyle change.

According to current knowledge, therapeutic interventions that take into account the family context are much more effective than interventions based solely on the child's individual involvement (28). Our own research, conducted in three different environments – educational, clinical and spa – clearly shows that the emotional and organizational involvement of parents and their attitudes towards health and lifestyle significantly increase the child's motivation to change and promote the durability of therapeutic effects. These assumptions are consistent with previous literature reports, which indicate that children who receive active family support are more willing to undertake and continue health-promoting activities (29–31). However, the role of parents goes beyond mere control – they also act as role models, influencing the formation of behavior patterns and building a sense of agency and intrinsic motivation in the child. In addition, as shown by the qualitative data, children who reported greater emotional support were less likely to experience anxiety about losing control over eating and less likely to associate self-esteem with body image. These phenomena seem to be important not only from the perspective of the effectiveness of weight loss interventions, but also in the context of the prevention of eating disorders and emotional problems that often coexist with overweight in developmental age. Limiting the number of meals has a negative impact on the mental health of children and adolescents, leading to feelings of guilt (32). To prevent this, parents should set a good example by eating meals together with their children from an early age. This has a positive effect on the development of healthy eating habits (33–35). However, parental pressure – even unintentional – can create an environment in which the child begins to avoid eating, which in turn is associated with a higher risk of developing eating disorders (36).

In a study of Hispanic adolescents aged 10–14 years, they emphasized the importance of parents and children making decisions together as an important protective factor in the context of overweight and obesity. An analysis of data from two studies focusing on the risk of type II diabetes showed that adolescents who rarely or never participated in joint decision-making with their parents had more than three times the risk of obesity (OR = 3.50; 95% CI [1.25–9.83]) compared to their peers, who always made decisions together (37). In addition, many parents perceive childhood obesity as a sign of health, which is due to deeply rooted cultural norms, which can affect children's inability to control their food intake (38, 39).

The data in the table 'Respondents' answers to the question 'Does your weight affect the way you think of yourself?' taking into account BMI' are also noteworthy. The vast majority of overweight and obese children surveyed admit that their weight negatively affects the way they think of themselves. The way a child perceives their own body and their self-esteem are directly related to the atmosphere at home. A lack of support, excessive criticism and comparing the child to others can result in low self-esteem. Emotional support from parents can have a protective function – children who are accepted despite being overweight show greater emotional resilience, cope better with failure and are more committed to the healing process (40). The effectiveness of health measures is higher in children who receive adequate social support, and the family remains the main source of support during the developmental age. Sunnstrand and co-authors emphasized the need to provide parents with adequate support, including issues related to conducting conversations about the child's body weight and shaping

constructive communication in this area (41). Although such conversations are mainly motivated by parents' concern for their child's health, they can be perceived by teenagers as critical, embarrassing or judgmental. As a result, they not only lead to lower self-esteem, but also increase the risk of developing behaviors such as restrictive diets, binge eating or avoiding meals. Research indicates that parents' comments regarding body appearance and weight, especially during adolescence, can reinforce a negative body image and increase susceptibility to eating disorders in adulthood. For this reason, there is an increasing emphasis on the need to support parents in having empathetic, non-judgmental conversations with their children about health and lifestyle (42–46). It is worth noting that independent attempts to introduce dietary restrictions without proper support can lead to frustration, guilt and, consequently, unhealthy eating patterns, as noted by other authors (47–49). Therefore, it is important that interventions concerning obesity in children and adolescents, implemented from an early age, are directed at the whole family, which will help young adults to inhibit obsessive eating behaviors (50, 51). According to research by Skelton et al. active participation of parents in the process of controlling the child's weight can contribute to better results in the reduction of overweight and obesity (52). Chan et al. also note that the role of parents' presence during the weight loss process is an important factor in strengthening desirable eating habits in children (53). Interestingly, the study by Schmied et al. it was shown that low parental readiness to make health changes was a significant predictor of absence from intervention classes (OR = 0.41; $p < 0.05$), while a higher level of family functioning was associated with higher attendance (RR = 1.25; $p < 0.01$) (54).

Our results show that nutritional principles alone are not enough if the child does not feel supported. An effective intervention should combine emotional, educational and environmental support – not just restrictive dietary recommendations. How children eat and how they change their habits depends largely on the family environment, which indicates the importance of a family approach to obesity therapy (55, 56). The effectiveness of the family approach in the treatment of childhood obesity is confirmed by the results of the Fit Family Challenge study, in which primary care physicians implemented a family-centered behavior modification program. The intervention proved feasible and resulted in clinically significant changes in BMI and lifestyle of children, which emphasizes the role of the home environment and the availability of systemic support in obesity therapy (57). In addition, it is worth noting that in our study, children quickly became discouraged from adopting and maintaining healthy eating habits, which indicates the difficulty in maintaining motivation without adequate support from the environment. According to the results of previous studies, the inclusion of family-centered care principles in weight control interventions can not only increase the effectiveness and quality of treatment, but also reduce dropout rates from therapeutic programs (58). One of the positive effects of parents' active involvement in the treatment of childhood obesity is the observed improvement in body mass index (BMI), which emphasizes the importance of a family approach in therapeutic interventions (59–61).

Our study has revealed many important observations, but it also has several significant limitations. Firstly, the use of self-reported questionnaires and participant declarations may introduce cognitive bias and a tendency to provide socially desirable answers. Secondly, the cross-sectional design prevents any firm conclusions about cause-and-effect relationships between the variables. Another limitation is the absence of a fully standardized tool to measure family support, even though the interviews clearly highlighted its relevance. Consequently,

the conclusions concerning the influence of the home environment should be regarded as primarily observational and qualitative.

Furthermore, although the questionnaire was developed on the basis of established theoretical frameworks and validated instruments, most notably the Eating Disorder Examination Questionnaire (EDE-Q) originally validated in Belgium, this study represents only an initial step toward its cultural and linguistic adaptation to the Polish context. The full validation of the Polish version is still ongoing, and therefore the present findings regarding motivational and emotional factors should be interpreted with caution. Finally, the relatively small sample size and the recruitment from three specific environments limit the generalizability of the results to the broader population of overweight and obese children and adolescents.

Despite these limitations, the study provides valuable insights into the interplay between motivation, emotions and family support in the process of lifestyle change among young people, while also pointing to the need for further longitudinal and validation research that includes both the perspectives of children and their caregivers.

Taken together, our findings highlight the central role of both individual motivation and family context in the process of weight reduction among children and adolescents. The importance of parental involvement observed in our study is consistent with evidence showing that family-based interventions lead to significant improvements in BMI and lifestyle outcomes (62, 63). Likewise, the difficulties in maintaining long-term dietary changes reported by participants align with previous research demonstrating that intrinsic motivation is strongly associated with healthier weight trajectories and that interventions grounded in Self-Determination Theory (SDT) foster sustainable behavior change (64–66). These converging data emphasize that nutritional recommendations alone are not sufficient if they are not supported by an appropriate emotional and environmental context. At the same time, methodological aspects require careful consideration: while our analyses provided important insights, future research with larger samples should apply advanced approaches such as multilevel regression or structural equation modelling to capture the complexity of motivational and family-related factors influencing weight management. By combining individual-level motivation with structured family support and more rigorous analytical frameworks, future interventions may achieve stronger and more durable outcomes in the prevention and treatment of childhood obesity.

Another methodological limitation is the use of chi-square tests for some cross-tabulations with multiple categories, which in places resulted in small cell sizes. To minimize this risk, logistic regression models were applied in parallel, providing a more robust statistical basis for interpretation. Nevertheless, future studies with larger samples should employ advanced statistical approaches such as multilevel regression or structural equation modelling to capture the complexity of motivational and family-related factors influencing weight reduction.

In conclusion, the results obtained emphasize the importance of a comprehensive approach to the treatment of overweight and obesity in children and adolescents, in which not only nutritional interventions play a key role, but also emotional support and the active involvement of the family in the process of change.

From a practical perspective, the results suggest that family members should be actively engaged in weight reduction programs. Parental involvement could include setting a positive example in dietary behaviors, encouraging regular physical activity, and providing emotional support during lifestyle changes. Structured family-based interventions, such as joint participation in nutrition workshops, supervised exercise sessions, or family counselling, may increase the

effectiveness of weight management strategies in children and adolescents. Healthcare professionals and educators should therefore consider approaches that integrate families as partners in the therapeutic process, rather than focusing exclusively on the individual child.

Given the cross-sectional nature of the project, the presented results should be interpreted as co-occurring relationships, not cause-and-effect relationships. The analysis does not allow to determine the temporality of phenomena or the direction of interaction between family support, types of motivation and eating behaviors, nor does it exclude the influence of unobserved confounding factors and the possibility of reverse causality. This means that higher family support, stronger controlled motivation or the presence of amotivation are related to the reported behaviors and emotions, but we cannot conclude that they cause them. To verify the directions of dependencies and mediating mechanisms, prospective studies are necessary, preferably longitudinal and interventional, with repeated measurements of support and motivation and objective indicators of health behavior. Complementing the analyses with a broader set of confounding variables and triangulation of data sources could further reduce the risk of bias and strengthen the relevance of the findings. These findings can inform the development of family-centered and school-based obesity interventions that combine nutritional education with motivational and emotional support strategies. Strengthening parental involvement and school-based peer programs could enhance intrinsic motivation and sustainability of healthy behaviors.

5 Limitations

This study has several limitations that should be considered. Firstly, the data were collected using self-reported questionnaires, which may introduce recall bias and a tendency to provide socially desirable responses. Secondly, the cross-sectional design does not allow for causal inferences regarding the observed relationships. Thirdly, although interviews revealed the important role of parental attitudes, no fully standardized instrument was applied to quantify family support, which limits comparability with other studies. Furthermore, while the questionnaire was developed on the basis of validated instruments, most notably the *Eating Disorder Examination Questionnaire (EDE-Q)* originally validated in Belgium, the present work should be regarded as an initial step toward its cultural and linguistic adaptation to the Polish context. A full validation process is still ongoing; therefore, the findings concerning motivational and emotional factors should be interpreted with caution. Finally, the relatively small sample size and recruitment from specific educational, clinical, and rehabilitation settings restrict the generalizability of the results to the broader population of overweight and obese children and adolescents.

6 Conclusion

The results of this study clearly demonstrate that family support, both emotional and organizational, plays a central role in the effectiveness of weight loss interventions among overweight and obese children and adolescents. Participants who experienced acceptance, understanding, and joint engagement from their parents were more motivated, had higher self-esteem, and showed greater persistence in sustaining lifestyle changes. Conversely, children lacking adequate family involvement more often reported difficulties in following

dietary recommendations, feelings of helplessness, and negative emotions related to body weight. Importantly, not only the presence of family support but also its quality and consistency proved to be crucial.

From a practical perspective, these findings highlight the need for systemic approaches to childhood obesity, with interventions directed not only at the child but also at parents and the entire family through education and support programs. Such strategies may enhance the durability of therapeutic effects and improve quality of life in young patients.

It should be emphasized that the study included only basic sociodemographic information such as age, sex, height, weight, and place of residence, which limits the ability to fully interpret the influence of environmental factors on motivation and perceived family support. The lack of detailed data on socioeconomic status, parental education, and family structure prevented adjustment for these potential confounders. Therefore, the results should be considered descriptive and interpreted with caution. Future research should incorporate a broader range of sociodemographic variables to allow for more precise assessment of their role in shaping motivation and the effectiveness of family support in promoting healthy behavior change.

The study also underscores a significant methodological gap in current research: the lack of uniform, standardized tools that integrate psychological, social, and family components alongside somatic parameters. Although our questionnaire was grounded in validated instruments such as the EDE-Q, the Polish adaptation of this tool is still underway. Thus, the present findings should be regarded as preliminary. Future studies should address this gap by employing fully validated measures, larger and more diverse samples, and advanced statistical approaches (e.g., multilevel regression, structural equation modelling) to better capture the complex interplay between motivational, emotional, and family-related factors.

Ultimately, tackling childhood obesity requires an interdisciplinary effort—bringing together medicine, psychology, pedagogy, dietetics, and sociology—with the family positioned as a key partner in both prevention and therapy.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Bioethics Committee of the District Medical Chamber in Rzeszów. The studies were conducted in accordance with the local legislation and

institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

MW: Conceptualization, Investigation, Methodology, Writing – original draft, DO: Formal analysis, Writing – review & editing, IS: Writing – original draft, Writing – review & editing, OB: Writing – original draft, Writing – review & editing, SS: Writing – review & editing, JB: Software, Validation, Writing – review & editing, DF: Resources, Software, Writing – review & editing, MK: Conceptualization, Supervision, Writing – original draft.

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Conflict of interest

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References

1. World Health Organization. Report of the commission on ending childhood obesity. Geneva: World Health Organization (2016).
2. GBDD 2021 Adolescent BMI Collaborators. Global, regional, and national prevalence of child and adolescent overweight and obesity, 1990–2021, with forecasts to 2050: a forecasting study for the global burden of disease study 2021. *Lancet*. 405:785–812. doi: 10.1016/S0140-6736(25)00397-6
3. Instytut Żywności i Żywienia. Stan odżywienia dzieci i młodzieży w Polsce – raport PITNUTS. The nutritional status of children and adolescents in Poland – PITNUTS 2016 report. Warszawa, Polska: Instytut Żywności i Żywienia (2016). 2016 p.
4. Ruze R, Liu T, Zou X, Song J, Chen Y, Xu R, et al. Obesity and type 2 diabetes mellitus: connections in epidemiology, pathogenesis, and treatments. *Front Endocrinol*. (2023) 14:1161521. doi: 10.3389/fendo.2023.1161521
5. Ahmed B, Sultana R, Greene MW. Adipose tissue and insulin resistance in obese. *Biomed Pharmacother*. (2023) 137:111315. doi: 10.1016/j.biopha.2021.111315
6. Mouton AJ, Li X, Hall ME, Hall JE. Obesity, hypertension, and cardiac dysfunction: novel roles of immunometabolism in macrophage activation and inflammation. *Circ Res*. (2020) 126:789–806. doi: 10.1161/CIRCRESAHA.119.312321

7. Nielsen LA, Nielsen TR, Holm JC. The impact of familial predisposition to obesity and cardiovascular disease on childhood obesity. *Obes Facts*. (2015) 8:319–28. doi: 10.1159/000441375
8. Güngör NK. Overweight and obesity in children and adolescents. *J Clin Res Pediatr Endocrinol*. (2014) 6:129–43. doi: 10.4274/jcrpe.1471
9. Sahoo K, Sahoo B, Choudhury AK, Soti NY, Kumar R, Bhadoria AS. Childhood obesity: causes and consequences. *J Family Med Prim Care*. (2015) 4:187–92. doi: 10.4103/2249-4863.154628
10. Rankin J, Matthews L, Cobley S, Han A, Sanders R, Wilshire HD, et al. Psychological consequences of childhood obesity: psychiatric comorbidity and prevention. *Adolesc Health Med Ther*. (2016) 7:125–46. doi: 10.2147/AHMT.S101631
11. Sutarisa S, Devakumar D, Yasuda SS, Das S, Saxena S. Is obesity associated with depression in children? Systematic review and meta-analysis. *Arch Dis Child*. (2019) 104:64–74. doi: 10.1136/archdischild-2017-314608
12. Liu Z, Sun L, Zhang Y, Wang J, Sun F, Zhang Z, et al. The prevalence of underweight and obesity in Chinese children and adolescents with major depressive disorder and relationship with suicidal ideation and attempted suicide. *Front Psych*. (2023) 14:1130437. doi: 10.3389/fpsyg.2023.1130437
13. Mahmood R, Kimonis V, Butler MG. Genetics of obesity in humans: a clinical review. *Int J Med Sci*. (2022) 23:11005. doi: 10.3390/ijms231911005
14. Atanasova P, Kusuma D, Pineda E, Frost G, Sassi F, Miraldo M. The impact of the consumer and neighbourhood food environment on dietary intake and obesity-related outcomes: a systematic review of causal impact studies. *Soc Sci Med*. (2022) 299:114879. doi: 10.1016/j.socscimed.2022.114879
15. Badon SE, Quesenberry CP, Xu F, Avakos LA, Hedderston MM. Gestational weight gain, birthweight and early-childhood obesity: between- and within-family comparisons. *Int J Epidemiol*. (2020) 49:1682–90. doi: 10.1093/ije/dyaa110
16. Najwyższa Izba Kontroli. Informacja o wynikach kontroli – Nadwaga i otyłość dzieci i młodzieży [report on the results of the audit – Overweight and obesity in children and adolescents]; Najwyższa Izba Kontroli. Warsaw, Poland, (2022). Available online at: <https://www.nik.gov.pl/2022/03/dostepnosci-profilaktyki-i-leczenia-otylosci-dzieci-i-młodziezy-narastajacy-problem-nieskuteczne-działania.html> (Accessed April 10, 2025).
17. OECD. The heavy burden of obesity: The economics of prevention. Paris, France: OECD Publishing (2019).
18. Jia P, Shi Y, Jiang Q, Dai S, Yu B, Yang S, et al. Environmental determinants of childhood obesity: a meta-analysis. *Lancet Glob Health*. (2023) 11:e7. doi: 10.1016/S2214-109X(23)00092-X
19. Nieto A, Subrick M. The effect of TV viewing on children's obesity risk and mental well-being: evidence from the UK digital switchover. *J Health Econ*. (2021) 80:102543. doi: 10.1016/j.jhealecon.2021.102543
20. Côtéman PC, Hanson P, van Rens T, Oyebo O. A rapid review of the evidence for children's TV and online advertisement restrictions to fight obesity. *Prev Med Rep*. (2022) 28:101717. doi: 10.1016/j.pmedr.2022.101717
21. Sures-Jaske L, Grunqvist A, Mäki P, Tönnönen H, Laatikainen T. Family socioeconomic status and childhood adiposity in Europe – a scoping review. *Prev Med*. (2022) 160:107095. doi: 10.1016/j.ypmed.2022.107095
22. Najwyższa Izba Kontroli. Sprawozdanie – dostępność opieki dietetycznej w POZ i AOS [Report – Availability of dietary care in primary and outpatient specialist healthcare]; Najwyższa Izba Kontroli. Warsaw, Poland (2021). Available online at: <https://www.nik.gov.pl/kontrola/P/19/061/> (Accessed April 10, 2025).
23. Kral TVE, Moore RH, Chittams J, Jones E, O'Malley L, Fisher JO. Identifying behavioral phenotypes for childhood obesity. *Appetite*. (2018) 127:87–96. doi: 10.1016/j.appet.2018.04.021
24. Wilfey DE, Forde LA, Hampi SE, Dreyer Gillette ML, Staiano AE, Graham AK, et al. Implementation of a scalable family-based behavioral treatment for childhood obesity delivered through primary care clinics: description of the Missouri childhood obesity research demonstration study protocol. *Child Obes*. (2021) 17:S39–47. doi: 10.1089/chi.2021.0175
25. Mason TR, Do B, Dunton G. Interactions of approach motivation and self-regulation in relation to obesity in children. *Eat Weight Disord*. (2021) 26:85–92. doi: 10.1007/s40519-019-00817-2
26. Buchanan L, Anderson E, Xu H, Phongsavan P, Rissel C, Wen LM. Sources of information and the use of mobile applications for health and parenting information during pregnancy: implications for health promotion. *Health Inform J*. (2021) 27:1469458211043146. doi: 10.1177/1460458211043146
27. European Commission. EU Action Plan on Childhood Obesity 2014–2020; European Commission: Brussels, Belgium (2014). Available online at: https://health.ec.europa.eu/system/files/2016-11/childhoodobesity_actionplan_2014_2020_en_0.pdf (Accessed April 10, 2025).
28. Wang Y, Min J, Khuri J, Li M. A systematic examination of the association between parental and child obesity across countries. *Adv Nutr*. (2017) 8:436–48. doi: 10.3945/an.116.013235
29. Lopez NV, Ayala GX, Corder K, Eisenberg CM, Zive MM, Wood C, et al. Parent support and parent-mediated behaviors are associated with children's sugary beverage consumption. *J Acad Nutr Diet*. (2012) 112:541–7. doi: 10.1016/j.jand.2011.11.013
30. Wright DR, Saclens BE, Fontes A, Lavelle TA. Assessment of parents' preferences for incentives to promote engagement in family-based childhood obesity treatment. *JAMA Netw Open*. (2019) 2:e191490. doi: 10.1001/jamanetworkopen.2019.1490
31. Anderson SE, Keim SA. Parent-child interaction, self-regulation, and obesity prevention in early childhood. *Curr Obes Rep*. (2016) 5:192–200. doi: 10.1007/s13679-016-0208-9
32. Pila E, Murray SB, Le Grange D, Sawyer SM, Hughes EK. Reciprocal relations between dietary restraint and negative affect in adolescents recovering treatment for anorexia nervosa. *J Abnorm Psychol*. (2019) 128:129–39. doi: 10.1037/abn0000402
33. Harte S, Theobald M, Trost SG. Culture and community: observation of mealtime enactment in early childhood education and care settings. *Int J Behav Nutr Phys Act*. (2019) 16:69. doi: 10.1186/s12966-019-0838-x
34. Harbeck MJ, Pagani LS. Associations between early family meal environment quality and later well-being in school-age children. *J Dev Behav Pediatr*. (2018) 39:136–43. doi: 10.1097/DBP.0000000000000520
35. Skafida V. The family meal panacea: exploring how different aspects of family meal occurrence, meal habits and meal enjoyment relate to young children's diets. *Soc Sci Health Illn*. (2013) 35:906–23. doi: 10.1111/1467-9566.12007
36. Lydecker JA, O'Brien E, Grilo CM. Parents have both implicit and explicit biases against children with obesity. *J Behav Med*. (2018) 41:784–91. doi: 10.1007/s10885-018-9929-4
37. Rahman A, Fulda KG, Franks SE, Fernando SL, Hubina N, Muzaffar O. How often parents make decisions with their children is associated with obesity. *BMC Pediatr*. (2018) 18:311. doi: 10.1186/s12887-018-1283-8
38. Almutairi SH, Alhamadi SA. Exploring parents' perceptions and experiences of childhood obesity and management in Riyadh, Saudi Arabia: an interpretive qualitative study. *BMC Public Health*. (2024) 24:3452. doi: 10.1186/s12889-024-21014-6
39. Xu H, Wen LM, Rissel C. Associations of parental influences with physical activity and screen time among young children: a systematic review. *J Obes*. (2015) 2015:546925. doi: 10.1155/2015/546925
40. Warnick JL, Stromberg SE, Krietsch KM, Janicke DM. Family functioning mediates the relationship between child behavior problems and parent feeding practices in youth with overweight or obesity. *Transl Behav Med*. (2019) 9:431–9. doi: 10.1093/tbm/taaf010
41. Spennstrand M, Neuman N, Järvelin K, Ek A, Nordin K, Salas XR, et al. "a balancing act": parents' longitudinal perspectives of weight-related discussions with their children following obesity treatment. *BMC Public Health*. (2024) 24:1695. doi: 10.1186/s12889-024-19195-1
42. Neumark-Sztainer D, Bauer KW, Friend S, Hannan PJ, Story M, Berge JM. Family weight talk and dieting: how much do they matter for body dissatisfaction and disordered eating behaviors in adolescent girls? *J Adolesc Health*. (2010) 47:270–6. doi: 10.1016/j.jadhealth.2010.02.001
43. Berge JM, MacLehose R, Loth KA, Eisenberg M, Buchianeri MM, Neumark-Sztainer D. Parent conversations about healthful eating and weight: associations with adolescent disordered eating behaviors. *JAMA Pediatr*. (2013) 167:746–53. doi: 10.1001/jamapediatrics.2013.78
44. Bauer KW, Buchianeri MM, Neumark-Sztainer D. Mother-reported parental weight talk and adolescent girls' emotional health, weight control attempts, and disordered eating behaviors. *J Eat Disord*. (2013) 1:45. doi: 10.1186/2050-2974-1-45
45. Handford CM, Rapee RM, Fardouly J. The influence of maternal modeling on body image concerns and eating disturbances in preadolescent girls. *Behav Res Ther*. (2018) 100:17–23. doi: 10.1016/j.brat.2017.11.001
46. Sevimier E, Mougharbel F, Goldfield GS, Alberga AS. The association between weight-based teasing from peers and family in childhood and depressive symptoms in childhood and adulthood: a systematic review. *Curr Obes Rep*. (2020) 9:15–29. doi: 10.1007/s13679-020-00367-0
47. Ward DS, Welker E, Choute A, Henderson KE, Lott M, Tovar A, et al. Strength of obesity prevention interventions in early care and education settings: a systematic review. *Prev Med*. (2017) 95:S37–52. doi: 10.1016/j.ypmed.2016.09.033
48. Sisson SB, Krumpal M, Arundson K, Castle S. Obesity prevention and obesogenic behavior interventions in child care: a systematic review. *Prev Med*. (2016) 87:57–69. doi: 10.1016/j.ypmed.2016.02.016
49. Golley RK, Hendrie GA, Slater A, Corsini N. Interventions that involve parents to improve children's weight-related nutrition intake and activity patterns – what nutrition and activity targets and behaviour change techniques are associated with intervention effectiveness? *Obes Rev*. (2011) 12:114–30. doi: 10.1111/j.1467-789X.2010.00745.x
50. Gluckman P, Nishtar S, Armstrong T. Ending childhood obesity: a multi-dimensional challenge. *Lancet*. (2015) 385:1048–50. doi: 10.1016/S0140-6736(15)60509-8
51. Berge JM, Bowley S, Trofholz A, Hanson C, Rutter M, MacLehose RE, et al. Childhood obesity and interpersonal dynamics during family meals. *Pediatrics*. (2014) 134:923–32. doi: 10.1542/peds.2014-1936
52. Skelton JA, Vitolins M, Pratt KJ, DeWitt LH, Eagleton SG, Brown C. Rethinking family-based obesity treatment. *Clin Obes*. (2023) 13:e12614. doi: 10.1111/coh.12614
53. Chai LK, Collins C, May C, Brain K, Wong S, Wong S, et al. Effectiveness of family-based weight management interventions for children with overweight and

obesity: an umbrella review. *JBI Database System Rev Implement Rep.* (2019) 17:1341–427. doi: 10.1111/2475-2875.103695

54. Schmied EA, Madanat H, Chuang E, Moody J, Ibarra L, Cervantes G, et al. Factors predicting parent engagement in a family-based childhood obesity prevention and control program. *BMC Public Health.* (2023) 23:457. doi: 10.1186/s12889-023-15359-7

55. Verga SMP, Muzza VA, Teodoro FC, Girardon-Perfina NMC, Marcon SS, Rodrigues ETAF, et al. The family system seeking to transform its eating behavior in the face of childhood obesity. *Rev Bras Enferm.* (2022) 75:e20210616. doi: 10.1590/0034-7167-2021-0616

56. Patrick H, Nicklas TA. A review of family and social determinants of children's eating patterns and diet quality. *J Am Coll Nutr.* (2005) 24:83–92. doi: 10.1080/07315724.2005.10719448

57. Jørgensen BT, Rosen R, Roth S, Cassia L, Dickinson LM, Coombs L, et al. The fit family challenge: a primary care childhood obesity pilot intervention. *J Am Board Fam Med.* (2016) 29:434–43. doi: 10.3122/jabfm.2016.04.150238

58. Simone M, Ferreira P, Luo M, Hoover C, Perkins M, Fiechtner L, et al. Psychometrics of the modified family-centered care assessment short version for childhood obesity. *Health Qual Life Outcomes.* (2024) 22:71. doi: 10.1186/s12955-024-02284-5

59. Trier C, Dahl M, Stjernholm T, Nielsen TR, Bejse C, Forsvig CE, et al. Effects of a family-based childhood obesity treatment program on parental weight status. *PLoS One.* (2016) 11:e0161921. doi: 10.1371/journal.pone.0161921

60. Sato AE, Jelalian F, Hart CN, Lloyd-Richardson EE, Mehlerbeck RS, Neill M, et al. Associations between parent behavior and adolescent weight control. *J Pediatr Psychol.* (2011) 36:451–60. doi: 10.1093/pepsy/pqj105

61. Petraglia J. The importance of being authentic: persuasion, narration, and dialogue in health communication and education. *Health Commun.* (2009) 24:176–85. doi: 10.1080/10410230802676771

62. Aleid M, Alsaheb S, Alsairafi M, Almutairi A, Alharbi M, Alotaibi S, et al. Effectiveness of family-based interventions for childhood obesity: a systematic review and meta-analysis. *Children.* (2024) 11:739. doi: 10.3390/children11060739

63. Bean MK, Mazzeo SE, Stern M, Evans RK, Bryan D, Ning Y. A systematic review of family-based interventions targeting weight loss in adolescents: the role of parental involvement. *Child Obes.* (2020) 16:3–19. doi: 10.1089/chi.2019.0114

64. Junghuelsing J, Schreiber AC, Hahne D, Gunawardena K, Herrmann D, Wunsch R, et al. Intrinsic motivation for physical activity is associated with lower BMI in children. *Pediatr Res.* (2025) 98:532–40. doi: 10.1038/s41390-025-03860-1

65. Henschbach S. Self-determination theory in adolescent obesity prevention: a systematic review. *Int J Environ Res Public Health.* (2025) 22:112. doi: 10.3390/ijerph22010112

66. Alberts J, Zöllner J, Bos S, Faber M, Klein C, Baumeister H. Digital health interventions grounded in self-determination theory: a scoping review. *Front Digit Health.* (2024) 2:1509986. doi: 10.3389/fdgh.2024.1509986

Article

Psychometric Properties and Factor Structure of the Polish ChEDE-Q in a Community Sample of Adolescents: Associations with BMI

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Abstract

Background: The Child and Adolescent Eating Disorder Examination Questionnaire (ChEDE-Q) is a widely used self-report screening instrument for assessing eating disorder psychopathology in young people. Evidence on the psychometric properties of the Polish-language version remains limited. This pilot study evaluated the internal consistency, dimensional structure, and BMI-related convergent validity of the Polish ChEDE-Q in a regional youth sample. **Methods:** A cross-sectional design was used, including 200 participants aged 10–18 years. Item characteristics and data quality were examined. Internal consistency was assessed using Cronbach's alpha and McDonald's omega. Dimensional structure was evaluated with exploratory factor analysis (EFA) based on a polychoric correlation matrix and confirmatory factor analysis (CFA) comparing one-factor, four-factor, and bifactor models. Convergent validity was examined using Spearman's rank correlations with BMI and linear regression analyses with BMI z-scores. **Results:** The global score showed high internal consistency ($\alpha = 0.898$; $\omega = 0.900$). Subscale reliability ranged from acceptable to high. EFA supported a multidimensional solution. In CFA, the bifactor model showed the best fit among the tested alternatives (CFI = 0.742; TLI = 0.681; RMSEA = 0.122; SRMR = 0.084), but none of the tested models achieved fully satisfactory absolute fit. The global score correlated positively with BMI ($\rho = 0.282$; $p < 0.001$) and was significantly associated with BMI z-score in regression analysis ($B = 0.334$; $p < 0.001$). **Conclusions:** The Polish ChEDE-Q global score demonstrated strong internal consistency and preliminary BMI-related convergent validity. The findings provide initial support for a general factor and for using the global score in screening-oriented research; however, the pilot character of the study and the suboptimal absolute fit indices indicate that further validation in larger and more heterogeneous samples is required.

Keywords: ChEDE-Q; child eating questionnaire; eating disorders; children and adolescents; psychometric properties; BMI



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1. Introduction

Eating disorders are among the most serious mental disorders due to their somatic and psychosocial consequences, the risk of a chronic course, and, in some cases, elevated mortality [1]. From a public health perspective, what matters is not only the clinical burden,

but also the costs borne by patients and families and the loss of quality of life, which at the population level translates into a substantial disease burden [2]. Evidence from systematic reviews indicates that the prevalence of eating disorder-related behaviors and symptoms is high, and in many countries, the problem remains significant even outside clinical populations [3]. In recent years, it has additionally been emphasized that disordered-eating symptoms often emerge already during developmental periods, and their global prevalence among children and adolescents constitutes a growing challenge for prevention and early intervention [4]. At the same time, unfavorable body weight trends persist in child and adolescent populations, including increasing rates of overweight and obesity in many regions worldwide, creating a context of heightened risk for problems related to eating and body image [5].

Contemporary theoretical approaches highlight the transdiagnostic nature of eating disorder psychopathology. In Fairburn's transdiagnostic model, a key mechanism shared across diagnoses is the overvaluation of weight and shape in self-evaluation, which promotes dietary restraint, binge-eating episodes, and compensatory behaviors, as well as maintaining symptom cycles through cognitive and behavioral mechanisms [6]. From a measurement perspective, this model supports an approach focused on assessing global eating pathology, understood as a common symptom core across diagnostic categories, while simultaneously monitoring clinically salient behaviors such as binge-eating and loss of control.

A particularly important issue in pediatrics and health psychology is the co-occurrence of excess body weight with behaviors typical of eating psychopathology, including binge-eating and eating with a sense of loss of control. A meta-analysis of children and adolescents with overweight and obesity demonstrated a substantial prevalence of such episodes, which is relevant both for prognosis and for intervention planning [7]. At the same time, a systematic review with meta-analysis suggests that obesity treatment with a dietary component may be associated with a risk of developing or exacerbating eating disorder-related behaviors, reinforcing the need for routine monitoring of disordered-eating symptoms in weight reduction programs for minors [8]. Consequently, in both clinical practice and epidemiological research, the use of screening tools with well-documented psychometric properties, appropriate to age and cultural context, becomes crucial.

One of the most commonly used self-report questionnaires for assessing the severity of eating disorder psychopathology is the Eating Disorder Examination Questionnaire, EDE Q. Given the time burden of the full version, shortened forms have been developed, including the EDE QS, designed as a more economical instrument that is also useful for repeated measurement [9]. At the same time, the literature points to considerable variability in findings regarding the factor structure of the EDE Q across samples, which may affect the interpretation of subscales and the global score. Studies in adolescent populations have reported multidimensional solutions, but not always consistently across countries and samples [10]. This is supported by analyses conducted in European and Asian populations, in which the fit of competing models was tested and limited cross-cultural comparability was noted [11,12]. In parallel, newer psychometric approaches, including item response theory analyses, indicate that some items may differ in diagnostic quality and that results may be best interpreted along a continuum with a strong general factor [13]. As a result, in adolescent research, the unidimensionality of the EDE Q has been debated; some data suggest dominance of a general component alongside relatively weaker stability of the classical subscales, which may support prioritizing interpretation of the global score in screening applications and in monitoring change [10,13].

In response to the need to reduce questionnaire length and incorporate content related to bulimic behaviors, other shortened versions have also been developed, such as the EDE

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Q 13, which combines a brief format with coverage of symptom domains of key clinical importance [14,15]. For screening applications in developmental groups, establishing interpretive thresholds for shortened versions is also important, as demonstrated by studies validating the EDE QS in adolescents and proposing cut-off values for screening [16]. Parallel work has addressed cut-offs in general populations, further enhancing the usefulness of these tools in screening practice [14]. The literature also includes validations of short EDE Q forms in various cultural contexts, incorporating confirmatory factor analysis and Rasch analyses, which additionally underscore the importance of adapting the tool to the language and population [17–19]. With respect to clinical interpretation, the need to develop sex-specific discriminative criteria has also been emphasized, as illustrated by work on cut-offs for men [18].

The adaptation and validation of tools for assessing eating disorders spans many language versions and samples with diverse characteristics. For example, evaluation of the psychometric properties of the Malay version of the EDE Q highlights the importance of adaptation procedures and re-verification of reliability and structure in a new context [20]. Studies conducted in Middle Eastern countries have examined correlates of eating psychopathology in local populations, drawing attention to associations with BMI and body dissatisfaction, which are relevant for interpreting convergent validity [21]. A growing line of research also addresses model fit of the EDE Q in groups differing by sexual orientation, including tests of measurement invariance among men [22,23]. Other studies compare alternative brief models in heterogeneous samples, pointing to the field's rapid development and the risk of interpretive inconsistency in the absence of local validation [24]. In this context, data from men diagnosed with eating disorders are also relevant, as limitations of classical subscale structures can be particularly evident in these populations [25].

Previous studies have shown that EDE-Q interpretation and clinical use may require attention to the characteristics and context of specific underrepresented populations [26–32]. These findings highlight the importance of cautious generalization across groups; however, as such subgroup-specific issues were not examined in the present study, they are not discussed here in detail.

For child and early adolescent populations, however, what is crucial is not only the fit of norms and cut-offs, but above all the appropriateness of item content and response format. To this end, child-adapted versions of the EDE Q have been developed, including the short form ChEDE Q8, intended to enable an economical assessment of key aspects of eating psychopathology in younger respondents [33]. At the same time, cultural adaptations of the tool are being carried out in different language settings, highlighting the importance of verifying reliability and validity in ethnically and socially diverse samples [34]. Psychometric evaluations of language versions of the ChEDE and ChEDE Q, including comparisons of the interview and questionnaire formats, further demonstrate the need to examine method concordance and subscale properties in clinical populations [35]. In pediatric practice, solutions incorporating caregivers' perspectives are also promising, as exemplified by validation of the parent version, ChEDE QP, in parent–child dyads [36].

A key issue remains what exactly the ChEDE Q measures, primarily a global eating disorder pathology consistent with the transdiagnostic approach, or four relatively distinct domains analogous to the classical EDE Q subscales: restraint, eating concern, shape concern, and weight concern. On the one hand, observations of high intercorrelations among domains and the primacy of a general factor in some psychometric analyses support interpreting the global score as the most stable indicator of severity [6,13]. On the other hand, in clinical and preventive applications, the domain profile may add value provided that the multidimensional structure is empirically confirmed in a given population and that the subscales show sufficient reliability and discrimination [35,36]. In practice, this implies

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the need to test competing structural models and to evaluate the utility of the global score and subscales depending on age, sex, BMI, and cultural context.

Against this backdrop, psychometric evaluation of the Polish version of the ChEDE-Q among children and adolescents is particularly important. The lack of local data on reliability, item characteristics, factor structure, and convergent validity limits the responsible use of the tool in research and screening practice. For this reason, conducting a pilot psychometric evaluation in a regional population is justified as a step preceding full validation of the instrument in larger and more diverse samples.

2. Materials and Methods

This section describes the study design, instrument, variables, and analytical strategy. The research materials and anonymized survey data were deposited in the Zenodo repository. The survey included a demographic section covering age, height, body weight, and place of residence, followed by ChEDE-Q items referring to the previous 28 days.

The pilot analyses focused on the psychometric performance of the 22 scored items and the behavioral indicators covering restrictive eating, food-related preoccupation, loss-of-control eating, compensatory physical activity, and weight- and shape-related concerns.

2.1. Study Design and Participants

The present study had a cross-sectional, pilot design and aimed to provide a preliminary psychometric evaluation of the Polish version of the Child and Adolescent Eating Disorder Examination Questionnaire (ChEDE-Q) in a regional adolescent sample. Data were collected in 2023–2024 in the Podkarpackie Voivodeship, south-eastern Poland, within the same fieldwork framework and institutional network as the broader regional youth health project. All participants completed the questionnaire once, anonymously, under standardized conditions.

Participants were recruited from three settings representing different socio-health contexts:

- A secondary school in Tyczyn;
- The 2nd Paediatrics, Endocrinology and Paediatric Diabetology Clinic of the Clinical Regional Hospital No. 2 in Rzeszów;
- Zimowit Health Resort in Rymanów-Zdrój.

Recruitment was conducted on site with the cooperation of school staff, clinicians, and personnel involved in youth health promotion activities. Adolescents and their caregivers were informed about the aim and procedure of the study, and those who agreed participated during scheduled assessment sessions organized at the recruitment sites. Because recruitment included both educational and health-related settings, the sample should be interpreted as a regional mixed-setting field sample rather than as a strictly population-representative community sample. This recruitment strategy also helps explain the relatively high BMI values observed in the sample, as adolescents with overweight or obesity were more likely to be represented in the clinical and therapeutic settings.

The target age range for the study was 10–18 years, and only participants within this range were included in the final analyses. This age criterion was applied consistently during data qualification and should be reported uniformly throughout the manuscript.

The inclusion criteria were as follows:

- Age between 10 and 18 years;
- Sufficient reading and comprehension ability to complete the questionnaire independently;
- Provision of parental or legal guardian consent;
- Adolescent's assent to participate in the study.

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The exclusion criteria were:

- Incomplete questionnaires;
- Missing key data required for calculation of questionnaire scores;
- Response patterns indicating insufficient data quality or internal inconsistency;
- After data screening, 200 complete questionnaires were retained for psychometric analyses.

The study was approved by the Bioethics Committee of the District Medical Chamber in Rzeszów (approval no. 78/2022/B) and was conducted in accordance with the Declaration of Helsinki. Participation was voluntary. All participants and their caregivers were informed about the anonymous character of the survey and the possibility of withdrawing at any stage without consequences. Written informed consent was obtained from parents or legal guardians, and assent was obtained from the adolescents prior to participation. Data were collected and stored in accordance with GDPR requirements and were analyzed only in aggregate form.

2.2. Study Instrument

The study used the Polish version of the Child and Adolescent Eating Disorder Examination Questionnaire (ChEDE-Q) as a self-report instrument designed to assess eating-related attitudes and behaviors, as well as weight- and shape-related concerns in children and adolescents. The questionnaire refers to experiences from the previous 28 days, which provides a standardized recall period for all symptom-related responses and ensures consistency in the reporting of recent behaviors and attitudes. In the present study, the Polish-language version was administered as the target instrument for a preliminary psychometric evaluation in a regional sample of adolescents.

The questionnaire included both demographic and symptom-related components. The demographic section collected basic participant information, including age, sex, place of residence, and self-reported anthropometric data. Place of residence was classified as rural or urban, while body height and body weight were used for subsequent calculation of BMI-based indicators. The main part of the instrument consisted of items assessing the frequency and severity of core eating disorder-related symptoms over the previous 28 days. Most items were scored using seven response categories reflecting either frequency or intensity, depending on the content of the question. These items covered key domains traditionally associated with eating disorder psychopathology, including dietary restraint, eating concern, shape concern, and weight concern. Additional items referred to dissatisfaction with weight and shape, the influence of weight and shape on self-evaluation, and emotional discomfort in situations involving eating or body exposure. The questionnaire also included supplementary questions concerning selected eating-related episodes and compensatory behaviors, such as episodes of eating accompanied by a sense of loss of control and increased physical activity undertaken in response to concerns about weight gain. In line with the psychometric focus of the present study, the analyses concentrated primarily on the scored ChEDE-Q items contributing to the global score and subscale structure.

Anthropometric measurements were obtained on site by trained research staff. Body height was measured to the nearest 0.1 cm using a SECA 213 stadiometer (Seca GmbH, Hamburg, Germany), and body weight was measured to the nearest 0.1 kg using a SECA 813 electronic scale (Seca GmbH, Hamburg, Germany). Measurements were taken in light clothing and without shoes, twice, and averaged for analysis. BMI was calculated as body weight in kilograms divided by height in meters squared. In addition, BMI z-scores were computed as age- and sex-standardized indicators of relative body mass.

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2.3. Study Procedure and Variables

The questionnaire was completed once, anonymously, and under standardized conditions at the recruitment sites described above. All participants responded individually and referred to the previous 28 days in accordance with the questionnaire instructions. Before completing the survey, participants received brief procedural guidance to ensure that they understood the general format of the questionnaire, although no assistance was provided in relation to the substantive content of individual answers. The study was designed as a one-wave assessment, and no repeated measurement was performed.

The variables included in the present analyses comprised sociodemographic, anthropometric, and questionnaire-derived psychometric indicators. Sociodemographic variables included age, sex, and place of residence, with residence coded as rural or urban. Anthropometric variables were based on self-reported body height and body weight. These data were used to calculate body mass index (BMI), expressed as body weight in kilograms divided by height in meters squared, and BMI z-scores, treated as age- and sex-standardized indicators of relative body mass. Psychometric variables derived from the ChEDE-Q included item-level scores, subscale scores, and the global score. In the present study, the global score was treated as the principal indicator of overall eating disorder-related psychopathology. Consistent with the aims and scope of this pilot psychometric report, convergent validity was evaluated primarily in relation to BMI and BMI z-score. This analytical decision was made to preserve coherence between the stated objectives of the study, the reported findings, and the limited but clinically relevant set of external variables included in the final analyses.

2.4. Data Preparation and Statistical Analyses

Before analyses, data quality control was performed at the item and respondent level, including assessment of response completeness, identification of values outside allowable ranges, and detection of coding inconsistencies. For each item, the proportion of missing data was determined, and response distributions were described using measures appropriate for ordinal data, including the median and interquartile range. Floor and ceiling effects were also evaluated at the item level, defined as the proportion of responses in the extreme categories of the scale, 0 or 6. Additionally, item total correlations were analyzed, corrected for the contribution of a given item to the total score, which enabled a preliminary assessment of each item's ability to differentiate levels of the measured trait within the sample.

Items rated on the seven-category response scale were recoded to the 0 to 6 range in accordance with the scoring scheme, enabling computation of quantitative scores. The global score and subscale scores were calculated as means of the items comprising a given domain, whereas behavioral items with dichotomous responses were analyzed separately as indicators of behavior frequency and were reported as counts and percentages. Anthropometric variables included body weight, height, and BMI, calculated as body weight in kilograms divided by height in meters squared. In addition, an age- and sex-adjusted BMI z score was computed and treated as an indicator of weight status relative to developmental norms and used in predictive analyses.

Internal consistency was evaluated for the global score and subscales using Cronbach's alpha and McDonald's omega, with 95-percent confidence intervals estimated using bootstrap. Factor structure was evaluated in two ways. First, exploratory factor analysis, EFA, was conducted using a polychoric correlation matrix, justified by the ordinal nature of the data, and the number of factors was evaluated based on empirical criteria and the interpretability of the solution. Second, confirmatory factor analysis, CFA, was performed to compare the fit of competing structural models of the instrument, including a one-factor

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model, a four-factor model, and a bifactor model. Model fit was reported using CFI, TLI, RMSEA, and SRMR, and conclusions were formulated with consideration of the pilot nature of the sample and limitations resulting from item-level response distributions.

Convergent validity was assessed using Spearman rank correlations between questionnaire scores and BMI and other external variables. Between-group comparisons were treated as exploratory and included analyses of differences by sex, age group, and place of residence, with effect sizes reported as the primary approach to interpreting results. Measurement equivalence across sex was additionally evaluated using a multigroup approach, sequentially testing configural, metric, and scalar invariance, and in the case of failure to meet full scalar invariance, a partial scalar approach was considered.

To better highlight the relationship between the severity of symptoms measured by ChEDE Q and weight status, linear regression analysis was conducted, with BMI z score as the dependent variable and the ChEDE Q global score as the predictor. In the basic model, the effect of the global score on BMI z score was estimated, and in a supplementary analysis, age and sex were included as covariates to reduce the risk of confounding due to developmental and sex related differences. Regression coefficients, B, standard errors, 95-percent confidence intervals, *p* values, and model fit, R-squared, were reported. Model assumptions were verified based on residual analysis and assessment of homoscedasticity, and in the case of deviations, robust standard errors were applied.

Exploratory factor analysis was conducted on a polychoric correlation matrix, which is appropriate for ordinal item responses. Confirmatory factor analyses and multigroup confirmatory factor analyses were estimated using the weighted least squares mean and variance-adjusted estimator (WLSMV), recommended for ordered categorical indicators. This approach was selected because the ChEDE-Q items were scored on ordinal response scales and several items showed marked floor and ceiling effects. Confirmatory models were used to compare the one-factor, four-factor, and bifactor solutions. Model fit was evaluated using the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). In the invariance analyses for ordinal indicators, threshold parameters were examined rather than continuous-item intercepts.

2.5. Ethical Aspects and Limitations

The study was survey-based and anonymous, with no collection of data enabling participant identification. Participation was voluntary. Procedures were conducted in accordance with confidentiality principles and ethical standards appropriate for research involving minors, including locally required parental or legal-guardian consent and participant assent appropriate to age and ability to understand the study information. Study limitations follow from its pilot character. The sample was regional, which limits generalization to the nationwide population. No clinical sample was included; therefore, the instrument's usefulness under diagnostic and therapeutic conditions cannot be directly assessed. Test–retest reliability was not evaluated, which limits inference about measurement stability over time. ROC analysis was not performed; therefore, cut-off points for screening applications were not established. Consequently, the results should be treated as preliminary and requiring confirmation in larger and more diverse samples, ideally including clinical groups and a design allowing assessment of stability and criterion validity.

2.6. Practical Application

The Polish version of ChEDE Q can be used as a screening tool in population-based and community studies conducted among children and adolescents, particularly in situations requiring rapid identification of elevated risk of disordered-eating symptoms and an

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initial assessment of eating psychopathology severity. Given the frequent co-occurrence of excess body weight with loss-of-control eating and other eating disorder-related symptoms, the tool may also be useful in populations with overweight and obesity, for example, in prevention and intervention programs implemented in school settings and within pediatric care. The questionnaire may further support monitoring changes in symptom severity during therapeutic interventions and weight reduction programs, especially when measurement is repeated at subsequent stages, while interpretation should take into account the pilot nature of the available data and the need for further validation, including establishing cut-off points and assessing measurement stability over time.

3. Results

3.1. Sample Characteristics, Data Quality, and Descriptive Results

A total of 200 complete questionnaires were included in the analysis. Sample characteristics are presented in Table 1.

Table 1. Characteristics of the study sample.

Variable	Value
Sample size	200
Gender, girls	108 (54.0%)
Gender, boys	92 (46.0%)
Residence, urban	122 (61.0%)
Residence, rural	78 (39.0%)
Age, years, median [Q1, Q3]	16.5 [14.8, 17.0]
Age, years, mean (SD)	15.68 (2.30)
Height, cm, median [Q1, Q3]	168 [159, 174]
Weight, kg, median [Q1, Q3]	70.0 [60.0, 82.5]
BMI, kg per m ² , median [Q1, Q3]	24.73 [22.51, 30.30]
BMI, kg per m ² , mean (SD)	26.59 (5.94)

Descriptive statistics for the ChEDE-Q global score and subscales are presented in Table 2. Overall, body image-related domains showed higher scores than eating-related domains, with the lowest values observed for eating concern.

Table 2. Descriptive statistics for ChEDE Q scale scores, 0 to 6.

Score	Median [Q1, Q3]	Mean (SD)	Min to Max
Global score	2.34 [1.52, 3.11]	2.32 (1.17)	0.00 to 5.23
Restraint	1.60 [0.80, 3.00]	1.92 (1.41)	0.00 to 6.00
Eating concern	1.33 [0.67, 2.38]	1.57 (1.13)	0.00 to 4.83
Shape concern	3.00 [1.60, 4.60]	3.02 (1.71)	0.00 to 6.00
Weight concern	2.83 [1.67, 4.00]	2.84 (1.49)	0.00 to 6.00

The distribution of the global score is presented in Figure 1, which indicates that scores were concentrated mainly in the moderate range.

Complete data were available for all 22 scored items; therefore, all psychometric analyses were conducted on the full sample. Item-level response distributions showed floor effects for several items, whereas ceiling effects were less frequent. Corrected item-total correlations varied across items, with the weakest association observed for P2 and the strongest for P24. Detailed item characteristics are presented in Table 3.

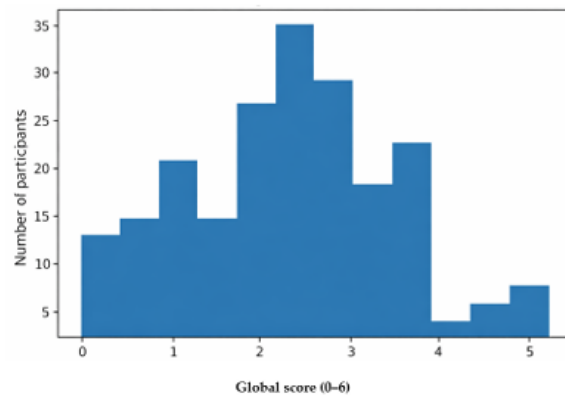


Figure 1. Distribution of the ChEDE Q global score in the study sample.

Table 3. Characteristics of scored items, 0 to 6.

Item	Median [Q1, Q3]	Floor n (%)	Ceiling n (%)	Rho, Item Total
P1	2 [0, 3]	54 (27.0%)	26 (13.0%)	0.54
P2	0 [0, 3]	112 (56.0%)	34 (17.0%)	0.18
P3	1 [0, 3]	76 (38.0%)	30 (15.0%)	0.48
P4	2 [1, 4]	36 (18.0%)	36 (18.0%)	0.36
P5	0 [0, 2]	112 (56.0%)	12 (6.0%)	0.51
P6	1 [0, 3]	82 (41.0%)	10 (5.0%)	0.27
P7	0 [0, 2]	104 (52.0%)	14 (7.0%)	0.33
P8	1 [0, 2]	64 (32.0%)	10 (5.0%)	0.29
P9	0 [0, 2]	104 (52.0%)	8 (4.0%)	0.30
P10	2 [0, 6]	60 (30.0%)	52 (26.0%)	0.61
P11	3 [1, 5]	48 (24.0%)	42 (21.0%)	0.64
P12	2 [1, 4]	48 (24.0%)	28 (14.0%)	0.58
P13	3 [1, 6]	40 (20.0%)	64 (32.0%)	0.58
P14	1 [0, 3]	82 (41.0%)	22 (11.0%)	0.65
P18	4 [1, 5]	30 (15.0%)	32 (16.0%)	0.63
P19	4 [2, 5]	32 (16.0%)	26 (13.0%)	0.68
P20	0 [0, 4]	100 (50.0%)	18 (9.0%)	0.37
P21	4 [3, 5]	18 (9.0%)	32 (16.0%)	0.68
P22	4 [1, 5]	30 (15.0%)	30 (15.0%)	0.71
P23	1 [0, 4]	86 (43.0%)	16 (8.0%)	0.45
P24	3 [1, 5]	46 (23.0%)	30 (15.0%)	0.73
P25	4 [1, 5]	42 (21.0%)	30 (15.0%)	0.52

Note: Floor and ceiling indicate the proportion of responses equal to 0 and 6 points, respectively.

3.2. Psychometric Properties, Internal Consistency and Factor Structure

Internal consistency for the four subscales and the global score was assessed using Cronbach's alpha and McDonald's omega. The global score showed high reliability, whereas subscale reliability ranged from acceptable to high. The strongest reliability was observed for shape concern, while eating concern showed the lowest internal consistency. Detailed results are presented in Table 4.

Exploratory factor analysis was performed using a polychoric correlation matrix. The data were adequate for factor analysis, and parallel analysis supported a three-factor solution. After oblimin rotation, the extracted factors corresponded broadly to body image

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and self-evaluation, restraint and weight/shape concern, and loss of control/cognitive focus on food. Detailed factor loadings are presented in Table 5.

Table 4. Internal consistency of subscales and the global score, bootstrap 95-percent confidence intervals.

Scale	k	Cronbach's Alpha	95-Percent CI Alpha	McDonald's Omega	95-Percent CI Omega
Restraint	5	0.696	[0.618, 0.769]	0.713	[0.642, 0.780]
Eating concern	6	0.651	[0.573, 0.717]	0.657	[0.577, 0.726]
Shape concern	5	0.851	[0.816, 0.890]	0.865	[0.832, 0.898]
Weight concern	6	0.785	[0.734, 0.827]	0.794	[0.747, 0.833]
Global score	22	0.898	[0.877, 0.918]	0.900	[0.879, 0.920]

Table 5. Factor loadings after oblimin rotation, values at or above 0.30 shown, empty cells indicate values below 0.30.

Item	F1	F2	F3
P1		0.76	
P2		0.45	
P3		0.57	
P4		0.65	
P5	0.30		0.41
P6			0.39
P7			0.87
P8			
P9			0.36
P10		0.54	
P11		0.71	
P12		0.39	
P13		0.79	
P14	0.31	0.32	0.40
P18	0.80		
P19	0.73		
P20	0.39		
P21	0.68		
P22	0.78		
P23	0.48		0.35
P24	0.87		
P25	0.84		

Correlations among the extracted factors are shown in Table 6. The strongest association was observed between F1 and F2, whereas the correlation between F2 and F3 was negligible.

Table 6. Interfactor correlations, oblique rotation.

	F1	F2	F3
F1	1.00	−0.52	−0.25
F2	−0.52	1.00	−0.05
F3	−0.25	−0.05	1.00

Convergent validity was evaluated using Spearman's rank correlations between ChEDE-Q scores and BMI and age. Positive associations with BMI were observed for the global score and most subscales, whereas eating concern was not significantly associated with BMI. Age showed weak negative associations with selected ChEDE-Q domains. Detailed results are presented in Tables 7 and 8.

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Table 7. Spearman correlations of ChEDE Q scores with BMI, bootstrap 95-percent confidence intervals.

Score	Spearman Rho	95-Percent CI	p
Global score	0.282	[0.143, 0.406]	<0.001
Restraint	0.339	[0.206, 0.459]	<0.001
Eating concern	0.064	[−0.086, 0.205]	0.370
Shape concern	0.214	[0.068, 0.353]	0.002
Weight concern	0.298	[0.155, 0.429]	<0.001

Table 8. Spearman correlations of ChEDE Q scores with age, bootstrap 95-percent confidence intervals.

Score	Spearman Rho	95-Percent CI	p
Global score	−0.166	[−0.300, −0.031]	0.019
Restraint	−0.082	[−0.217, 0.051]	0.249
Eating concern	0.094	[−0.044, 0.221]	0.187
Shape concern	−0.165	[−0.307, −0.028]	0.019
Weight concern	−0.271	[−0.395, −0.141]	<0.001

A linear regression analysis was performed to examine the relationship between the ChEDE-Q global score and BMI z-score. The global score was a significant predictor in both the univariable and adjusted models. Detailed regression results are presented in Table 9.

Table 9. Linear regression, ChEDE Q global score as a predictor of BMI z score; N equals 200.

Model	Predictor	B	SE	95-Percent CI	p	R Squared
1	ChEDE Q global score	0.334	0.083	0.172, 0.497	<0.001	0.077
2	ChEDE Q global score, adjusted for age and sex	0.295	0.065	0.167, 0.423	<0.001	0.442
2	Age, years	−0.361	0.032	−0.422, −0.299	<0.001	
2	Male sex, versus female	0.363	0.151	0.068, 0.658	0.016	

3.3. Convergent Validity and Additional Analyses

Exploratory analyses examined differences in ChEDE-Q scores by sex, age, and place of residence using the Mann–Whitney U test. No statistically significant sex differences were found for the global score or any of the subscales, and effect sizes were small across domains (Table 10).

Table 10. Comparison of ChEDE Q scores by sex, Mann–Whitney U.

Score	n Girls	Median [Q1, Q3] Girls	n Boys	Median [Q1, Q3] Boys	p	r _{rb}	g
Global score	108	2.25 [1.64, 3.36]	92	2.39 [1.27, 2.77]	0.183	0.11	0.24
Restraint	108	1.70 [0.80, 3.00]	92	1.50 [0.80, 2.80]	0.421	0.07	0.19
Eating concern	108	1.50 [0.67, 2.67]	92	1.33 [0.50, 2.00]	0.096	0.14	0.29
Shape concern	108	3.20 [1.80, 4.60]	92	3.00 [1.60, 4.20]	0.222	0.10	0.18
Weight concern	108	3.08 [1.67, 4.17]	92	2.67 [1.67, 3.67]	0.352	0.08	0.14

For age, the only statistically significant difference was observed for eating concern, which was higher in the older group. No significant differences were found for the remaining domains (Table 11).

Table 11. Comparison of ChEDE Q scores by age, 13 years or younger versus 14 years or older, Mann–Whitney U.

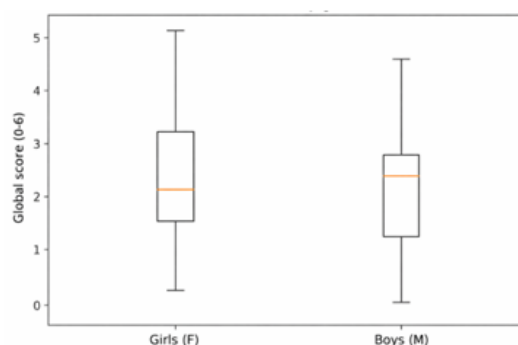
Score	n 13 or Younger	Median [Q1, Q3] 13 or Younger	n 14 or Older	Median [Q1, Q3] 14 or Older	<i>p</i>	<i>r_{rb}</i>	<i>g</i>
Global score	42	2.77 [1.27, 3.00]	158	2.23 [1.64, 3.26]	0.934	0.01	−0.11
Restraint	42	1.40 [0.60, 2.80]	158	1.60 [0.80, 3.00]	0.296	−0.10	−0.18
Eating concern	42	1.17 [0.33, 1.83]	158	1.50 [0.71, 2.62]	0.016	−0.24	−0.45
Shape concern	42	3.20 [1.20, 4.40]	158	3.00 [1.60, 4.60]	0.872	−0.02	−0.05
Weight concern	42	3.50 [2.00, 4.17]	158	2.67 [1.67, 3.67]	0.138	0.15	0.20

No statistically significant differences were found by place of residence, and effect sizes were small across all domains (Table 12).

Table 12. Comparison of ChEDE Q scores by place of residence, city versus rural, Mann–Whitney U.

Score	n City	Median [Q1, Q3] City	n Rural	Median [Q1, Q3] Rural	<i>p</i>	<i>r_{rb}</i>	<i>g</i>
Global score	122	2.45 [1.64, 3.27]	78	2.23 [1.44, 2.94]	0.254	0.10	0.17
Restraint	122	1.60 [0.80, 3.00]	78	1.40 [0.80, 2.75]	0.663	0.04	0.12
Eating concern	122	1.33 [0.67, 2.17]	78	1.33 [0.71, 2.46]	0.945	−0.01	0.02
Shape concern	122	3.20 [1.60, 4.60]	78	2.80 [1.65, 4.40]	0.155	0.12	0.19
Weight concern	122	2.83 [1.67, 4.17]	78	2.83 [1.75, 3.67]	0.225	0.10	0.21

To illustrate distributions by sex, a box plot of the global score is presented in Figure 2. Despite visible median differences, distributions largely overlapped, consistent with the nonparametric test results.

**Figure 2.** ChEDE Q global score by sex.

Behavioral items P15 to P17 were analyzed as dichotomous variables (yes/no). Response frequencies are presented in Table 13, and their graphical comparison is shown in Figure 3. Increased physical activity undertaken to avoid weight gain was the most frequently endorsed behavior (42.0%), whereas episodes of loss of control over eating (23.0%) and being unable to stop eating (20.0%) were reported less often.

Associations of YES responses in items P15–P17 with the global score and BMI are presented in Table 14. For all three items, the global score was significantly higher in participants endorsing the behavior than in those with NO responses, with the strongest effect observed for P15. For BMI, significantly higher values were found in the YES groups

for P15 and P17, whereas no significant difference was observed for P16. Detailed results are presented in Table 14.

Table 13. Frequency of YES or NO responses in behavioral items.

Item	YES n	YES Percent	NO n	NO Percent
P15	46	23.0	154	77.0
P16	40	20.0	160	80.0
P17	84	42.0	116	58.0

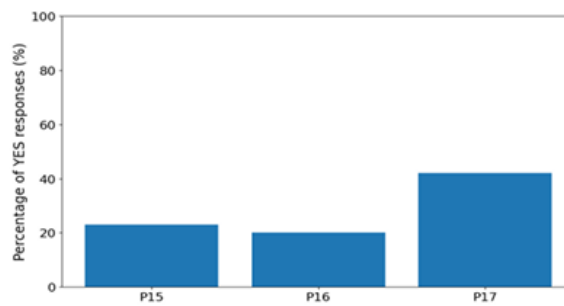


Figure 3. Percentage of YES responses in behavioral items P15 to P17.

Table 14. Associations of behavioral items, YES or NO, with the global score and BMI, Mann–Whitney U.

Item	Variable	n YES	Median [Q1, Q3] YES	n NO	Median [Q1, Q3] NO	p	r _{rb}	g
P15	Global score	46	3.36 [2.56, 3.75]	154	2.00 [1.23, 2.77]	<0.001	0.62	1.27
P15	BMI	46	29.07 [23.63, 31.01]	154	24.44 [22.31, 29.86]	0.013	0.24	0.38
P16	Global score	40	2.93 [2.33, 3.56]	160	2.18 [1.27, 2.88]	<0.001	0.41	0.73
P16	BMI	40	24.72 [23.37, 29.58]	160	24.73 [21.44, 30.31]	0.555	0.06	0.12
P17	Global score	84	2.80 [2.23, 3.45]	116	1.89 [1.27, 2.59]	<0.001	0.43	0.72
P17	BMI	84	28.20 [23.73, 31.63]	116	24.22 [20.76, 28.31]	<0.001	0.31	0.48

The relationship between BMI and the global score is illustrated in Figure 4. The plot confirms the positive direction of the association, consistent with the earlier rank correlation results, while also showing substantial dispersion. This means that higher BMI more often co-occurred with higher global severity, but the relationship was not deterministic, and global scores varied even among individuals with similar BMI.

An example of the response distribution for a body image-related item is shown in Figure 5, and selected descriptive characteristics are presented in Table 15.

Table 15. Selected body image and weight concern items, frequencies of extreme responses.

Item	At Least 5 n, Percent	0 n, Percent	Median [Q1, Q3]
P21	84 (42.0)	18 (9.0)	4 [3, 5]
P22	72 (36.0)	30 (15.0)	4 [1, 5]
P24	54 (27.0)	46 (23.0)	3 [1, 5]
P25	52 (26.0)	42 (21.0)	4 [1, 5]
P13	74 (37.0)	40 (20.0)	3 [1, 6]
P11	64 (32.0)	48 (24.0)	3 [1, 5]

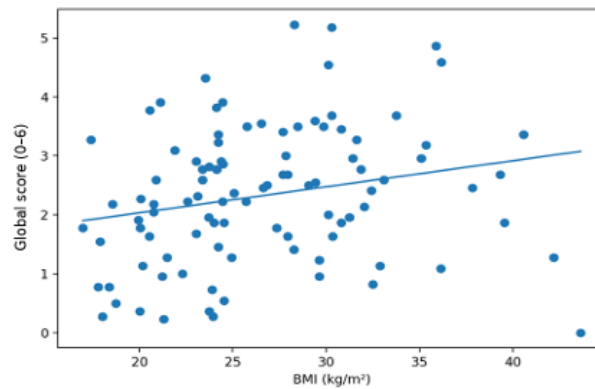


Figure 4. Association between BMI and the ChEDE Q global score.

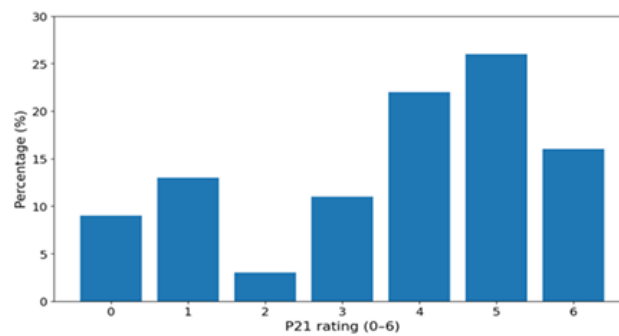


Figure 5. Response distribution for item P21, weight dissatisfaction.

3.4. Factor Structure

To complement the structural analyses, confirmatory factor analysis was performed for the 22 scored items. Three models were tested: a one-factor model, a four-factor model corresponding to the classical domains, and a bifactor model including one general factor and four specific factors. Model fit indices are presented in Table 16.

Table 16. CFA model fit for 22 items, N = 200.

Model	χ^2	df	CFI	TLI	RMSEA	SRMR
One-factor	1048.69	209	0.607	0.565	0.142	0.105
Four-factor	916.15	203	0.666	0.620	0.133	0.100
Bifactor	737.78	187	0.742	0.681	0.122	0.084

Overall, the one-factor and four-factor models showed unsatisfactory fit. The bifactor model showed the best relative fit among the tested solutions, although none of the models achieved a fully acceptable fit.

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3.5. Confirmatory Factor Analysis and Measurement Invariance Across Sex

Measurement invariance by sex was evaluated using multigroup confirmatory factor analysis for the four-factor structure of the instrument. Configural, metric, and scalar invariance were tested hierarchically. Detailed results are presented in Table 17.

Table 17. Sex invariance tests in MG CFA for the four-factor model, N = 200.

Model	Constraints	χ^2 (df)	CFI	TLI	RMSEA	SRMR	Δ CFI, Δ RMSEA, Δ SRMR
1	Configural	1694.944 (402)	0.537	0.468	0.127	0.123	not applicable
2	Metric	1739.040 (424)	0.530	0.487	0.125	0.132	−0.008, −0.002, +0.009
3	Scalar	1795.359 (446)	0.517	0.500	0.123	0.133	−0.012, −0.002, +0.000
4	Partial scalar	1754.602 (442)	0.530	0.509	0.122	0.132	+0.001, −0.003, +0.000

The results supported configural and metric invariance across sex. Full scalar invariance was not supported; therefore, a partial scalar invariance model was estimated. The partial scalar model showed fit comparable to the metric model, without further deterioration in fit.

4. Discussion

The present pilot study provides preliminary evidence that the Polish version of the ChEDE-Q may be useful as a screening-oriented measure of eating disorder-related psychopathology in children and adolescents aged 10 to 18 years. The most robust result was the strong internal consistency of the global score, which supports its use as the principal overall indicator of symptom severity in research and group-level analyses. In contrast, the subscales were more heterogeneous, with the strongest performance observed for shape concern and weight concern and the weakest for eating concern. This pattern is clinically and psychometrically meaningful, as body- and weight-related concerns may be more salient and more consistently endorsed than narrower eating-related cognitions in mixed and nonclinical developmental samples. Pronounced floor effects observed for several items further support this interpretation, suggesting that less frequent pathological behaviors were uncommon in a substantial part of the sample, whereas body image concerns may represent a more coherent and stable component of the construct.

The reliability profile observed in the present study is broadly consistent with previous research on child- and adolescent-adapted eating disorder questionnaires. The recent Indian adaptation of the ChEDE-Q showed that a shorter two-factor solution centered on eating/restraint concerns and weight/shape concerns performed adequately in adolescents, while the Italian validation study also supported good psychometric performance of the child-adapted instrument in younger populations. Similarly, the ChEDE-Q8 was developed as a brief and psychometrically efficient instrument for children, emphasizing the practical usefulness of a global indicator of eating disorder psychopathology [33–35]. Taken together, these findings suggest that, especially in pilot and mixed developmental samples, the global score may be psychometrically more defensible than full reliance on a differentiated subscale interpretation.

The factor-analytic findings should be interpreted with particular caution. Although the bifactor model showed the best relative fit among the tested solutions, none of the tested models achieved fit indices that would typically be considered satisfactory in a full validation study. Accordingly, the present data do not support strong claims about a stable and well-fitting multidimensional latent structure. Rather, they provide preliminary evidence for a meaningful general factor accompanied by specific symptom components that may not be fully separable in a developmental sample. This interpretation is in line with previous adolescent EDE-Q studies, in which the original four-factor structure has

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often been difficult to replicate. White et al. proposed an alternative adolescent factor solution, while Forsén Mantilla et al. found that the adolescent version of the EDE-Q did not conform well to the standard adult structure and that, in younger respondents, the measure may reflect less differentiated underlying dimensions. More broadly, the systematic review by Jenkins and Rienecke concluded that no consensus currently exists regarding the optimal latent structure of the EDE-Q across samples and settings [11,37,38]. In this context, the present results support using the global score as the most defensible summary index, whereas subscale scores should be interpreted cautiously and primarily as supplementary indicators.

The item-level pattern observed in the present study is also compatible with this interpretation. Several items demonstrated marked floor effects, whereas the strongest item-total relationships were concentrated around body dissatisfaction and the subjective importance of weight and shape. This suggests that body image-related concerns may form the most psychometrically coherent core of the questionnaire in mixed youth samples, whereas more behaviorally specific symptoms may be less frequent and, therefore, less internally cohesive. Similar tendencies toward reduced or reorganized factor structures have been described in adolescent samples from Mexico and Sweden, where parsimonious or modified models performed better than the classical arrangement derived from adult conceptualizations [11,13,39,40]. These findings underline the importance of developmental context when interpreting ChEDE-Q data and suggest that direct transfer of adult structural assumptions to child and adolescent populations may not always be appropriate.

The measurement invariance analyses add value to the study, but they also require a balanced interpretation. Although changes in fit indices across models suggested practical support for metric invariance and partial scalar invariance, the relatively weak fit of the configural model limits the strength of the conclusions that can be drawn. In other words, sex comparisons may be provisionally acceptable, especially at the level of the global score, but the baseline structural uncertainty means that invariance findings should not be overinterpreted. This cautious position is consistent with previous work indicating that some EDE-Q structures may be invariant across sex only partially or under selected model specifications [13,41]. The same caution applies to the observed associations between ChEDE-Q scores and BMI-related indices. The positive association between the global score and both BMI and BMI z-score is theoretically plausible and provides preliminary support for BMI-related convergent validity. However, this effect should not be overstated. In the adjusted model, a substantial portion of explained variance likely reflected age, sex, and sample composition rather than the independent contribution of questionnaire scores alone. Given that the present sample was recruited from mixed educational and health-related settings, and that adolescents with elevated BMI may have been overrepresented, the observed associations should be interpreted as expected cross-sectional covariation rather than as evidence of predictive or diagnostic utility.

Several limitations should be acknowledged. First, the study had a pilot and cross-sectional design, which limits generalizability and precludes conclusions regarding temporal stability or the direction of observed associations. Second, the sample was regional and not population-representative, and the recruitment strategy may have increased the proportion of adolescents with elevated BMI. Third, the anthropometric data were self-reported. Previous work has shown that self-reported height and weight in children and adolescents can correlate strongly with measured values, but may still result in underestimation of weight and BMI and reduced accuracy at the extremes of the distribution [39]. Fourth, although the factor-analytic strategy was ambitious, the CFA results were clearly suboptimal, which reinforces the need for replication in larger and more heterogeneous samples, ideally with explicit use of estimators tailored to ordinal data. Finally, the present study did not

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include test–retest reliability, criterion validity against interview-based diagnosis, or the development of clinical cut-off values, all of which are essential for full validation and for stronger clinical interpretation.

Despite these limitations, the study makes a meaningful contribution by providing a first multidimensional psychometric evaluation of the Polish ChEDE-Q in a developmental sample. The findings support the use of the global score as the most stable and defensible index at the current stage of validation, while indicating that the subscales require more cautious interpretation. From a practical perspective, the Polish ChEDE-Q may be considered a promising screening-oriented instrument for research and for early risk identification, particularly in groups with elevated BMI, but the present data do not yet justify strong diagnostic conclusions or independent clinical decision-making based solely on questionnaire scores. Future studies should include broader and more-diverse samples, direct anthropometric measurements, formal analyses of temporal stability and criterion validity, and further testing of whether the Polish version is best conceptualized as a predominantly unidimensional measure or as a reduced multidimensional structure more appropriate for children and adolescents [11,13,33–35,37–42].

The descriptive and behavioral findings complement the psychometric results by indicating that body image-related concerns may represent the most salient component of eating disorder psychopathology captured by the Polish ChEDE-Q in this mixed developmental sample. In contrast, some behaviorally specific items appeared less homogeneous, which is consistent with the more cautious interpretation of subscale scores. Taken together, these findings further support the use of the global score as the most robust summary index at the current stage of validation.

5. Conclusions

The Polish version of the ChEDE-Q showed promising psychometric properties in this pilot regional sample. The findings support the global score as the most robust indicator of eating disorder-related psychopathology for screening-oriented research in children and adolescents.

At the same time, the factorial and invariance analyses indicate that the questionnaire structure should be interpreted with caution, particularly at the subscale level. Accordingly, subscale scores should currently be treated as supplementary rather than primary indicators.

Overall, the Polish ChEDE-Q appears to be a promising instrument for early identification of eating disorder-related symptoms, but further validation in larger and more diverse samples is needed before stronger clinical or interpretative conclusions can be drawn.

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Data Availability Statement: All data and materials are included in the manuscript.

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Nomenclature

- P1 Have you tried to eat less in order to change your body shape or weight?
- P2 When going to bed, did you refrain from getting up at night and eating anything for 8 h?
- P3 Have you tried not to eat foods you like in order to change your body shape or weight?
- P4 Have you tried to follow dietary rules to change your weight or body shape, for example amount, calories, what and when you eat?
- P5 Have you wanted your stomach to be completely empty?
- P6 Difficulty concentrating because of thoughts about food?
- P7 Fear that you might lose control over your eating behaviors?
- P8 Overeating, how often did you eat too much?
- P9 Have you eaten in secret?
- P10 Have you wanted your stomach to be completely flat?
- P11 How often have you thought about not gaining weight?
- P12 How often have you felt heavy?
- P13 How often have you thought about losing weight?
- P14 How often have you felt guilty after eating?
- P15 During overeating, did you feel a lack of control over what and how much you ate, no or yes plus frequency.
- P16 Have you had moments when you felt you could not stop eating, no or yes plus frequency.
- P17 Have you exercised a lot in order not to gain weight, no or yes plus frequency.
- P18 Does your weight influence the way you think about yourself?
- P19 Does the shape of your body influence the way you think about yourself?
- P20 Would weighing yourself once a week for the next month be a problem for you?
- P21 Have you been dissatisfied with your weight?
- P22 Have you been dissatisfied with your body shape?
- P23 Have you worried that others would see you eating?
- P24 Have you felt uncomfortable or shy when seeing your own body, for example, in a mirror or while bathing?
- P25 Have you felt uncomfortable or shy when others could see your body, for example, in changing rooms or while swimming?

References

1. Treasure, J.; Duarte, T.A.; Schmidt, U. Eating disorders. *Lancet* **2020**, *395*, 899–911. [\[CrossRef\]](#)
2. van Hoeken, D.; Hoek, H.W. Review of the burden of eating disorders: Mortality, disability, costs, quality of life, and family burden. *Curr. Opin. Psychiatry* **2020**, *33*, 521–527. [\[CrossRef\]](#) [\[PubMed\]](#)
3. Galmiche, M.; Déchelotte, P.; Lambert, G.; Tavoracci, M.P. Prevalence of eating disorders over the 2000–2018 period: A systematic literature review. *Am. J. Clin. Nutr.* **2019**, *109*, 1402–1413. [\[CrossRef\]](#) [\[PubMed\]](#)
4. López-Gil, J.F.; García-Hermoso, A.; Smith, L.; Firth, J.; Trott, M.; Mesas, A.E.; Jiménez-López, E.; Gutiérrez-Espinoza, H.; Tárraga-López, P.J.; Victoria-Montesinos, D. Global proportion of disordered eating among children and adolescents: A systematic review and meta-analysis. *JAMA Pediatr.* **2023**, *177*, 363–372. [\[CrossRef\]](#) [\[PubMed\]](#)
5. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet* **2017**, *390*, 2627–2642. [\[CrossRef\]](#)
6. Fairburn, C.G.; Cooper, Z.; Shafran, R. Cognitive behaviour therapy for eating disorders: A “transdiagnostic” theory and treatment. *Behav. Res. Ther.* **2003**, *41*, 509–528. [\[CrossRef\]](#)
7. He, J.; Cai, Z.; Fan, X. Prevalence of binge and loss of control eating among children and adolescents with overweight and obesity: A meta-analysis. *Int. J. Eat. Disord.* **2017**, *50*, 91–103. [\[CrossRef\]](#)
8. Jebeile, H.; Gow, M.L.; Baur, L.A.; Garnett, S.P.; Paxton, S.J.; Lister, N.B. Treatment of obesity, with a dietary component, and eating disorder risk in children and adolescents: A systematic review with meta-analysis. *Obes. Rev.* **2019**, *20*, 1287–1298. [\[CrossRef\]](#)

<https://doi.org/10.3390/nu18071028>

9. Gideon, N.; Hawkes, N.; Mond, J.; Saunders, R.; Tchanturia, K.; Serpell, L. Development and psychometric validation of the EDE-QS, a short form of the Eating Disorder Examination Questionnaire (EDE-Q). *PLoS ONE* **2016**, *11*, e0152744. [\[CrossRef\]](#)
10. Carey, M.; Kupeli, N.; Knight, R.; Troop, N.A.; Jenkinson, P.M.; Preston, C. Eating Disorder Examination Questionnaire (EDE-Q): Norms and psychometric properties in U.K. females and males. *Psychol. Assess.* **2019**, *31*, 839–850. [\[CrossRef\]](#)
11. Forsén Mantilla, E.; Birgegård, A.; Clinton, D. Factor analysis of the adolescent version of the Eating Disorders Examination Questionnaire (EDE-Q): Results from Swedish general population and clinical samples. *J. Eat. Disord.* **2017**, *5*, 19. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Mitsui, T.; Yoshida, T.; Komaki, G. Psychometric properties of the Eating Disorder Examination Questionnaire (EDE-Q) in Japanese adolescents. *Biopsychosoc. Med.* **2017**, *11*, 9. [\[CrossRef\]](#) [\[PubMed\]](#)
13. Dufour, R.; Steiger, H.; Booij, L. Examining dimensionality and item-quality of the Eating Disorder Examination Questionnaire in individuals with eating disorders using item response theory analysis. *Int. J. Eat. Disord.* **2025**, *58*, 349–361. [\[CrossRef\]](#) [\[PubMed\]](#)
14. Meule, A.; Hilbert, A.; de Zwaan, M.; Brähler, E.; Koch, S.; Voderholzer, U. Cutoff scores of the Eating Disorder Examination-Questionnaire for the German population. *Int. J. Eat. Disord.* **2024**, *57*, 602–610. [\[CrossRef\]](#)
15. Lev-Ari, L.; Bachner-Melman, R.; Zohar, A.H. Eating Disorder Examination Questionnaire (EDE-Q-13): Expanding on the short form. *J. Eat. Disord.* **2021**, *9*, 57. [\[CrossRef\]](#)
16. Dahlgren, C.L.; Lichtenstein, M.B.; Brockmeyer, T.; Hansen, S.; Clausen, L. Identifying a cut-off score for the Eating Disorder Examination Questionnaire Short Form (EDE-QS) in adolescents. *BMC Psychol.* **2025**, *13*, 1042. [\[CrossRef\]](#)
17. He, J.; Sun, S.; Fan, X. Validation of the 12-item Short Form of the Eating Disorder Examination Questionnaire in the Chinese context: Confirmatory factor analysis and Rasch analysis. *Eat. Weight Disord.* **2021**, *26*, 201–209. [\[CrossRef\]](#)
18. Schaefer, L.M.; Smith, K.E.; Leonard, R.; Wetterneck, C.; Smith, B.; Farrell, N.; Riemann, B.C.; Frederick, D.A.; Schaumberg, K.; Klump, K.L.; et al. Identifying a male clinical cutoff on the Eating Disorder Examination-Questionnaire (EDE-Q). *Int. J. Eat. Disord.* **2018**, *51*, 1357–1360. [\[CrossRef\]](#)
19. Lichtenstein, M.B.; Clausen, L. Validation of the Eating Disorder Examination Questionnaire in Danish: A confirmatory factor analytic and Rasch-based approach. *J. Clin. Med.* **2021**, *10*, 3976. [\[CrossRef\]](#)
20. Taib, M.N.; Abdul Khaiyom, J.H.; Fauziana, R. Psychometric properties of the Malay version of the Eating Disorder Examination Questionnaire (EDE-Q). *Eat. Behav.* **2021**, *42*, 101533. [\[CrossRef\]](#)
21. Melisse, B.; van Furth, E.F.; de Beurs, E. Eating disorder examination questionnaire (EDE-Q): Validity and norms for Saudi nationals. *Eat. Weight Disord.* **2022**, *27*, 139–150. [\[CrossRef\]](#) [\[PubMed\]](#)
22. Scharmer, C.; Donahue, J.M.; Heiss, S.; Anderson, D.A. Factor structure of the Eating Disorder Examination-Questionnaire among heterosexual and sexual minority males. *Eat. Behav.* **2020**, *38*, 101403. [\[CrossRef\]](#) [\[PubMed\]](#)
23. Klimek, P.; Murray, S.B.; Brown, T.; Gonzales, M.; Blashill, A.J. Measurement invariance of the Eating Disorder Examination-Questionnaire across sexual orientation in men. *Int. J. Eat. Disord.* **2021**, *54*, 745–754. [\[CrossRef\]](#) [\[PubMed\]](#)
24. Compote, E.J.; Brown, T.A.; Lavender, J.M.; Murray, S.B.; Nagata, J.M. Evaluation of alternative brief models of the Eating Disorder Examination-Questionnaire across diverse samples. *J. Eat. Disord.* **2023**, *11*, 164. [\[CrossRef\]](#)
25. Laskowski, N.M.; Eriksson, J.; Monell, E.; Birgegård, A.; Forsén Mantilla, E. Psychometric evaluation of the Eating Disorder Examination-Questionnaire in men with eating disorders. *J. Eat. Disord.* **2023**, *11*, 34. [\[CrossRef\]](#)
26. Nagata, J.M.; Murray, S.B.; Compote, E.J.; Pak, E.H.; Schauer, R.; Flentje, A.; Capriotti, M.R.; Lubensky, M.E.; Lunn, M.R.; Obedin-Maliver, J. Community norms for the Eating Disorder Examination Questionnaire (EDE-Q) among transgender men and women. *Eat. Behav.* **2020**, *37*, 101381. [\[CrossRef\]](#)
27. Nagata, J.M.; Compote, E.J.; Cattle, C.J.; Flentje, A.; Capriotti, M.R.; Lubensky, M.E.; Murray, S.B.; Obedin-Maliver, J.; Lunn, M.R. Community norms for the Eating Disorder Examination Questionnaire (EDE-Q) among gender-expansive populations. *J. Eat. Disord.* **2020**, *8*, 74. [\[CrossRef\]](#)
28. Nagata, J.M.; Compote, E.J.; Murray, S.B.; Schauer, R.; Pak, E.; Flentje, A.; Capriotti, M.R.; Lubensky, M.E.; Lunn, M.R.; Obedin-Maliver, J. Community norms for the Eating Disorder Examination Questionnaire (EDE-Q) among cisgender bisexual plus women and men. *Eat. Weight Disord.* **2021**, *26*, 2227–2239. [\[CrossRef\]](#)
29. Avila, J.T.; Golden, N.H.; Aye, T. Eating disorder screening in transgender youth. *J. Adolesc. Health* **2019**, *65*, 815–817. [\[CrossRef\]](#)
30. Roberts, S.R.; Maheux, A.J.; Watson, R.J.; Puhl, R.M.; Choukas-Bradley, S. Sexual and gender minority (SGM) adolescents' disordered eating: Exploring general and SGM-specific factors. *Int. J. Eat. Disord.* **2022**, *55*, 933–946. [\[CrossRef\]](#)
31. Austen, E.; Greenaway, K.H.; Griffiths, S. Differences in weight stigma between gay, bisexual, and heterosexual men. *Body Image* **2020**, *35*, 30–40. [\[CrossRef\]](#)
32. Thorne, N.; Witcomb, G.L.; Nieder, T.; Nixon, E.; Yip, A.; Arcelus, J. A comparison of mental health symptomatology and levels of social support in young treatment seeking transgender individuals who identify as binary and non-binary. *Int. J. Transgenderism* **2019**, *20*, 241–250. [\[CrossRef\]](#)
33. Kliem, S.; Schmidt, R.; Vogel, M.; Hiemisch, A.; Kiess, W.; Hilbert, A. An 8-item short form of the Eating Disorder Examination-Questionnaire adapted for children (ChEDE-Q8). *Int. J. Eat. Disord.* **2017**, *50*, 679–686. [\[CrossRef\]](#) [\[PubMed\]](#)

<https://doi.org/10.3390/nu18071028>

34. Ahuja, L.; Diedrichs, P.C.; Garbett, K.M.; Chaudhry, A.; Hasan, F.; Uglik-Marucha, N.; Vitoratou, S.; Dhillon, M.; Shroff, H.; Lewis-Smith, H. Adaptation and validation of the Child Eating Disorder Examination Questionnaire (ChEDE-Q) for Use in English among Adolescents in Urban India. *Nutrients* **2023**, *15*, 3836. [[CrossRef](#)] [[PubMed](#)]
35. Bonvini, L.; Taddei, S.; Caini, S.; Calugi, S.; Bugli, G.; Tarchi, L.; Chiari, S.; Galli, I.; Giunti, I.; Marino, C.; et al. Child eating disorder examination (ChEDE) interview and child eating disorder examination questionnaire (ChEDE-Q): Psychometric properties of the Italian versions. *Eat. Weight Disord.* **2025**, *30*, 26. [[CrossRef](#)] [[PubMed](#)]
36. Lange, C.; Schmidt, R.; Hilbert, A. Validation of the parent version of the eating disorder examination-questionnaire adapted for children in parent-child dyads with children with and without loss of control eating. *J. Eat. Disord.* **2025**, *13*, 118. [[CrossRef](#)]
37. White, H.J.; Haycraft, E.; Goodwin, H.; Meyer, C. Eating disorder examination questionnaire: Factor structure for adolescent girls and boys. *Int. J. Eat. Disord.* **2014**, *47*, 99–104. [[CrossRef](#)]
38. Jenkins, P.E.; Rienecke, R.D. Structural validity of the Eating Disorder Examination-Questionnaire: A systematic review. *Int. J. Eat. Disord.* **2022**, *55*, 1012–1030. [[CrossRef](#)]
39. Rand-Giovannetti, D.; Cicero, D.C.; Mond, J.M.; Latner, J.D. Psychometric Properties of the Eating Disorder Examination-Questionnaire (EDE-Q): A Confirmatory Factor Analysis and Assessment of Measurement Invariance by Sex. *Assessment* **2020**, *27*, 164–177. [[CrossRef](#)]
40. Rios-Leyvraz, M.; Ortega, N.; Chiolo, A. Reliability of Self-Reported Height and Weight in Children: A School-Based Cross-Sectional Study and a Review. *Nutrients* **2022**, *15*, 75. [[CrossRef](#)]
41. Penelo, E.; Negrete, A.; Portell, M.; Raich, R.M. Psychometric Properties of the Eating Disorder Examination Questionnaire (EDE-Q) and Norms for Rural and Urban Adolescent Males and Females in Mexico. *PLoS ONE* **2013**, *8*, e83245. [[CrossRef](#)]
42. Decaluwé, V.; Braet, C. *Child Eating Disorder Examination—Questionnaire*; Dutch Translation and Adaptation of the Eating Disorder Examination—Questionnaire; Fairburn, C., Beglin, S., Eds.; Springer: Cham, Switzerland, 1999.

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7. Literatura

Biggs BK, Wilson DK, Quattlebaum M, et al (2021) Examination of weight-loss motivators and family factors in relation to weight management strategies and dietary behaviors among adolescents with obesity. *Nutrients* 13:1729. <https://doi.org/10.3390/nu13051729>

Burt Solorzano CM, McCartney CR (2010) Obesity and the pubertal transition in girls and boys. *Reproduction* 140(3):399–410. <https://doi.org/10.1530/REP-10-0119>

Casa-Coila MD, Vilca-Apaza HM, Mamani-Jilaja D, et al (2025) Healthy eating practices for optimal nutrition and well-being: a systematic review. *O Mundo Da Saúde* 49. <https://doi.org/10.15343/0104-7809.202549e17422025I>

Centers for Disease Control and Prevention (2026) Data, Trends, and Maps: Definitions and Sources. <https://www.cdc.gov/dnpao-data-trends-maps/database/definitions.html>. Accessed in 8 April 2026

Chan B, Yu Y, Huang F, Vardhanabhuti V (2023) Towards visceral fat estimation at population scale: correlation of visceral adipose tissue assessment using three-dimensional cross-sectional imaging with BIA, DXA, and single-slice CT. *Front Endocrinol* 14:1211696. <https://doi.org/10.3389/fendo.2023.1211696>

di Palma E, Filice E, Cavallo A, et al (2021) Childhood obesity and respiratory diseases: which link? *Children* 8:177. <https://doi.org/10.3390/children8030177>

Dülger H, Ayaz-Alkaya S (2024) The effect of health literacy-grounded web-based education on nutrition and exercise behaviours in adolescents: a randomized controlled trial. *Int J Nurs Pract* 30(5):e13253. <https://doi.org/10.1111/ijn.13253>

Enright G, Allman-Farinelli M, Redfern J (2020) Effectiveness of family-based behavior change interventions on obesity-related behavior change in children: a realist synthesis. *Int J Environ Res Public Health* 17:4099. <https://doi.org/10.3390/ijerph17114099>

Fang H, Berg E, Cheng X, Shen W (2018) How to best assess abdominal obesity. *Current Opinion in Clinical Nutrition and Metabolic Care* 21(5):360-365. <https://doi.org/10.1097/MCO.0000000000000485>

Felső R, Lohner S, Hollódy K, et al (2017) Relationship between sleep duration and

- childhood obesity: systematic review including the potential underlying mechanisms. *Nutr Metab Cardiovasc Dis* 27(9):751-761. <https://doi.org/10.1016/j.numecd.2017.07.008>
- Fisher A, Hammersley ML, Jones RA, et al (2018) Goal setting for weight-related behavior change in children: an exploratory study. *Nutr Health* 24(2):67-74. <https://doi.org/10.1177/0260106018758519>
- Goel A, Reddy S, Goel P (2024) Causes, consequences, and preventive strategies for childhood obesity: a narrative review. *Cureus* 16(7):e64985. <https://doi.org/10.7759/cureus.64985>
- Huang JS, Barlow SE, Quiros-Tejeira RE, et al (2013) Childhood obesity for pediatric gastroenterologists. *J Pediatr Gastroenterol Nutr* 56(1):99-109. <https://doi.org/10.1097/MPG.0b013e31826d3c62>
- Janahi S, Alkhater N, Bucheer A, et al (2024) A reliability generalization meta-analysis of the Eating Attitudes Test-26 (EAT-26) scale. *Cureus* 16(11):e73647. <https://doi.org/10.7759/cureus.73647>
- Javed A, Jumean M, Murad M, et al (2015) Diagnostic performance of body mass index to identify obesity as defined by body adiposity in children and adolescents: a systematic review and meta-analysis. *Pediatric Obesity* 10. <https://doi.org/10.1111/ijpo.242>
- Jebeile H, Kelly AS, O'Malley G, Baur LA (2022) Obesity in children and adolescents: epidemiology, causes, assessment, and management. *Lancet Diabetes Endocrinol* 10(5):351-365. [https://doi.org/10.1016/S2213-8587\(22\)00047-X](https://doi.org/10.1016/S2213-8587(22)00047-X)
- Jebeile H, Kelly AS, O'Malley G, Baur LA (2022) Obesity in children and adolescents: epidemiology, causes, assessment, and management. *Lancet Diabetes Endocrinol* 10(5):351-365. [https://doi.org/10.1016/S2213-8587\(22\)00047-X](https://doi.org/10.1016/S2213-8587(22)00047-X)
- Kang NR, Kwack YS (2020) An update on mental health problems and cognitive behavioral therapy in pediatric obesity. *Pediatr Gastroenterol Hepatol Nutr* 23(1):15-25. <https://doi.org/10.5223/pghn.2020.23.1.15>
- Kansra AR, Lakkunarajah S, Jay MS (2021) Childhood and adolescent obesity: a review. *Front Pediatr* 8:581461. <https://doi.org/10.3389/fped.2020.581461>
- Kliem S, Schmidt R, Vogel M, et al (2017) An 8-item short form of the Eating Disorder

Examination-Questionnaire adapted for children (ChEDE-Q8). *Int J Eat Disord* 50(6):679-686. <https://doi.org/10.1002/eat.22658>

Li Y, Xia PF, Geng TT, et al (2023) Trends in Self-Reported Adherence to Healthy Lifestyle Behaviors Among US Adults, 1999 to March 2020. *JAMA Netw Open* 6(7):e2323584. <https://doi.org/10.1001/jamanetworkopen.2023.23584>

Lichtenstein MB, Haastrup L, Johansen KK, et al (2021) Validation of the Eating Disorder Examination Questionnaire in Danish eating disorder patients and athletes. *J Clin Med* 10(17):3976. <https://doi.org/10.3390/jcm10173976>

Mannino A, Sarapis K, Moschonis G (2022) The effect of maternal overweight and obesity pre-pregnancy and during childhood in the development of obesity in children and adolescents: a systematic literature review. *Nutrients* 14(23):5125. <https://doi.org/10.3390/nu14235125>

Marcus C, Danielsson P, Hagman E (2022) Pediatric obesity-long-term consequences and effect of weight loss. *J Intern Med* 292:870–891. <https://doi.org/10.1111/joim.13547>

Marshall TA, Curtis AM, Cavanaugh JE, et al (2019) Child and adolescent sugar-sweetened beverage intakes are longitudinally associated with higher body mass index z-scores in a birth cohort followed 17 years. *J Acad Nutr Diet* 119(3):425-434. <https://doi.org/10.1016/j.jand.2018.11.003>

Mason T (2020) Loneliness, eating, and body mass index in parent–adolescent dyads from the Family Life, Activity, Sun, Health, and Eating study. *Pers Relatsh* 27:420–432. <https://doi.org/10.1111/pere.12321>

Menor-Rodriguez MJ, Cortés-Martín J, Rodríguez-Blanque R, et al (2022) Influence of an educational intervention on eating habits in school-aged children. *Children* 9:574. <https://doi.org/10.3390/children9040574>

Ministerstwo Zdrowia (2023) Otyłość u dzieci - same z niej nie wyrosną. <https://pacjent.gov.pl/aktualnosc/otylosc-u-dzieci-same-z-niej-nie-wyrosna>. Accessed 8 April 2025

Oussaada S, Van Galen K, Cooman M, et al (2019) The pathogenesis of obesity. *Metabolism: Clinical and Experimental* 92:26-36. <https://doi.org/10.1016/j.metabol.2018.12.012>

- Peuters C, Maenhout L, Cardon G, et al (2024) A mobile healthy lifestyle intervention to promote mental health in adolescence: a mixed-methods evaluation. *BMC Public Health* 24(1):44. <https://doi.org/10.1186/s12889-023-17260-9>
- Pomahacova R, Paterova P, Nykodymova E, et al (2023) Overweight and obesity in children and adolescents with endocrine disorders. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub* 167(4):328-334. <https://doi.org/10.5507/bp.2023.036>
- Rafiq N, Bai C, Fang Y, et al (2009) Long-term follow-up of patients with nonalcoholic fatty liver. *Clin Gastroenterol Hepatol* 7(2):234-238. <https://doi.org/10.1016/j.cgh.2008.11.005>
- Ruiz LD, Zuelch ML, Dimitratos SM, Scherr RE (2020) Adolescent obesity: diet quality, psychosocial health, and cardiometabolic risk factors. *Nutrients* 12:43. <https://doi.org/10.3390/nu12010043>
- Sahoo K, Sahoo B, Choudhury AK, et al (2015) Childhood obesity: causes and consequences. *J Fam Med Prim Care* 4(2):187-192. <https://doi.org/10.4103/2249-4863.154628>
- Sansone A, Romanelli F, Sansone M, et al (2017) Gynecomastia and hormones. *Endocrine* 55(1):37-44. <https://doi.org/10.1007/s12020-016-0975-9>
- Schoeppe S, Alley S, Rebar A, et al (2017) Apps to improve diet, physical activity and sedentary behaviour in children and adolescents: a review of quality, features and behaviour change techniques. *Int J Behav Nutr Phys Act* 14. <https://doi.org/10.1186/s12966-017-0538-3>
- Sinaiko AR, Steinberger J, Moran A, et al (2005) Relation of body mass index and insulin resistance to cardiovascular risk factors, inflammatory factors, and oxidative stress during adolescence. *Circulation* 111(15):1985-1991. <https://doi.org/10.1161/01.CIR.0000161837.23846.57>
- Skinner AC, Perrin EM, Moss LA, Skelton JA (2015) Cardiometabolic risks and severity of obesity in children and young adults. *N Engl J Med* 373(14):1307-1317. <https://doi.org/10.1056/NEJMoa1502821>
- Solmi F, Hatch SL, Hotopf M, et al (2015) Validation of the SCOFF questionnaire for eating disorders in a multiethnic general population sample. *Int J Eat Disord* 48(3):312-316. <https://doi.org/10.1002/eat.22373>
- Stabouli S, Erdine S, Suurorg L, et al (2021) Obesity and eating disorders in children and

- adolescents: the bidirectional link. *Nutrients* 13:4321. <https://doi.org/10.3390/nu13124321>
- Steinberger J, Moran A, Hong CP, et al (2001) Adiposity in childhood predicts obesity and insulin resistance in young adulthood. *J Pediatr* 138(4):469-473. <https://doi.org/10.1067/mpd.2001.112658>
- Wąsacz M, Frej D, Ochojska D, Kopańska M (2026) Psychometric Properties and Factor Structure of the Polish ChEDE-Q in a Community Sample of Adolescents: Associations with BMI. *Nutrients* 18:1028. <https://www.mdpi.com/2072-6643/18/7/1028>
- Wąsacz M, Ochojska D, Sarzyńska I, (2025c) Family support and motivational factors in weight loss among children and adolescents - a cross-sectional study. *Frontiers in Nutrition* 12:1618016. <https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2025.1618016/full>
- Wąsacz M, Sarzyńska I, Błajda J, et al (2025a) The Impact of Digital Technologies in Shaping Weight Loss Motivation Among Children and Adolescents. *Children-Basel* 12:685. <https://www.mdpi.com/2227-9067/12/6/685>
- Wąsacz M, Sarzyńska I, Ochojska D, et al (2025b) Psychosocial Consequences of Excess Weight and the Importance of Physical Activity in Combating Obesity in Children and Adolescents: A Pilot Study. *Nutrients* 17:1690. <https://www.mdpi.com/2072-6643/17/10/1690>
- World Health Organization (2025) Obesity and overweight. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>. Accessed 8 April 2026
- Xu Z, Liu Y, Yan C et al (2021) Measurement of visceral fat and abdominal obesity by single-frequency bioelectrical impedance and CT: a cross-sectional study. *BMJ Open* 11:e04822. <https://doi:10.1136/bmjopen-2020-048221>
- Yackobovitch-Gavan M, Wolf Linhard D, Nagelberg N, et al (2018) Intervention for childhood obesity based on parents only or parents and child compared with follow-up alone. *Pediatr Obes* 13(11):647-655. <https://doi.org/10.1111/ijpo.12263>
- Zhang X, Liu J, Ni Y, et al (2024) Global Prevalence of Overweight and Obesity in Children and Adolescents: A Systematic Review and Meta-Analysis. *JAMA Pediatr* 178(8):800-813. <https://doi.org/10.1001/jamapediatrics.2024.1576>
- Zhang X, Liu J, Ni Y, et al (2024) Global Prevalence of Overweight and Obesity in Children

and Adolescents. JAMA Pediatrics 178:800-813.
<https://doi.org/10.1001/jamapediatrics.2024.1576>

8. Streszczenie w języku polskim:

Niniejsza rozprawa doktorska została przygotowana w oparciu o cykl czterech powiązanych tematycznie publikacji pełnotekstowych (1 praca przeglądowa, 3 prace oryginalne), dotyczących analizy mechanizmów motywacyjnych oraz uwarunkowań psychospołecznych, środowiskowych i behawioralnych związanych z nadwagą i otyłością wśród dzieci i młodzieży.

Przegląd literatury obejmował badania dotyczące skuteczności interwencji ukierunkowanych na zmianę zachowań zdrowotnych w tej grupie wiekowej, ze szczególnym uwzględnieniem wykorzystania technologii cyfrowych, takich jak aplikacje mobilne, platformy eHealth oraz urządzenia monitorujące aktywność fizyczną. W pracy zebrano dane dotyczące wpływu tych narzędzi na redukcję masy ciała, poziom aktywności fizycznej, nawyki żywieniowe oraz funkcjonowanie psychospołeczne dzieci i młodzieży. Analiza uwzględniała również znaczenie personalizacji interwencji oraz zaangażowania środowiska rodzinnego. Wyniki wskazują, że technologie cyfrowe mogą stanowić skuteczne wsparcie w procesie zmiany stylu życia, jednak ich efektywność zależy od długoterminowego zaangażowania użytkowników oraz integracji z klasycznymi formami wsparcia.

Badania własne wykazały, że nadwaga i otyłość u dzieci i młodzieży są istotnie związane z pogorszeniem funkcjonowania psychospołecznego, w tym z obniżoną samooceną oraz negatywnym obrazem własnego ciała. Zaobserwowano, że znaczna część badanych odczuwa niezadowolenie ze swojego wyglądu, a masa ciała ma istotny wpływ na sposób postrzegania siebie. Wykazano również obecność nieprawidłowych zachowań żywieniowych oraz niski poziom aktywności fizycznej w badanej populacji, co wskazuje na konieczność podejmowania kompleksowych działań profilaktycznych i edukacyjnych.

Kolejne badanie skoncentrowało się na analizie trwałości podejmowanych prób zmiany nawyków zdrowotnych. Wyniki wskazują, że mimo podejmowania działań ukierunkowanych na redukcję masy ciała, większość z nich ma charakter krótkotrwały. Zidentyfikowano istotną rolę czynników emocjonalnych, takich jak lęk, wstyd czy poczucie winy, które towarzyszą procesowi zmiany stylu życia i mogą ograniczać jego skuteczność. Wykazano także znaczenie wsparcia rodzinnego jako czynnika sprzyjającego utrzymaniu motywacji i trwałości zmian zachowań zdrowotnych.

W ramach badań dokonano również oceny zależności pomiędzy zaburzeniami zachowań żywieniowych a masą ciała, wykorzystując kwestionariusz ChEDE-Q. Uzyskane wyniki potwierdziły jego przydatność w identyfikacji nieprawidłowych wzorców odżywiania oraz wykazały istotny związek pomiędzy nasileniem objawów zaburzeń odżywiania a wskaźnikiem BMI. Wskazuje to na konieczność wczesnej diagnostyki oraz monitorowania problemów związanych z odżywianiem w tej grupie.

Podsumowując, uzyskane wyniki wskazują, że nadwaga i otyłość wśród dzieci i młodzieży mają charakter wieloczynnikowy i wymagają podejścia interdyscyplinarnego. Wykazano, że kluczowe znaczenie ma nie tylko modyfikacja diety i zwiększenie aktywności fizycznej, ale również uwzględnienie czynników psychospołecznych, w tym motywacji, samooceny oraz wsparcia środowiska rodzinnego. Wyniki podkreślają potrzebę opracowania kompleksowych i spersonalizowanych strategii interwencyjnych, a także dalszych badań nad skutecznością długoterminowych działań profilaktycznych i terapeutycznych w tej populacji.

9. Streszczenie w języku angielskim:

This doctoral dissertation was prepared based on a series of four thematically related full-text publications (1 review paper and 3 original research articles) focusing on the analysis of motivational mechanisms as well as psychosocial, environmental, and behavioral determinants associated with overweight and obesity among children and adolescents.

The literature review covered studies on the effectiveness of interventions aimed at changing health behaviors in this age group, with particular emphasis on the use of digital technologies such as mobile applications, eHealth platforms, and physical activity monitoring devices. The study compiled data on the impact of these tools on weight reduction, physical activity levels, dietary habits, and psychosocial functioning of children and adolescents. The analysis also considered the importance of intervention personalization and family involvement. The findings indicate that digital technologies can serve as effective support tools in the process of lifestyle change; however, their effectiveness depends on long-term user engagement and integration with traditional forms of support.

The authors' own research demonstrated that overweight and obesity in children and adolescents are significantly associated with impaired psychosocial functioning, including lower self-esteem and a negative body image. It was observed that a substantial proportion of respondents were dissatisfied with their appearance, and body weight had a significant impact on self-perception. The presence of unhealthy eating behaviors and low levels of physical activity in the studied population were also identified, indicating the need for comprehensive preventive and educational interventions.

Another study focused on the sustainability of attempts to change health behaviors. The results show that although efforts to reduce body weight are undertaken, most of them are short-term. The significant role of emotional factors, such as anxiety, shame, and guilt, which accompany lifestyle changes and may limit their effectiveness, was identified. The importance of family support as a factor promoting motivation and long-term maintenance of healthy behaviors was also demonstrated.

The research also included an assessment of the relationship between disordered eating behaviors and body weight using the ChEDE-Q questionnaire. The obtained results confirmed its usefulness in identifying abnormal eating patterns and revealed a significant association between the severity of eating disorder symptoms and BMI. This highlights the need for early diagnosis and monitoring of eating-related problems in this group.

In conclusion, the obtained results indicate that overweight and obesity among children and adolescents are multifactorial in nature and require an interdisciplinary approach. It was demonstrated that not only dietary modification and increased physical activity are important, but also psychosocial factors, including motivation, self-esteem, and family support. The findings emphasize the need to develop comprehensive and personalized intervention strategies, as well as further research on the effectiveness of long-term preventive and therapeutic actions in this population.

10. Oświadczenie autora:

11. Oświadczenia współautorów:

12. Dorobek naukowy

Oryginalne pełnotekstowe prace naukowe - chronologicznie			
Lp.	Opis bibliograficzny pracy	IF	MNiSW
1	Kopańska M, Ochojska D, Brydak K, Bartman P, Wąsacz M. (2024) The importance of QEEG in diagnosing and evaluating the effectiveness of EEG biofeedback therapy in children with mild autism spectrum disorder, revealing attention deficit disorder. Acta Neuropsychologica 22:463–479. Available from: https://www.researchgate.net/publication/385018444	1.100	70,000
2	Wąsacz M , Sarzyńska I, Ochojska D, Błajda J, Bartkowska O, Brydak K, Stańczyk S, Bator M, Kopańska M (2025) Psychosocial Consequences of Excess Weight and the Importance of Physical Activity in Combating Obesity in Children and Adolescents: A Pilot Study. Nutrients 17:1690. Available from: https://www.mdpi.com/2072-6643/17/10/1690	5,000	140,000
3	Wąsacz M , Ochojska D, Sarzyńska I, Bartkowska O, Stańczyk S, Błajda J, Frej D, Kopańska M (2025) Family support and motivational factors in weight loss among children and adolescents - a cross-sectional study. Frontiers in Nutrition 12:1618016. Available from: https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2025.1618016/full	5,100	70,000

4	Wąsacz M , Frej D, Ochojska D, Kopańska M (2026) Psychometric Properties and Factor Structure of the Polish ChEDE-Q in a Community Sample of Adolescents: Associations with BMI. <i>Nutrients</i> 18:1028. Available from: https://www.mdpi.com/2072-6643/18/7/1028	5,000	140,000
Suma punktów:		16,200	420,000

Oryginalne poglądy - chronologicznie			
Lp.	Opis bibliograficzny pracy	IF	MNiSW (2024r.)
1	Wąsacz M , Hejda P, Sarzyńska I, Trojnia J, Mazur A, Kopańska M. Prewencja i czynniki wpływające na używanie wyrobów tytoniowych wśród dzieci i młodzieży szkolnej : przegląd literatury <i>International Review of Medical Practice</i> 2024 : T. 30, nr 4, s. 55-60, bibliogr., streszcz. pol., ang Available from: https://medicalpractice.lazarski.pl/medicalpractice/issue/download/180/252 doi: 10.26399/rmp.v30.4.2024		20,000
2	Wąsacz M , Sarzyńska I, Błajda J, Orlov N, Kopańska M (2025) The Impact of Digital Technologies in Shaping Weight Loss Motivation Among Children and Adolescents. <i>Children-Basel</i> 12:685. Available from: https://www.mdpi.com/2227-9067/12/6/685	2,100	40,000
Suma punktów:		2,100	60,000

Suma punktów		
	IF	MNiSW (2024r.)
Oryginalne pełnotekstowe	16,200	420,000
Oryginalne pogładowe	2,100	60,000
Suma punktów:	18,300	480,000

Cytowania na dzień 16.04.2026r.

Web of Science Core Collection: 13

Index Hirscha: 2

Scopus: 13

Index Hirscha: 2

Google Scholar: 13

Index Hirscha: 2