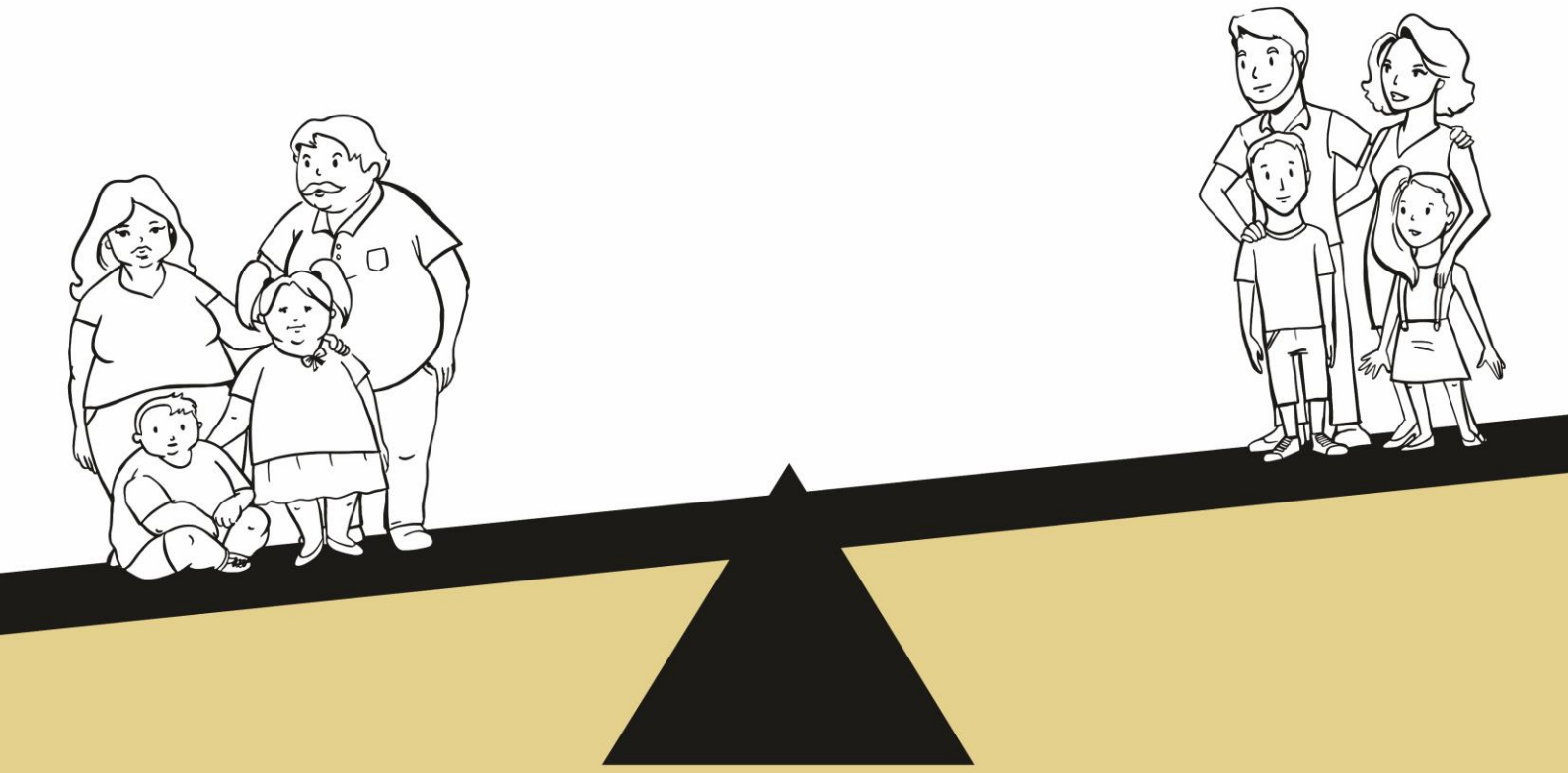

Roberta Caçador Frontini

Individual and familial adaptation to paediatric overweight and obesity:

A study with parents, children and adolescents

Doctoral thesis in Interuniversity Doctorate in Psychology, Specialty Clinical Psychology
Subject area: Family Psychology and Family Intervention, supervised by Doctor Helena Moreira and Professor Maria Cristina Canavarro, and submitted to the Faculty of Psychology and Education Sciences of the University of Coimbra

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UNIVERSIDADE DE COIMBRA

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Title

Individual and familial adaptation to paediatric overweight and obesity: A study with parents, children and adolescents

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Scientific Domain

Psychology – Specialty: Clinical Psychology

Host Institution

Faculty of Psychology and Education Sciences of the University of Coimbra | Portugal
Relationships, Development & Health Research Group | Cognitive-Behavioral Center for Research and Intervention R&D Unit

European Host Institution for Supplementary Research Activities

School of Sport, Exercise and Health Sciences of the Loughborough University | United Kingdom
Emma Haycraft | Loughborough University, United Kingdom
Period: May 1st – July 31st, 2015

Institutions Granting the Degree

Faculty of Psychology and Education Sciences of the University of Coimbra | Portugal Faculty of Psychology of the University of Lisbon | Portugal

Doctoral thesis in Interuniversity Doctorate in Psychology, Specialty: Clinical Psychology – Subject area: Family Psychology and Family Intervention from the Faculty of Psychology and Education Sciences of the University of Coimbra and the Faculty of Psychology of the University of Lisbon, supervised by Dr. Helena Moreira and Professor Maria Cristina Canavarro, and submitted to the Faculty of Psychology and Education Sciences of the University of Coimbra.

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This research project was supported by a Ph.D. Scholarship from the Portuguese Foundation for Science and Technology (SFRH/BD/86063/2012).

Acknowledgements

It is a truth universally acknowledged that a single[1] PhD student takes this opportunity to give a special acknowledgement to some of the professionals, friends, and family members that directly or indirectly helped with this work.

First and foremost, I am thankful to the primary supervisor, **Dr. Helena Moreira** for her scientific wisdom. The final result would be much different without her guidance.

I also wish to express my gratitude to **Professor Maria Cristina Canavarro**, for this scientific opportunity. Her wisdom, advice and example will stay with me forever.

Likewise, I also want to thank the members of the **Relationships, Development and Health Research Group**, of the Cognitive and Behavioral Center for Research and Intervention (CINEICC; R&D unit of the Portuguese Foundation for Science and Technology), at the Faculty of Psychology and Education Sciences of the University of Coimbra.

To **Professor Emma Haycraft** I wish to express my gratitude for the way she welcomed me at Loughborough University, giving me the opportunity to work with her and **Dr. Natalie Pearson**. It was a tremendous privilege to spend 3 months with them at the School of Sport, Exercise and Health Sciences, a highly rated University in the United Kingdom. I will never forget the knowledge and human qualities they shared with me.

It is crucial to do research with a good sample! This sample was recruited in three **healthcare institutions**: Hospital Pediátrico do Centro Hospitalar de Coimbra (CHC), Hospital de Santo André - Centro Hospitalar de Leiria and Centro de Saúde de Eiras. I wish to thank Professor Sérgio Cunha Velho for the availability and the generous way he offered to collaborate on sampling on the Hospital Pediátrico do Centro Hospitalar de Coimbra, for his support and, especially, for the friendship we created. I also wish to thank all the staff of the Hospital de Santo André - Centro Hospitalar de Leiria, especially to Dr. Pascoal Moleiro. Finally, at the Centro de Saúde de Eiras I wish to thank Dr. Ana Carvalhas and Dr. Natalie Cunha for all the wisdom they shared with me and the opportunities they gave me. I hope we will all collaborate in future works. I must not forget to thank all the children/adolescents and their families who voluntarily agreed to participate in this research.

I must also thank the **Professors and colleagues** of the Interuniversity Doctorate Program in Clinical Psychology from the Faculty of Psychology and Education Sciences of the University of Coimbra and the Faculty of Psychology of the University of Lisbon, especially Dr. Carla Crespo for being without even realizing, a scientific role model to me. Moreover, thank you Ana Melo

[1] Austen, J. (1813). *Pride and Prejudice*. London: Whitehall.

and Joana Carvalho, for becoming more than just PhD colleagues: you are now both an essential part of my life.

I also wish to give a special thanks to some of my **friends** (or, as I like to call it, the family members I chose): Alípio Firmino, Ana and Arlindo, António Raposo, Cristina Luiz (thank you for the constant English revisions as well!), Danielle Bettencourt, Eduardo Dias (and his awesome family), Gina Simão, Joana Almeida, Jorge Correia, Mariana Oliveira, Miguel Pereira, Raquel Pereira, Silvéria Miranda, Sofia Garcia, Tila and her mother Joana, and William - you all have an importance that I will never be able to express. I also wish to thank some of the recent friends I made at BA (and their amazing staff) for changing an important part of my life. I wish to thank the members of "Filhos da Fruta" for waking up an old dream long forgotten (don't let me wait much longer for those tickets). Moreover, thank you to the members of the "Conversas Livrásticas" book club, for the quality of time spent. I also need to thank Ana Dias, for taking my cover project and transforming it in this final result and I owe a truly special appreciation to Claudia Figueiredo.

Finally, this thesis highlights the importance of **family**. Therefore, I must thank my uncles Ana Maria, Angelo Squillaci, José Lourenço and Maria Beatriz. I wish to remember those who cannot be forgotten, my grandparents Lidia and Enrico. In addition, I wish to thank my grandmother Maria for her constant presence in my life and my grandfather Joaquim Francisco Caçador who accompanied me at the beginning of this adventure but who left us in the middle of it... I know you would be the proudest of all! To my parents (Fausto and Helena), to whom I dedicate this work, I wish to say that my gratitude and endless love cannot be fully expressed in words!

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List of Abbreviations and Acronyms

BMI | Body mass index = weight (kg)/height^2(m^2)

CHC | Chronic health condition

FES | Family Environment Scale

HrQoL | Health-related quality of life

QoL | Quality of life

SDQ | Strengths and Difficulties Questionnaire

SEM | Structural equation modelling

SES | Socio-economic status

WHO | World Health Organization

zBMI | BMI z scores

Abstract

Background

Considered as a serious public health problem, paediatric overweight/obesity is a health condition of high and increasing prevalence, particularly in Portugal, which can lead to the development of various physical and psychosocial complications. Some of those psychosocial consequences are present in the entire family system, not being restricted to the child/adolescent. Furthermore, paediatric obesity frequently tends to arise in a particular family context and environment, which is why it is important to understand how children and adolescents deal and adapt to such condition. It is thus also important to understand the familial, parental and individual factors that are associated with the psychosocial adaptation of children/adolescents seeking treatment for overweight/obesity. Moreover, and taking into account that the impact of overweight/obesity varies from one person to another, it is also essential to identify potential factors that could help understand the psychosocial adjustment and the weight of these youths.

Methods

This research project comprises four different cross-sectional studies. In the first study, the sample comprised 264 parent-child dyads divided into 3 groups (healthy weight, overweight and obesity). The second study comprised 223 mother-child dyads divided into 2 groups (healthy weight and obesity). The third study comprised 297 mother-child dyads divided into 2 groups (healthy weight and overweight/obesity). Finally, the fourth study comprised 182 dyads of children/adolescents with overweight or obesity and their mothers. Familial, parental and individual variables were assessed. Individual adaptation variables were self-reported by children/adolescents (i.e., quality of life, psychopathological symptoms, body esteem and social life) and parents (i.e., quality of life, anxiety and depressive symptoms). Familial (i.e., family cohesion) and parental variables (i.e., parenting stress and parenting styles) were only evaluated by parents. Children/adolescents' and parents' weight and height were also assessed.

Results

In general, children/adolescents with overweight/obesity and their parents reported worst adaptation outcomes (e.g., lower levels of quality of life, higher levels of psychopathological symptoms) than their healthy weight counterparts. In addition, mothers of children/adolescents with overweight/obesity reported higher levels of parenting stress, lower levels of family cohesion (FC), and used a more permissive parenting style than mothers of children/adolescents with healthy weight. With regard to the links between study variables, several indirect

associations were found. First, the association between parent's anxiety symptoms and the quality of life (QoL) of children/adolescents was found to be mediated by the psychological problems of only the adolescents. Second, higher levels of parenting stress were associated with poorer QoL in children/adolescents through the use of a more permissive parenting style. Third, the relationship between FC and weight status was sequentially mediated by mothers' QoL and children's/adolescents' externalizing symptoms. Finally, the relationship between FC and internalizing symptoms was mediated by children's/adolescents' perception of body esteem and social life.

Conclusions

This doctoral thesis has the main aim to provide a better understanding of the psychosocial adaptation of children/adolescents with overweight/obesity and their parents, highlighting the importance of focusing on the promotion of their mental health and QoL. More importantly, the four empirical studies highlight the importance of implementing multidisciplinary family focused interventions. The four studies emphasize the connection between parent-child adaptation outcomes, providing innovative input to the field by identifying mechanisms that might account for the link between the family and child's outcomes. For instance, one study underlined the connection between parenting stress, parenting styles and children's/adolescent's QoL. Another study identified the mechanisms that might account for the link between FC and weight, suggesting the importance of mothers' QoL and children's externalizing symptoms. Finally, another study suggested that being part of a more cohesive family may promote a better mental health in children/adolescents with overweight/obesity. To sum up, the studies emphasize the importance of working in intervention programs with the family in order to promote better psychosocial adjustment of the youths and their parents. The work of the psychologist alongside other professionals is of utmost importance in order to enhance adherence to prescribed treatment.

Keywords

Adaptation • Children / adolescents / parents • Family • Overweight • Peadiatric Obesity

Resumo

Introdução

Considerada um grave problema de saúde pública, a obesidade/excesso de peso pediátrica é uma condição de saúde de elevada e crescente prevalência, particularmente em Portugal, que pode levar ao desenvolvimento de várias complicações físicas e psicossociais. Algumas dessas consequências psicossociais estão presentes em todo o sistema familiar, não se restringindo à criança/adolescente. Mais ainda, a obesidade pediátrica tende a surgir frequentemente em determinados contextos e ambientes familiares, razão pela qual é importante compreender-se como as crianças e os adolescentes lidam e se adaptam a esta condição. Nesse sentido, é importante compreender que fatores familiares, parentais e individuais estão associados à adaptação psicossocial das crianças/adolescentes em tratamento para excesso de peso/obesidade. Tendo em conta que o impacto do excesso de peso/obesidade varia de uma pessoa para outra, também é importante identificar potenciais fatores que possam ajudar a compreender o ajustamento psicossocial e o peso destes jovens.

Metodologia

Este projeto de investigação incluiu quatro estudos transversais diferentes. No primeiro estudo, a amostra compreendeu 264 díades pai-filho divididas em 3 grupos (peso saudável, excesso de peso e obesidade). O segundo estudo compreendeu 223 díades mãe-filho divididas em 2 grupos (peso saudável e obesidade). O terceiro estudo compreendeu 297 díades mãe-filho divididas em 2 grupos (peso saudável e excesso de peso/obesidade). Finalmente, o quarto estudo incluiu 182 díades de crianças/adolescentes com excesso de peso ou obesidade e respetivas mães. Foram avaliadas variáveis familiares, parentais e individuais. Os fatores individuais de adaptação foram auto-relatadas pelas crianças/adolescents (i.e., qualidade de vida, sintomatologia psicopatológica, estima corporal e vida social) e pelos pais (i.e., qualidade de vida, e sintomas de ansiedade e depressão). Variáveis familiares (i.e., coesão familiar) e parentais (i.e., stress parental e estilos parentais) foram avaliados apenas pelos pais. O peso e altura das crianças/adolescentes e dos pais também foram avaliados.

Resultados

Crianças/adolescentes com excesso de peso/obesidade e os respetivos pais reportaram pior adaptação (e.g., níveis mais baixos de qualidade de vida, níveis mais elevados de sintomatologia psicopatológica) em comparação com crianças/adolescentes com peso saudável. Além disso, as mães de crianças/adolescentes com excesso de peso/obesidade reportaram maiores níveis de stress parental, níveis mais baixos de coesão familiar, e reportaram o uso de um estilo parental

mais permissivo comparativamente às mães de crianças/adolescentes com peso saudável. Em relação às relações entre as variáveis estudadas, foram encontradas várias associações indiretas. Em primeiro lugar, encontrou-se que a associação entre os sintomas ansiosos dos pais e a qualidade de vida (QV) das crianças/adolescentes era mediada pela sintomatologia psicopatológica de, apenas, os adolescentes. Em segundo lugar, os níveis mais altos de stress parental encontravam-se associados a níveis mais baixos de QV de crianças/adolescentes através do uso de um estilo parental permissivo. Em terceiro lugar, a relação entre coesão familiar e a categoria de peso das crianças/adolescentes foi sequencialmente mediada pela QV da mãe e os sintomas externalizantes das crianças/adolescentes. Por fim, a relação entre coesão familiar e sintomas internalizantes processou-se de forma indireta pela perceção de estima corporal e da vida social da criança/adolescente.

Conclusões

Esta tese de doutoramento tem como principal objetivo proporcionar uma melhor compreensão da adaptação psicossocial de crianças/adolescentes com excesso de peso/obesidade e respetivos pais, destacando a importância em se focar na promoção da saúde mental e QV. Os quatro estudos empíricos destacam a importância da implementação de intervenções multidisciplinares centradas na família. Os estudos enfatizam a ligação entre os resultados de adaptação de pais e filhos, fornecendo contributos inovadores para o campo em estudo, identificando mecanismos que poderiam explicar a relação entre a família e a adaptação da criança. Por exemplo, um estudo sublinhou a ligação entre o stress dos pais, os estilos parentais dos pais e a QV da criança/adolescente. Outro estudo identificou os mecanismos que poderiam explicar a ligação entre coesão familiar (FC) e peso, sugerindo a importância da QV da mãe e os sintomas externalizantes das crianças. Finalmente, outro estudo sugeriu que fazer-se parte de uma família mais coesa pode promover uma melhor saúde mental em crianças/adolescentes com excesso de peso/obesidade. Em suma, os estudos enfatizam a importância de trabalhar, em programas de intervenção, com a família, a fim de promover um melhor ajuste psicossocial dos jovens e seus pais. O trabalho do psicólogo, juntamente com outros profissionais, é de extrema importância a fim de melhorar a adesão ao tratamento prescrito.

Palavras-chave

Adaptação • Crianças / adolescentes / pais • Familia • Excesso de Peso • Obesidade Pediátrica

Introductory Note

Paediatric obesity is considered one of the most serious public health challenges of this century, reaching alarming proportions worldwide (World Health Organization, 2016b). It is also the most common metabolic and nutritional disease in youths (Ahmad, Ahmad, & Ahmad, 2010). Moreover, Portugal is one of the European countries with the highest prevalence of paediatric overweight and obesity (Branca, Nikogosian, & Lobstein, 2007; Rito & Graça, 2015). It is a medical health condition that progresses over time, becoming a medical disease (Vash, 2015), caused by an imbalance between energy intake and energy expenditure (Maggi, Busetto, Noale, Limongi, & Crepaldi, 2015).

Direct consequences of paediatric overweight/obesity are hard to establish, but several negative psychosocial outcomes are known (Erermis et al., 2004; Jelalian & Hart, 2009): compromised quality of life (QoL) (Varni, Limbers, & Burwinkle, 2007; Zeller & Modi, 2006), higher levels of psychopathological symptoms (Braet, Mervielde, & Vandereycken, 1997; Erermis et al., 2004), or poor body esteem or body image (Pinquart, 2013; Zeller et al., 2015). Paediatric obesity is also a powerful risk factor for various chronic, non-communicable diseases (Rito & Graça, 2015), such as type 2 diabetes, hypertensive disease, some types of cancer, and cardiovascular, metabolic, and pulmonary problems (Branca et al., 2007; Daniels, 2006). Moreover, not only overweight/obesity has several consequences for other family members as well (Herzer et al., 2010), but the disease itself may be affected by the family system (De Sousa, 2009; Hasenboehler, Munsch, Meyer, Kappler, & Vögele, 2009; Hooper, Burnham, & Richey, 2009) in a reciprocal and transitional way (Fiese & Sameroff, 1989; Kazak, Rourke, & Navsaria, 2009).

The family is one of the most important systems for children/adolescents, and the interrelationship between children's and parents' adjustment is widely acknowledged (Drotar, 1997; Kazak et al., 2009; Schor & American Academy of Pediatrics, 2003). Despite the interest in paediatric obesity research to understand the connection between familial or parental factors and children's/adolescents' variables, there is a lack of understanding regarding specific mechanisms through which family characteristics may be associated with children's/adolescents' psychosocial adjustment. The investigation into paediatric obesity also has other important gaps. For instance, when studying such subjective concepts such as QoL or psychopathology, proxy reports have been preferred over self-reports. However, self-reports have been acknowledged as the most effective way to have the subjective point of view of children and adolescents because of its consistency with the definition of QoL (Matza, Swensen, Flood, Secnik, & Leidy, 2004). Furthermore, the majority of studies only focused on obesity, excluding overweight or using the two groups as one, not taking into account the specificities of each condition. Also, children and

adolescents are usually recruited as a group, with some research not taking into account their phase of development. All the aforementioned gaps were taken into account in this research project, and the way they were addressed in each study is specified later (Chapter III).

It is not only important to understand the role of paediatric obesity on children/adolescents and their family member's adaptation outcomes, but also to identify potential factors that could promote the psychosocial adjustment of these youths. In fact, although overweight/obese children/adolescents are at a higher risk of experiencing psychosocial difficulties, some children/adolescents do not experience (or at least experience less) psychosocial suffering than others. Thus, it is important to clarify why some children/adolescents are more resilient to the negative psychosocial consequences of overweight/obesity than others (Griffiths, Parsons, & Hill, 2010). Additionally, unlike other chronic health conditions (CHCs), paediatric overweight/obesity may present modifiable factors and may reverse with appropriate intervention approaches (Fulton et al., 2009). Thus, it is important to better understand the possible role that psychologists may have in dealing with those families, not only in promoting better psychosocial adaptation and promoting less suffering but also towards a better acknowledgement of the condition of children/adolescents, which may improve adherence to treatment.

The present dissertation is organized into four main chapters: Chapter I | Theoretical Framework; Chapter II | Objectives and Methods, Chapter III | Empirical Studies, and Chapter IV | Discussion.

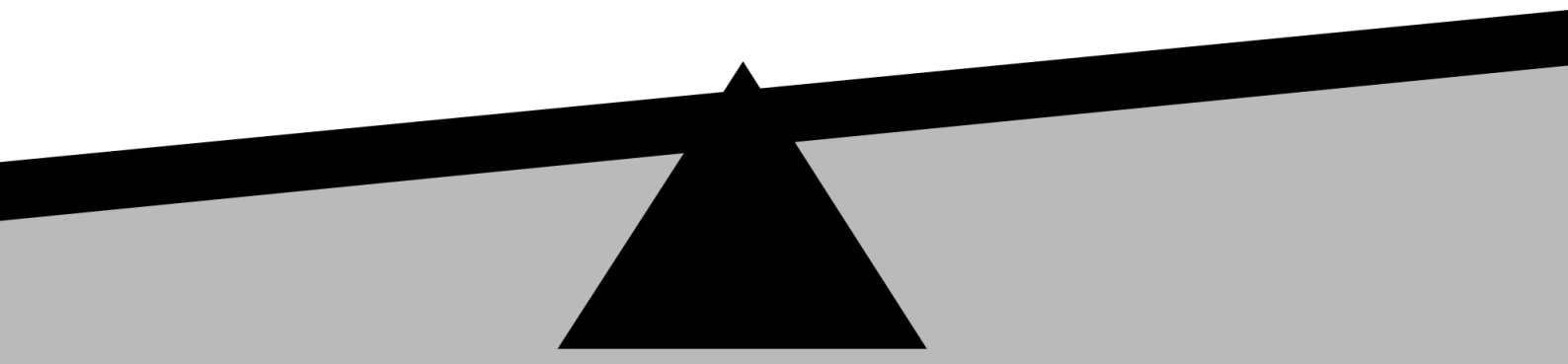
Chapter I | Theoretical Framework provides a brief literature review regarding the scientific state-of-the-art on the topic of psychosocial adaptations of children/adolescents with overweight/obesity and their parents. This chapter presents a brief description of paediatric overweight/obesity, including its definition, etiology, consequences, clinical manifestations, economic implications, and recommendations for treatment (prevention, medical, nutritional, and psychological interventions). We also discussed the importance of family in the context of paediatric overweight/obesity. Subsequently, we discuss some conceptual models, the variables studied in this project and some methodological issues. This introductory section ends with a summary of some research gaps and challenges in current literature of paediatric overweight/obesity, which guided the formulation of our research project.

Chapter II | Objectives and Methods describes the operational and methodological options of this research project. We present the research objectives of each study, along with a description of our study design, participants, procedure, sample, variables, and instruments. We discuss the statistical options that allowed us to test our models and answer our research questions, and we finish with a reflection on ethical considerations that guided our research.

Chapter III | Empirical Studies includes four original studies presented in the format of scientific papers. One was published in a national peer-reviewed journal; another one was published in an international peer-reviewed journal. The last two were already accepted for publication in two different international journals. Each article is formatted with the norms of the respective journals (which may be different from the APA style). In this final thesis we present the manuscripts as they were sent to the editor, prior to publication.

Finally, in **Chapter IV | Discussion**, we offer a discussion of the results and findings of our four empirical studies. Our hypothesis and objectives are revisited in light of our findings. In this chapter, we also discuss the strengths and limitations of our studies, the practical and clinical contributions of our work, and the implications for health policymaking in paediatrics.

Chapter I | Theoretical Framework



1. Introduction: Clinical and epidemiological characteristics of paediatric obesity

Paediatric obesity is abnormal or excessive fat accumulation in children and adolescents (Cole & Rolland-Cachera, 2002; World Health Organization, 2006) that develops with a positive imbalance between energy intake and energy expenditure (Maggi et al., 2015). This condition increases the risk of health problems and is acknowledged as a major public health problem worldwide (Buttitta, Iliescu, Rousseau, & Guerrien, 2014).

Reference curves are used for the diagnose of overweight or obesity and for monitoring the growth of an individual (Rolland-Cachera & For the European Childhood Obesity Group, 2011), thus, a child is considered overweight or obese if he/she presents a body mass index (BMI) above the given age and sex-specific percentile cut-offs (Anderson & Butcher, 2006). Yet, the diagnosis of a child/adolescent with overweight or obesity is difficult, and research in this area might not be easy to conduct, due to the various different approaches used to define it (Lobstein, Baur, & Uauy, 2004). Moreover, children constantly develop and grow (Anderson & Butcher, 2006; Cole & Rolland-Cachera, 2002), and their BMI fluctuates, not only according to age but also to gender (Jelalian & Hart, 2009). Furthermore, although BMI is broadly used, there are numerous references and cut-offs available, which makes comparisons between studies difficult (Rolland-Cachera & For the European Childhood Obesity Group, 2011). In this project, weight condition was based on growth charts of the National Centre for Health and Statistics (Kuczmarski, Ogden, Guo, & et al., 2002), because they were adapted and used in the Portuguese Health System during sample collection and until recently. In addition, in the current study, children's/adolescents' BMI was transformed into Z scores (zBMI). As previously highlighted, the assessment of BMI in children/adolescents is complex, because their BMI tends to change according to age and gender (Dinsdale, Ridler, & Ells, 2011). Therefore, zBMI is frequently used, because it indicates that the number of standard deviations of the child's/adolescent's measurement stays below the reference value (Cole & Rolland-Cachera, 2002), i.e., below the average BMI value for their age group and gender (Dinsdale et al., 2011).

1.1. Etiology of paediatric obesity

Obesity has a multifactorial origin, affected by a complex interaction of factors, including genetic predisposition, human behaviour, and environment factors (Loche & Ozanne, 2016; Loos & Janssens, 2016; Mariani et al., 2015; Wabitsch, 2002). Although biological predisposition plays an important role in the development of this CHC, environmental factors are major contributors to the obesity epidemic (Maggi et al., 2015). For instance, socio-economic status (SES) may have an impact on youths being overweight/obese, with some studies reporting that children from a lower SES background are at higher risk (Danielzik, Czerwinski-Mast, Langnäse, Dilba, & Müller,

2004; Gray et al., 2007; Igel, Romppel, Baar, Brähler, & Grande, 2016; Vieweg, Johnston, Lanier, Fernandez, & Pandurangi, 2007). Families socially disadvantaged may lack nutritional knowledge and opportunities for physical exercise (Hill & Lissau, 2002) which is linked to higher weight.

Numerous genetic variations are known to be linked to obesity (Loos & Janssens, 2016). This genetic susceptibility may be passed from parents to children (Anderson & Butcher, 2006; Loos & Janssens, 2016) and may be influenced by the environment (Anderson & Butcher, 2006). Therefore, there is an important interaction between genetic and environmental factors (Barros & Ramos, 2008; Silventoinen, Rokholm, Kaprio, & Sorensen, 2010) and a few monogenetic and rare defects have been associated with obesity (Wabitsch, 2002).

Although it is the combination of genetic and environmental factors that affects overweight/obesity, there is still a lack of knowledge regarding the way environment influences genetic susceptibility and vice-versa (Orho-Melander & Gloyn, 2016). More studies are needed to address this gap, specifically, family, twin, and adoption studies, which are usually important to understand the heritability of fatness (Guillaume & Lissau, 2002).

The presence of overweight/obesity in other family members is important to predict overweight/obesity in the child. In fact, research has highlighted that the presence of parental overweight/obesity is strongly associated with the child being overweight/obese (Danielzik et al., 2004; Gibson et al., 2016; Lissau, Burniat, Poskitt, & Cole, 2002; Moens et al., 2009). This highlights, on one hand, the importance of genetic predisposition and, on the other hand, the importance environment has for the presence of the disease in the child (Moens et al., 2009; Silventoinen et al., 2010).

The presence of some CHCs, such as asthma, may be a cause (but also a consequence) of overweight/obesity, because children/adolescents may decrease their physical activity because of difficulty breathing or may take some medication, for which a side effect may be weight gain (Vivier & Tompkins, 2008). Other diseases may have an important role. Many endocrinological or neurological syndromes, such as Praeder Willi, Klinefelter's, Frohlich's, Lawrence Mood Biedl, Klein-Levin, and Mauriac syndromes, can lead to overweight/obesity (Anderson & Butcher, 2006). Other conditions may lead to overweight/obesity as a side effect of medication (Han, Lawlor, & Kimm, 2010) or may make it difficult for the child to be active or even move, due to motor skill difficulties (Bandini et al., 2015; Dewey, Cantell, & Crawford, 2007; Minshew, Sung, Jones, & Furman, 2004; Provost, Lopez, & Heimerl, 2007).

Two factors considered as the most proximal causes of overweight/obesity are poor dietary habits and sedentary lifestyles (Gorin & Crane, 2008). Obesity is influenced by the exposure of the child to an unhealthy environment (Lake & Townshend, 2006). Nowadays research has shown that a child's food intake is influenced more by external cues rather than energy needs (Fisher, Rolls, & Birch, 2003), emphasizing the importance of the amount and

quality of food presented at home. Parents and other family members are mainly responsible for the food to which the child has access. Parents decide what food will be available for the children to eat and when the children should eat, and parents influence childrens' eating and exercise patterns (Frelut & Flodmark, 2002). Moreover, not only are the presence of unhealthy food and drinks significant for gaining weight (e.g., snacks, soft drinks, fast food, etc.) (Anderson & Butcher, 2006) but parenting practices and styles also have an important role in the consumption of those unhealthy foods. Yet again, this highlights the importance of parents on their children's weight.

Economic and social changes have also permitted the rise of overweight and obesity in early years of life. This is a case of unhealthy food being cheaper than healthy food in the food market (World Health Organization, 2016b), as well as the building structure of the environment; for instance, the use of more built-in technology allows less physical activity and therefore less energy expenditure (Anderson & Butcher, 2006; Grave, Centis, Marzocchi, & Ghoch, 2013). There has been a change in food availability and types of food consumed, which, along with a decline in physical activity, results in an energy imbalance (OECD/EU, 2016; World Health Organization, 2016). Thus, biology and technology combined are important to the obesity epidemic (Han et al., 2010).

1.2. Definition

As previously explored, there are many references and cut-offs available for the diagnosis of overweight/obesity in children/adolescents, which makes it difficult to compare results between studies (Rolland-Cachera & For the European Childhood Obesity Group, 2011). Commonly, "overweight" is used to refer to excessive weight compared to the weight standard, while "obese" means excessive body fat (Ogden & Flegal, 2010). In children, because weight varies according to gender and age, reference curves are needed. Table 1 presents some references used in order to diagnose overweight/obesity.

Table 1 | References Available for the Diagnose of Children/Adolescents Overweight/Obesity

Name	Notes	Year	Reference	Country
CDC Growth Charts	Sex-specific BMI according to age grow charts	2000	Kuczmarski et al., 2002	USA
IOTF	BMI centiles	2000	Cole, Bellizzi, Flegal, & Dietz, 2000	International
World Health Organization (WHO) standards	They present a standard of physiological growth.	2006	WHO Multicentre Growth Reference Study Group, 2006	International
WHO standards	To extend previous growth curves to older children (5 to 19 years old)	2007	Onis et al., 2007	International

Another major issue regarding the definition of overweight/obesity is the mixed terminology used. In fact, the way different levels of BMI are defined constantly changes (Rolland-Cachera & For the European Childhood Obesity Group, 2011), which leads to some confusion and difficulty in comparing studies. For instance, although terms such as "at risk of overweight" or "overweight" and "obesity" can constantly be found in literature, but the same terms might not be used for the same levels of adiposity (Flegal & Ogden, 2011; Rolland-Cachera, 2009). In some articles, different authors decide to use different terminologies (i.e., every so often they use the term "overweight" when talking about children/adolescents who are "obese"). Moreover, there have been some changes in terminology over time as well. For instance, "at risk of overweight" has been replaced by terms such as "overweight" and "obesity" (Ogden & Flegal, 2010). Up to now, none of the various definitions, terminologies, references, or cut-offs are considered ideal (Rolland-Cachera & For the European Childhood Obesity Group, 2011); therefore, a researcher in this area must be aware of all the different terms and proceed accordingly when reading research. Moreover, a researcher should explicitly state the definition used in that particular investigation to avoid unconformity.

In all four studies, children/adolescents were clustered into three weight categories groups according to growth charts of the National Centre for Health and Statistics (Kuczmarski et al., 2002) adapted and used in the Portuguese health system since 2006 and during the recruitment period (DGS - Divisão de Saúde Materna Infantil e dos Adolescentes, 2006). The groups (paediatric obesity: BMI ≥ 95th percentile; overweight: percentile 85 ≤ IMC < percentil 95; healthy weight: 5th percentile ≤ BMI < 85th percentile) were defined by taking into account

the percentile values of the BMI for children/adolescents of the same age and sex, calculated from weight (kg) and height (m), according to the following formula: weight/height^2. Then, the children's/adolescents' BMI was transformed into zBMI.

1.3. The epidemiology of obesity in Portugal

Obesity has reached epidemical and pandemic levels worldwide (De Sousa, 2009; Grave, Centis, Marzocchi, & Ghoch, 2013; Loche & Ozanne, 2016; World Health Organization, 2000). In 2007, the World Health Organization stated that among primary-school-age children (7–9 years), Portugal had the highest rates of paediatric overweight (32%) in the WHO European Region (Branca et al., 2007). Another report from the Health Behaviour in School-aged Children (HBSC) study found that, of Portuguese children 11 years old, 37% of boys and 25% of girls are overweight. Of 13-year-old adolescents, 31% of boys and 18% of girls are overweight, and of 15-year-olds, 24% of boys and 17% of girls are overweight (Currie et al., 2012). A more recent study of prevalence in Portugal showed that of children from six to eight years old, 31.6% are overweight, and 13.9% are obese (according to WHO criteria) (Rito & Graça, 2015). The OECD/EU (2016) also acknowledged that Portugal has an alarming prevalence and reported that more than one in four children in Portugal are overweight. This alarming prevalence places Portugal in the top five countries of the European region with the highest prevalence of paediatric obesity (Rito & Graça, 2015).

1.4. Consequences and clinical manifestations

Paediatric obesity is associated with a number of physical and psychological health problems, affecting almost all organ systems in the human body (Lobstein et al., 2004). Although children are more susceptible to weight-related health problems because of their developing bodies (Daniels, 2006), it is difficult to establish a list of direct consequences of paediatric obesity (Rito & Graça, 2015). Nevertheless, those health problems have both concurrent and future repercussions on adulthood (Dietz, 1998; Jelalian & Hart, 2009; World Health Organization, 2016; Zeller & Modi, 2008). The longer the presence of obesity, the more the child is at risk of having health problems (Golden, Schneider, & Wood, 2016). Unfortunately, many health conditions known today that attribute to paediatric overweight/obesity were once thought to be only applicable to adults (Daniels, 2006; Dowden, 2016).

Obesity is a cause of morbidities in childhood, causing gastrointestinal, musculoskeletal, and orthopaedic complications and cardiovascular problems (Daniels, 2006; Lobstein & Jackson-Leach, 2006; OECD/EU, 2016), that lead to ischaemic heart disease and stroke, hypertensive disease, and some types of cancer, such as colon, breast, and endometrial cancer (Branca et al.,

2007; Pereira & Mateus, 2003). Overweight and obesity causes more than one million deaths and 12 million life-years of ill health each year, being responsible for about 80% of cases of type 2 diabetes and 55% of hypertensive disease among adults (Branca et al., 2007). Even if a condition or symptom only appears in adulthood, it may appear earlier than usual if there was a history of weight problems in childhood (Daniels, 2006). Moreover, the presence of obesity in early years and adolescence increases the risk of obesity in adulthood (Daniels, 2006; Frelut & Flodmark, 2002; Modi et al., 2008).

Paediatric obesity also has numerous emotional correlates (Jelalian & Hart, 2009) and an important psychological impact (Buttitta et al., 2014), contributing also to behavioural and emotional difficulties, such as depression, stigmatization, poor socialization, and reduced educational attainment (Daniels, 2006; Miller, Lee, & Lumeng, 2015; Pizzi & Vroman, 2013). Obesity impacts health-related quality of life (HrQoL), namely physical, social, emotional, and academic functioning (Jelalian & Hart, 2009). Some studies reported difficulties in social functioning, explicitly weight-related teasing, not only by friends but also by family members (Neumark-Sztainer et al., 2002). The psychological adjustment to paediatric obesity will be discussed in depth on Chapter 1, Section 3.1.

Because of those dramatic consequences and the rising prevalence, today's youths may live shorter lives than their parents (Daniels, 2006) and place significant burdens on individuals and healthcare systems (Vallis, 2016).

1.5. Paediatric obesity: Economical implications

It is difficult to accurately estimate or quantify the impact of this CHC (World Health Organization, 2016b), especially in children/adolescents. Nonetheless, paediatric obesity is known to affect the immediate health of the youth. These individual health consequences may be associated with economic repercussions, both for the individual and for society (Litwin, 2014), causing severe consequences in adulthood (World Health Organization, 2016b). In fact, an obese child may be an obese adult (Modi et al., 2008; The NS, Suchindran, North, Popkin, & Gordon-Larsen, 2010), with literature showing that more than 60% of children who are overweight before puberty will be overweight as adults, accelerating the emergence of non-communicable diseases and increasing the burden on health services (Branca et al., 2007; Pereira & Mateus, 2003). This leads to considerable healthcare costs (Maggi et al., 2015; Müller-Riemenschneider, Reinhold, Berghöfer, & Willich, 2008). The cost related to the consequent obesity health problems is the most important economic topic related to this condition (Daniels, 2006). Those health problems may have a psychosocial nature, which are responsible for the greater immediate costs of this CHC (Dietz, 1998). Moreover, because of obesity-related diseases, the

individual will be limited in terms of economic opportunities (Branca et al., 2007), due to significant additional healthcare costs related to those diseases (OECD/EU, 2016).

Although studies suggest that decreasing the BMI in adults may decrease the risk of morbidity and mortality (Juonala et al., 2011), presence of obesity in childhood may have a permanent imprint on adult health (Kelsey, Zaepfel, Bjornstad, & Nadeau, 2014), which suggests the importance of preventing and eradicating paediatric obesity (Finkelstein, Graham, & Malhotra, 2014). The prevention of paediatric obesity will most likely result in significant economic benefits (World Health Organization, 2016b). Moreover, intensifying primary preventive actions must be a priority, taking into account that prevalence of overweight/obesity will most likely increase the economic burden in the near future (Müller-Riemenschneider et al., 2008).

Nonetheless, it is of utmost importance to note that a large proportion of the total burden of diseases is due to paediatric obesity (Daniels, 2006). A study showed that, in Portugal, the increasing prevalence of overweight/obesity provides significant consequences for health services and Portuguese society in general (Pereira & Mateus, 2003). In 2002, the total direct and indirect cost was estimated at almost 500 million euros (Pereira & Mateus, 2003). In 1999, it was estimated that, in Portugal, 230 million euros was the direct cost of obesity for 1996 (Pereira, Mateus, & Amaral, 1999). Thus, it is acknowledged that obesity causes considerable economical losses for the country (Pereira & Mateus, 2003), indicating that it would be possible to generate savings in health services and generate productivity gains to the national economy through effective prevention of obesity (Pereira, 2007). This prevention, in order to be effective, should start at an early age. Propitiously, it is possible to improve weight management among all youths with positive repercussions in adulthood (Finkelstein et al., 2014).

1.6. Recommendations for treatment of paediatric obesity

As highlighted so far, the drastic health consequences of paediatric overweight/obesity and the increase of this worldwide prevalence creates a pressing need to structure good intervention programmes. Nevertheless, the treatment of obesity must have wider objectives apart from weight loss, and it is important that health professionals focus on health improvements as well as on QoL improvements (Mariani et al., 2015). Furthermore, health professionals should help those children/adolescents and their families understand the importance of change in order to promote adherence to prescribed treatment. Although there is an increase in intervention programmes and projects to fight paediatric obesity in Portugal, there is no constant updated registration, and interventions tend to be isolated, which hinders improvement of future interventions (Filipe, Godinho, & Graça, 2016).

Moreover, although there is an increase in intervention programs, there is still a long way to go to make them focus on the psychological changes related to paediatric obesity. In a recent systematic review, Filipe and colleagues (2016) assessed a total of 29 projects/programmes on paediatric obesity. The authors found that the majority focus on the promotion of behavioural change, centred on the adoption of healthier eating and physical behaviours in order to prevent the health consequences of overweight/obesity. The next section gives a brief overview regarding interventions needed and used to prevent paediatric obesity.

1.6.1. Importance of prevention

The prevention of paediatric obesity is of utmost importance (Daniels, 2006), and must be considered a priority, not only in Portugal but also worldwide (Filipe et al., 2016). Despite the fact that prevention is an important topic in all types of obesity treatment (e.g., nutrition, psychology) and that it is important to work in a multi-disciplinary perspective, prevention is a matter of such significance that it is important to make a quick note about it. Research acknowledges that more resources should be redirected towards obesity prevention, specifically because once a weight problem appears, it is more likely to progress (Dowden, 2016).

There are several reasons why prevention should be addressed, from the fact that paediatric obesity may lead to obesity in adulthood to the fact that it is extremely difficult to treat obesity once it is present (Lissau et al., 2002). Moreover, it is truly important to implement prevention interventions as soon as possible in order to avert the rise of childhood obesity, which is increasing in younger children (Lourenço, Santos, & Carmo, 2014), especially taking into account that prevention is considered the best option to reverse the increasing prevalence of childhood obesity worldwide (Han et al., 2010). Moreover, healthy habits (nutrition and physical activities) are acquired early in life (Lourenço et al., 2014). Although there are concerns that preventing obesity may lead to future complications, such as the appearance of other eating disorders (e.g., O'Dea, 2005), recent literature refutes this assertion (Golden et al., 2016; Schwartz & Henderson, 2009). Since children are seen regularly in medical settings, those visits are an opportunity for health professionals to work with families in order to prevent this epidemic (Han et al., 2010). Paediatricians may educate families in order to create constructive eating and physical habits to manage weight (Golden et al., 2016).

The principle of obesity prevention is similar to the principle of weight-loss interventions: body fat must be transformed into energy expenditure (Maggi et al., 2015). Since levels of activity have fallen radically, the reduction of sedentary behaviour needs to be a priority (Lissau et al., 2002). Paediatricians, for example, should help parents be role models for their youths, making

healthy foods rather than sweeteners and other unhealthy foods and drinks available at home (Golden et al., 2016).

Finally, it is important to note that prevention programmes for reducing paediatric overweight should be long (more than six months), involving not only children but also their parents or other caregivers (Guerra, Da Silveira, & Salvador, 2016). Moreover, obesity prevention requires a whole-of-government and multidisciplinary approach (World Health Organization, 2016b).

1.6.2. Medical/nutritional and physical treatments

Increasing physical activity and healthy eating habits is one of the main goals of medical and nutritional treatments that could be improved with individual or group sessions by a trained health professional (Cuzzolaro, 2015).

Nutritional intervention should focus on: (1) informing about healthy nutrition and physical activity; (2) training to manage and control nutrition and physical activity under anxiety and stressful circumstances; (3) managing clinical parameters (e.g., blood glucose, blood pressure); (4) increasing a sense of responsibility and care; and (5) promoting motivation to change and contribute to therapeutic compliance (Capodaglio & Petroni, 2015).

Although pharmacological approaches are sometimes used with younger patients, non-pharmacological methodologies should always be considered as first-line therapy, especially in children (Han et al., 2010). Moreover, and although weight loss is very important for children/adolescents with overweight/obesity, an area that lacks attention is the maintenance of weight loss (Jelalian & Hart, 2009), which should be a focus of medical, nutritional, and physical treatments. Physical activity and the reduction of sedentary behaviour must also be considered as priorities in treatment (Lissau et al., 2002).

1.6.3. Incorporating psychological approaches

The importance of dealing with psychological aspects in the treatment of obesity has become more explicit recently (Gravina, Palla, Piccione, & Nebbiai, 2015). Interventions in paediatric obesity should take into account emotional, cognitive, and behavioural processes as well as intense work on family habits (Cuzzolaro, 2015). Thus, the role of a psychologist is important, not only prior to surgical and nonsurgical approaches but also following weight loss, especially to help the patient adjust the subsequent emotional, behavioural, and social changes that might occur and for the prevention of relapse and in order for the effects to last beyond the end of treatment (Gravina, Palla, Piccione, & Nebbiai, 2015). Moreover, motivation is crucial

for adherence to treatment and for stable weight loss, which may be obtained through psychological approaches (Capodaglio & Petroni, 2015; Cuzzolaro, 2015).

Previously, a brief note was made regarding medical, nutritional, and physical interventions. Yet, those programmes require that patients also learn cognitions about food, eating, and changes in lifestyle, habits, and behaviours (Gravina, Palla, Piccione, & Nebbiai, 2015). These skills might be important to support the main treatment goals of a psychological approach: (1) teaching the child to self-regulate and resist temptation and (2) teaching the child how to have a healthy lifestyle that will last in the long-term (Braet, Moens, & Latomme, 2016).

Moreover, prior to the implementation of any kind of treatment, some individuals with this CHC experience difficulties losing weight, which are usually related to emotional discomforts, frequent mood alterations, low self-esteem, negative body image, and even interpersonal relationship difficulties (Gravina et al., 2015). When those problems and/or the presence of psychopathology are detected, individual care and psychotherapy may be required (Braet et al., 2016).

Cognitive behavioural therapy (CBT) might be especially important to help individuals with obesity, not only changing their negative eating behaviours but also incorporating healthy lifestyle changes (Gravina et al., 2015) and should include psychoeducational approaches, which, combined with nutritional intervention and a physical activity plan, may result in greater weight loss (Capodaglio & Petroni, 2015).

Some techniques used are: (1) self-monitoring techniques (e.g., food and exercise journals and diaries), (2) stress management, (3) stimulus control (e.g., eating only at the kitchen table or restricting quantities of food) and social support; (4) problem-solving, (5) behavioural modification (e.g., eating slowly and taking time to taste and enjoy the food), and (6) cognitive restructuring (e.g., having more realistic weight-loss goals; Braet et al., 2016; Capodaglio & Petroni, 2015; Gravina et al., 2015). Behavioural treatment is typically provided once a week for four to six months (Braet et al., 2016; Butryn, Webb, & Wadden, 2011). To sum up, regarding paediatric obesity, psychologists must be facilitators of change, helping these families to live the process of weight loss with less suffering.

1.6.4. Importance of including family in treatment

Family is of utmost importance for the lifestyles and environment of children/adolescents (Frelut & Flodmark, 2002). Children/adolescents are dependent upon their caregivers to provide food, which is determined by their parents' own food preferences and selections (Birch & Davison, 2001). Youths' lifestyles are strongly influenced by their parents through: education, nutritional status, attitudes towards food, attitudes towards physical activity patterns, availability of food at home, and even parents' SES (Guerra et al., 2016; Jelalian & Hart, 2009; Lissau et al.,

2002; Zeller & Daniels, 2004). Because of the important role parents have on the lives of their children/adolescents, it is apparent that family members should be part of any paediatric obesity interventions. However, obesity interventions still focus on the individual (Karp & Gesell, 2015; Skelton, Buehler, Irby, & Grzywacz, 2012), albeit research has consistently shown and supported family-based interventions, identifying parental behaviour as a crucial element for an effective treatment (Barlow & Expert Committee, 2007; Epstein, Paluch, Roemmich, & Beecher, 2007; Golan, 2006; Niemeier, Hektner, & Enger, 2012; Ventura & Birch, 2008).

More recently, the WHO felt the need to emphasize, yet again, the importance to develop and support family-based interventions when managing children/adolescents with overweight/obesity (World Health Organization, 2016b). In fact, research has consistently found that involving parents in intervention is an ingredient for success (Cislak, Safron, Pratt, Gaspar, & Luszczynska, 2012; Dordevic, Bonham, Ware, Brennan, & Truby, 2015). Thus, focusing on family behavioural lifestyle, for instance, may lead to more positive outcomes on body fatness and weight of the children (World Health Organization, 2016b). Family-based interventions focusing on paediatric obesity, targeting not only the child but also the parent and incorporating parent training in child management skills, may have both short-term positive outcomes as well as long-term treatment efficacy (Zeller & Daniels, 2004).

2. Conceptual models of adaptation to paediatric CHCs

The adaptation to a CHC is a continuous, active, and dialectic process between the child and the family (Barros, 2003). Because of its complexity, several conceptual models have attempted to help professionals better understand individual and family adaptation outcomes. Some of those models helped guide the four studies presented in this research: the Transactional Model of Development (Fiese & Sameroff, 1989; Sameroff, 2009), the Transactional Stress and Coping Model for chronic childhood illness (Thompson et al., 1992), The Social-Ecological Model of Human Development (Bronfenbrenner, 1979), and The Disability-Stress-Coping Model (Wallander & Varni, 1992, 1998). A brief presentation of each model is described afterwards.

2.1. Transactional approach to parent-child adaptation

Paediatric health influences the child/adolescent but also the family in a reciprocal and interactive way (Kazak et al., 2009). In the presence of a CHC, the family may be an adaptive facilitator but also an obstacle (Barros, 2003). For instance, the presence of a condition such as overweight/obesity may have an important role in adaptation outcomes of children/adolescents and parents (such as QoL), but, reciprocally, some psychosocial adaptation factors (e.g., lower levels of QoL) may influence the weight of a child. Parents can be facilitators, or obstructers, of

this relationship between disease and adaptation. Therefore, in our research project and in order to address some gaps in paediatric literature, we endorsed a transactional approach to study the adjustment of children/adolescents to overweight/obesity as well as the adjustment of their parents. Nevertheless, and although the influence and impact of obesity in the family and the youths are well documented in literature (as previously highlighted), it is important to reemphasize that our four studies are cross-sectional, not allowing causal inferences.

Because the child is behaviourally, cognitively, and emotionally dependent on the family environment (Barros, 2003), in our studies, we were interested in understanding the way parents and their children/adolescents shape each other's adaptation. For example, in one of our studies (Frontini, Moreira, & Canavarro, 2016), we were interested in understanding if the relationship between parenting stress and the QoL of children/adolescents was mediated by a particular parenting style. The study was influenced by a transactional approach, since bidirectional influences between the individual (e.g., the child/adolescent) and the context or social environment were taken into account (Harper, 2013), though we did not test a transactional model.

Our studies are in line with two particular transactional approaches, because both highlight the importance of parent-child reciprocal interactions: the generic Transactional Model of Development (Fiese & Sameroff, 1989; Sameroff, 2009) and the Transactional Stress and Coping Model for chronic childhood illness (Thompson et al., 1992). Both models consider children as active participants in their own lives, influencing their contexts and their family members and being influenced by them (Fiese, 1997), which has an impact on their adaptation outcomes and on their parents' caregiving experiences (Fiese & Sameroff, 1989). A child is born with certain temperamental characteristics, while parents are tasked with meeting the needs of the child in the context of their interpersonal and environmental resources, which, in turn, may influence the expression of the child's behavioural development (Harper, 2013). For example, and using this model, research has found that children with difficult temperaments born in families with insensitive mothers had significantly higher risks of being overweight/obese during school age (Wu, Dixon, Dalton, Tudiver, & Liu, 2011). Although the interaction between parenting and child characteristics on the course and appearance of overweight/obesity has been well documented using a transactional system approach (e.g., Black & Dewey, 2014; Koulouglioti et al., 2013; Wu et al., 2011), to the best of our knowledge, much less research has been done regarding the role of this interaction on psychosocial outcomes in children/adolescents with overweight/obesity.

In the Transactional Stress and Coping Model for chronic childhood illness (Thompson et al., 1992), chronic illness is considered as a potential stressor. Not only the individual but also all the family system needs to adapt to this condition. The model portrays dyadic adaptation

processes in greater detail, suggesting that parental adaptation influences child adaptation and vice-versa. Moreover, in the transactional model, the child is considered an active participant in his/her own life. The functioning of the child as well as his/her behaviour, along with parents' caregiving experiences, are considered important for child adaptation outcomes and functioning. It is important to note that, although families of children/adolescents with health conditions are seen as typically disrupted, research has supported the competence that families may have to deal with paediatric illness (Kazak et al., 2009). This is in line with transactional models that recognize parent-child positive adaptation as important for understanding health-related issues and not restricted to maladaptive outcomes (Fiese, 1997). Therefore, chronic illness may represent a significant stress for the child and the family or, on the contrary, an increased opportunity for enrichment (Barros, 2003).

2.2. Social-ecological models (Bronfenbrenner's and Kazak's models)

Apart from the influence of transactional models, this research project adopts the Social-Ecological Model of Human Development as part of a broader family systems approach. Urie Bronfenbrenner (1979) developed this model and considers the presence and interaction of many systems and provides a framework that helps identify common parameters of illness and family responses (Kazak et al., 2009). In fact, socio-ecological models help in understanding and explaining multiple influences on body weight, with ecological systems-based approaches increasingly encouraged when addressing childhood obesity (Cauchi, Glonti, Petticrew, & Knai, 2016). This model also considers bidirectional influences from family and social contexts on children/adolescents. Four concentric circles typically represent it, each contained within the next. The four circles are termed: the microsystem (e.g., which includes interactions between the child and the immediate settings or environments in which he/she is actively involved, such as the family or school), the mesosystem (e.g., the transitions that occur between major settings in which the child is inserted at a particular moment in his/her life), the exosystem (e.g., more distal formal and informal social structures that may indirectly influence the child's development, interacting with some of the structures of the microsystem), and the macrosystem (e.g., considered the final layer, including the cultural values and main institutional patterns and systems, such as economic, social, educational, legal, and political systems; Lakic, 2012). According to the model, an individual change or development is explained by taking into account the context in which the person is inserted (Davison & Birch, 2012).

Anne Kazak (2009) adapted the Social-Ecological Model of Human Development to paediatric psychology, where the child, the family, the illness itself, and the treatment may be represented as microsystems with reciprocal patterns of effects. For instance, in this model, the illness of a child may influence parents' stress responses. Other microsystems may also be

affected by the disease, but those are the most proximal contextual influences on the developing child (Long & Marsland, 2011). Fundamentally, this model highlights the importance of the social context for children's/adolescents' functioning.

2.3. Disability-Stress-Coping Model (Wallander & Varni, 1992, 1998)

The present research project examined the psychosocial adjustment of children/adolescents with overweight/obesity based also on the disability-stress-coping model (Wallander & Varni, 1992, 1998). Wallander and Varni (1992, 1998) proposed this conceptual framework to understand the adjustment of chronically ill children/adolescents, taking into account that the adjustment to a CHC is not entirely explained by the illness itself. The model gives great importance to possible modifiable risk and protective factors that should be taken into account to fully understand adjustment processes. Moreover, the authors suggest that risk and protective factors may have direct or indirect effects on the adjustment of the child/adolescent. According to those authors, not every parent of children/adolescents with a chronic illness report clinically significant psychological problems, with some presenting resilience when facing a stressful event (Wallander & Varni, 1998). Moreover, the model hypothesizes that the associations between risk factors and the adjustment of the child and their parents may be moderated by resistance factors. Those factors may be intrapersonal (stable person factors, such as sense of challenge), socio-ecological (such as family environment or social support), and stress-processing factors (such as coping strategies). The risk and resistance factors may have an effect on adjustment, directly or indirectly (Wallander et al., 1989). This model has been extensively used as a conceptual framework to examine the adjustment of children/adolescents (and their parents) to the presence of a paediatric chronic disease, but not so much in paediatric obesity (for some exceptions, see Gerke et al., 2013; Greenfield & Marks, 2009). Given the complexity of the model, Banis et al. (1988) encourage the examination of small groups of variables instead of testing a comprehensive model of adaptation to paediatric CHCs as a whole. Over the years, only specific components of this model have been tested (Wallander et al., 1989).

Specifically, in the present research project, our studies applied the Disability-Stress-Coping Model by taking into account that stress or family environment (e.g., parenting stress, FC) may have an important role in the adaptation of children/adolescents with overweight/obesity (e.g., QoL or psychopathological symptoms) through, for example, psychopathological problems or body esteem. All those relationships and the way the models were tested are explained in the respective section of each article (see Chapter III).

3. Individual, parental, and familial variables

In this research project, we were interested in characterizing important areas of functioning of children/adolescents and families where there is a presence of paediatric overweight/obesity, at different levels: individual, parental, and familial. Figure 1 presents the variables assessed at each level and will be detailed in the following.

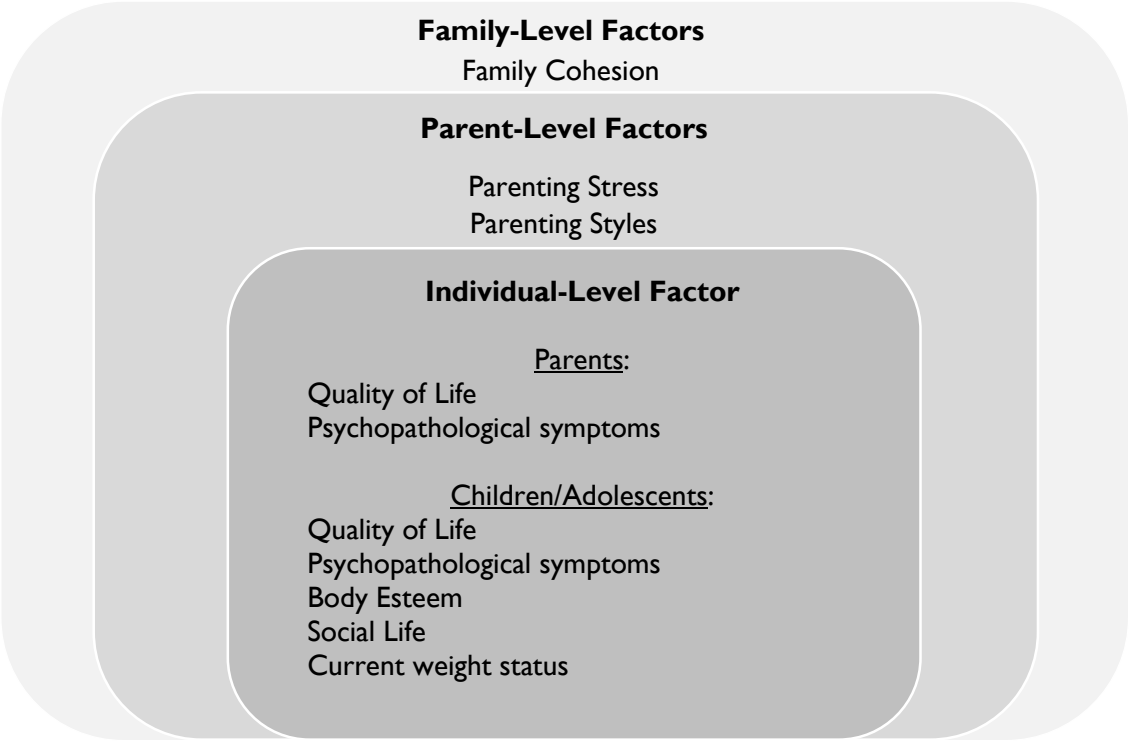


Figure 1 | Variables assessed in this project and the levels they belong to

3.1. Individual adjustment to paediatric obesity

Research has consistently shown that children/adolescents with overweight/obesity present lower levels of psychosocial adjustment when compared to children/adolescents of healthy weight (Braet et al., 1997; Zeller & Modi, 2006) or with other CHC (Ingerski et al., 2010; Moreira et al., 2013). Moreover, as highlighted previously, the adaptation process is not strictly to the child/adolescent but comprises all the family. Nowadays, and considering the advances in medical care, the focus of interventions should not be entirely on the problem itself (i.e., losing weight) but also on the numerous adaptation outcomes that are compromised with this disease. Therefore, understanding the psychosocial adjustment of children/adolescents and family members is of utmost importance.

3.1.1. Children's/adolescents' individual adaptation outcomes in paediatric obesity

3.1.1.1. QoL and psychopathological symptoms

As previously explored, in recent years, there has been an increase in paediatric obesity prevalence worldwide and, particularly, in Portugal. Therefore, there has also been an increase in concerns regarding the effects of this CHC on the QoL and psychopathological symptoms of children/adolescents with obesity. Paediatric obesity is associated with a number of negative psychosocial consequences. In fact, several studies have shown that it can negatively influence the QoL, HrQoL, and mental health of children/adolescents (Griffiths et al., 2010; Jelalian & Hart, 2009; Schwimmer, Burwinkle, & Varmi, 2003; Zeller & Modi, 2006). The term QoL was officially defined by the World Health Organization Quality of Life [WHOQOL] in 1994, which took into account the personal perception of the life of the individual in the context of his/her goals and expectations, highlighting his/her subjective nature (The WHOQOL Group, 1994). It is a multidimensional and subjective construct comprising several domains, including the physical, social, and psychological (World Health Organization, 1993). HRQoL is a key health outcome parameter and regards the subjective impact that an illness or medical treatment may have in the individual's physical, mental, emotional, social, and behavioural well-being (Bullinger, Schmidt, Petersen, & Ravens-Sieberer, 2006; Eiser & Morse, 2001; Petersen, Schmidt, Power, Bullinger, & the DISABKIDS Group, 2005; Spieth & Harris, 1996). Research suggests that the lower levels of QoL and HRQoL present in children/adolescents with obesity are comparable to those present in other chronic diseases, such as diabetes, cardiac conditions, gastrointestinal disorders, and even cancer (Schwimmer et al., 2003; Varni, Limbers, & Burwinkle, 2007). Moreover, children/adolescents with overweight/obesity usually report significantly lower levels of QoL when compared to their healthier counterparts (Kolotkin et al., 2006; Nadeau et al., 2011; Riazi, Shakoor, Dundas, Eiser, & McKenzie, 2010; Schwimmer et al., 2003; Wafa et al., 2016; Wille et al., 2010; Zeller & Modi, 2006). In children/adolescents with overweight/obesity, evidence shows that most dimensions of QoL are affected, particularly the social and physical dimensions (Buttitta et al., 2014). Literature has also found age and gender differences regarding children's/adolescents' QoL. For instance, girls have reported lower levels compared to boys (Chen et al., 2005; Kolotkin et al., 2006; Swallen, Reither, Haas, & Meier, 2005; Tsiros et al., 2009; Zeller & Modi, 2006), while QoL and HRQoL were found to decrease as age increases, with adolescents reporting lower levels than children (Modi & Zeller, 2008).

One aspect that may compromise the QoL of children/adolescents with overweight/obesity is the presence of psychopathological symptoms that are frequent in those youths (Cuzzolaro, 2015). Yet again, psychopathological symptoms may be a cause or a

consequence of the presence of overweight/obesity. Literature has shown that children/adolescents with overweight/obesity present more negative emotions, depression, anxiety, and behaviour problems, especially when compared to children/adolescents of healthy weight (Braet, Mervielde, & Vandereycken, 1997; Britz et al., 2000; Griffiths et al., 2010; Jelalian & Hart, 2009; Moreira et al., 2013; Riazi, Shakoor, Dundas, Eiser, & McKenzie, 2010; Vila et al., 2004). The presence of psychopathological symptoms in these children/adolescents may be a consequence of stigmatization perpetuated by peers (Stevens, Herbozo, Morrell, Schaefer, & Thompson, 2016) as well as a consequence of social exclusion and dissatisfaction with body image (Jelalian & Hart, 2009).

3.1.1.2. Children's/adolescent's body esteem

Body esteem is defined as the overall positive or negative assessment that a person has about his/her body (Mayer & Eisenberg, 1988). Body image concerns are frequent with children/adolescents with overweight/obesity (Loth, Mond, Wall, & Neumark-Sztainer, 2011; Neumark-Sztainer, 2011; Pinquart, 2013). Children/adolescents with overweight and/or obesity present lower levels of body esteem (Griffiths et al., 2010; Isnard et al., 2003; Neumark-Sztainer, 2011; Smolak & Thompson, 2009) and higher levels of body image dissatisfaction (Frontini, Moreira, Gouveia, & Canavarro, 2013) when compared with children/adolescents of healthy weight.

With regard to gender differences, some studies show girls presenting lower levels of body esteem compared to boys (Duncan, Al-Nakeeb, & Nevill, 2004; Kolotkin et al., 2006; Mendelson, Mendelson, & White, 2001; Mendelson, White, & Mendelson, 1996; Modi et al., 2008; Zeller et al., 2015). Regarding age, research has also shown some differences. Taking into consideration that adolescence is a vulnerable period in the development of body image, Wertheim and Paxton (2011) acknowledge that there could be a focus on physical appearance in this stage. In fact, body satisfaction tends to decrease as age increases (Bucchianeri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013; Eisenberg, Neumark-Sztainer, & Paxton, 2006). Mendelson and colleagues (1996), for instance, found older children having lower scores of body esteem compared to younger children, which is consistent with the fact that adolescents are often worried about body image (Erermis et al., 2004).

3.1.1.3. Children's/adolescent's social life

As highlighted so far, overweight/obesity can impact several aspects, including the physical, emotional, and social domains of life (Ahuja et al., 2014) that comprise social relationships (Hill & Lissau, 2002). In this study, we were interested in exploring children's/adolescents' perception of how they are treated within their social environment. Literature has found that

children/adolescents with overweight/obesity have lower levels of social life than their healthy-weight peers; that is, they present higher levels of social isolation and lower levels of social functioning, rating lower their perceptions of how they are treated within their social environment and their ability to establish friendships regarding their weight (Fallon et al., 2005; Kolotkin et al., 2006; Strauss & Pollack, 2003; Varni et al., 2007; Williams, Wake, Hesketh, Maher, & Waters, 2005; Zeller et al., 2015). This might be because those children/adolescents are usually stigmatized, teased, and disliked by others (Latner & Stunkard, 2003; Stunkard, Faith, & Allison, 2003), whether they are friends or family members (Puhl & Latner, 2007). This is particularly alarming, given that negative social life has been associated with psychopathological problems (Zeller, 2015) affecting children's/adolescents' mental health (National Obesity Observatory, 2011; Thompson, Coovert, Richards, Johnson, & Cattarin, 1995). Research has also found some gender and age differences regarding social life in children/adolescents with overweight/obesity. For instance, a research suggested that girls with obesity present fewer social contacts with friends than boys (Falkner et al., 2001).

3.1.2. Parents' individual adaptation outcomes in paediatric obesity

3.1.2.1. Quality of life and psychopathological symptoms

Research has also found some difficulties in adaptation outcomes in parents of children/adolescents with overweight/obesity. Specifically, it has been found that a considerable number of parents of children/adolescents with overweight/obesity report worse QoL than parents of children/adolescents of healthy weight (Guilfoyle et al., 2010; Modi, Guilfoyle, & Zeller, 2009) as well as greater psychological distress (Zeller et al., 2004). In a study that included parents and children/adolescents with several CHCs, Moreira et al. (2013) found that parents of children/adolescents with obesity reported lower levels of QoL compared to parents of healthy-weight children/adolescents with asthma and epilepsy. Children's weight status is also related to maternal psychopathology (Zeller et al., 2007), such as higher levels of maternal anxiety and depression (De Sousa, 2009). Furthermore, it has been found that maternal distress is associated with poorer QoL of children/adolescents with obesity (Janicke et al., 2007). The presence of maternal distress has also been linked with treatment outcomes of children/adolescents with obesity (Zeller & Modi, 2008), such as lower levels of weight loss (Epstein, Wisniewski, & Weng, 1994; Puder & Munsch, 2010).

3.2. Interconnection between parental variables, obesity, and children's/adolescents' adjustment

When taking parenting into account, the main aim of paediatric research has been the focus on their adaptation to youth illness, with less research focusing on how parents attitudes and behaviours may influence youth outcomes (Kazak et al., 2009). Exploring multiple indicators of familial stress in the context of childhood obesity is of utmost importance, given that research acknowledges that unfavourable family factors might negatively impact childhood obesity management (Moens et al., 2009). It is important to clarify the way parenting is associated with children's/adolescents' adaptation outcomes (e.g., behavioural problems), which may provide important information for researchers and practitioners (Voisin, Harty, Kim, Elsaesser, & Takahashi, 2016).

3.2.1. Parenting Stress

Parenting stress is typically defined as an affective response to parenting demands that results from the balance between parents' perceptions regarding demands of their parenting role and perceptions regarding their resources for meeting the demands of parenthood (Deater-Deckard, 1998). Parenting stress includes multiple components, such as behavioural, cognitive, and affective, which are related to the stress associated with parenting demands (Abidin, 1995; Haskett, Ahern, Ward, & Allaire, 2006). It is a complex concept often found in overweight/obesity literature.

Higher levels of parenting stress are usually found in caregivers of children with obesity when compared to parents of healthy youths (Guilfoyle, Zeller, & Modi, 2010; Moens et al., 2009). This may be due to several reasons, for instance, the concern regarding the health of the child or the struggle with new demands, such as imposed diets for their kids (Ohleyer et al., 2007). Thus, parents may have to cope with personal emotions related to the health status of their child along with management of several burdensome caregiving tasks (e.g., attending regular clinical appointments; Guilfoyle et al., 2010). Nonetheless, and according to literature, parenting stress may, in turn, interfere with the weight of the child/adolescent. For instance, spending more time worrying about themselves or dealing with the consequences of their stress may impact the interaction parents have with their children. In fact, parents with higher levels of parenting stress may be less physically active and spend less time doing physical activities with their children, which may be linked to less healthy behaviours (Dwyer, Needham, Simpson, & Heeney, 2008; Walton, Simpson, Darlington, & Haines, 2014).

It is well known that parenting stress can also compromise not only youths' physical health but also their psychological well-being, with higher levels of parenting stress being also related to elevated levels of psychopathology in youths (Guilfoyle, Zeller, & Modi, 2010; Ohleyer et al.,

2007), higher externalizing behaviours (Buodo, Moscardino, Scrimin, Altoè, & Palomba, 2013), and impaired HrQoL (Guilfoyle et al., 2010; Janicke et al., 2007). In fact, in the context of paediatric obesity, poor caregiving functioning and higher levels of parenting stress have been associated with impared HrQoL (Guilfoyle et al., 2010; Zeller & Modi, 2008). Although it appears to be a link between parenting stress and children's/adolescents' well-being, the relationship between the two variables does not appear to be straightforward but rather mediated by other variables, such as negative parenting behaviour (Anthony, Anthony, Glanville, Waanders, & Shaffer, 2005; Crnic & Low, 2002).

3.2.2. Parenting styles

Another parenting dimension that has been studied in paediatric obesity research is parenting styles. According to Baumrind (1989), parenting style is a stable characteristic of the parent that provides the context for child-rearing and socialization, which can be categorized, according to the author, into three categories: authoritative, permissive, and authoritarian (Baumrind, 1971). The authoritative parenting style is characterized by a combination of warmness, involvement, and monitoring of activities with flexible but firm control; the permissive parenting is defined as an absence of warmth, monitoring, control, and discipline, whereas authoritarian parenting is characterized by low warmth, high control, and severe discipline (Zeller & Modi, 2008).

Research has suggested that paediatric obesity may be the result of ineffective parenting styles. Both the authoritarian and the permissive parenting styles are considered risk factors for obesity (Baumrind, Larzelere, & Owens, 2010; Jelalian & Hart, 2009; Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006), whereas the authoritative parenting style has been associated with a lower risk of obesity (Jelalian & Hart, 2009; Pinquart, 2014). For instance, Rhee and colleagues (2006) found that mothers using an authoritarian parenting style, when compared to mothers with an authoritative parenting style, were more likely to have overweight children two years later. This association might be due to the relation between parenting styles and eating and physical activities. For example, Lohaus and colleagues (2009) found that when parents used an authoritative parenting style, when compared to parents using the other two parenting styles, their children had higher levels of positive health behaviours and lower levels of negative health behaviours, particularly behaviours related to fruit and vegetable consumption. Other studies reported the authoritative feeding style as being related to a greater consumption of fruits and vegetables, whereas the authoritarian feeding style has been associated with the presence of more sweets at home and less control over TV viewing (Gable & Lutz, 2000). The authoritarian parenting style may alter the way the child learns how to choose the most appropriate foods (Latzer & Stein, 2013). Moreover, when parents restrict or forbid the consumption of certain

foods (particularly foods high in fat and sugar), children are more likely to want to consume them and more likely to eat them (Birch, Fisher, & Davison, 2003; Fisher & Birch, 2000), which may be a particular characteristic of authoritarian parents. Thus, parenting style appears to be related to the weight of the child, impacting his/her eating behaviour, enhancing the risk of being overweight, and impacting also emotional functioning (Rhee et al., 2006).

Since parenting styles constitutes the environmental and emotional context for childcare (Baumrind, 1971; Baumrind, 1989), it may have an important role on the emotional functioning of the child. For instance, research has found that children/adolescents of authoritative parents have greater competence in early peer relationships (Bornstein & Bornstein, 2014), are more confident, and present higher levels of well-being (Steinberg, 2001). This parenting style provides a positive emotional climate for children/adolescents, promoting their autonomy and social competence (Baumrind, 1966; Hsieh, 1998; Mensah & Kuranchie, 2013). In turn, the authoritarian and permissive parenting styles have been related to children's/adolescents' emotional dysfunction, such as poor emotion regulation (Chang, Schwartz, Dodge, & McBride-Chang, 2003) and lower levels of adjustment. This may be due to a minimization of opportunities children/adolescents may have to learn to cope with stress (Bornstein & Bornstein, 2014). The use of a more authoritarian parenting style may also be related to less youth social competence (Mensah & Kuranchie, 2013).

3.3. Interconnection between family, obesity, and children's/adolescents' adjustment

In a previous section (1.6.4. Importance of including family in treatment), the importance of family for treatment management is briefly discussed. Moreover, we previously acknowledged that paediatric health has an influence on the family in a reciprocal and interactive way (Kazak et al., 2009), with family factors having a significant effect on the course of illness and vice versa (Field & Duchoslav, 2009). Some research supports findings that family dysfunction may influence the course of a disease or even an outcome (Kazak et al., 2009), with theories suggesting that poor family function may lead to an increased risk of obesity (Hasenboehler et al., 2009; Hooper et al., 2009). Nevertheless, specific mechanisms through which family characteristics influence paediatric overweight/obesity remain unclear and need to be a research focus (Moens et al., 2009). Moreover, although the influence of family function on weight status has been addressed (for instance, poorer family function has been related to increased eating pathology risk) (Iannaccone, D'Olimpio, Cella, & Cotrufo, 2016), little is known regarding the role of family function on parental and children's/adolescents' adjustment to paediatric obesity, with little research accounting for the links between these variables.

Research has consistently suggested at least three domains of family factors that influence the course of a youth's chronic illness: family function (e.g., FC), family response to treatment (e.g., family coping strategies), and parental factors (i.e., maternal adjustment/distress and parental overprotection; Field & Duchoslav, 2009). In this research project, we were interested in exploring, at a familial level, family function, because research has consistently shown that home environment and family function (parents in particular) have important roles in children's/adolescents' weight status (Jelalian & Hart, 2009) and on children's/adolescents' adjustment (e.g., externalizing behaviour; Hamlett, Pellegrini, & Katz, 1992). We were also interested in parental factors, which were previously explored (Section 3.2. Interconnection between parental variables, obesity, and children's/adolescents' adjustment). Regarding family function, one of the most commonly socio-ecological factors mentioned in chronically ill youth literature is FC (Field & Duchoslav, 2009; Wallander, Thompson, & Alriksson-Schmidt, 2003). FC is a key dimension of the family environment (Holmbeck, Coakley, Hommeyer, Shapera, & Westhoven, 2002). It is a family process defined as a degree to which an individual is connected or disconnected to the family system (Olson, Russell, & Sprenkle, 1983). Families with higher levels of FC are more supportive, healthy and uses positive interactions between family members (Field & Duchoslav, 2009). It has been acknowledged that paediatric obesity arises in families with less FC (Mendelson, White, & Schliecker, 1995; Zeller et al., 2007), which may suggest that FC may be an important family factor in paediatric obesity research. Such home environmental factors as FC have been found to influence the consumption of fruits and healthy foods in children (Franko et al., 2008; Haerens et al., 2008; Moore & Harré, 2007), which might be linked with their weight (including with the presence of overweight and/or obesity). FC has also been positively related to the consumption of breakfast and negatively associated with eating unhealthy foods (Moore & Harré, 2007). Wallander and Varni (1992) acknowledge that FC may also influence parental adjustment and found that higher FC was significantly predictive of better child/adolescent adjustment (Wallander & Varni, 1998). Nonetheless, these relationships might not be direct but mediated by other variables, which should be the focus of future research. Moreover, exploring the relationship between those variables in paediatric obesity is scarce and should be of utmost importance.

Furthermore, although family factors and characteristics are important in paediatric overweight/obesity studies, they are still studied too fragmentarily (Moens et al., 2009). Thus, other types of analyses (such as mediation analyses) are important in this study field, since they help complement simple descriptive analyses, creating a more functional understanding of the relationships between variables (Preacher & Hayes, 2004). When examining the association between FC and parental adjustment on child/adolescent adjustment with mediation analyses,

FC can be considered as an independent variable (e.g., Wallander et al., 1989) which may help understand their role on parental and children/adolescents adjustment.

4. Methodological considerations in paediatric psychology

4.1. Importance of a developmental approach

While many studies consider childhood and adolescence as one homogeneous group, children and adolescents have totally different developmental tasks and worries (Holmbeck, 2002; Kolotkin et al., 2006). Therefore, whenever possible, those two groups should be considered separately. Searching for differences between children and adolescents may help tailor more specific intervention programmes for paediatric overweight/obesity. This is supported by a significant body of research following developmental psychology, psychopathology, and paediatric psychology approaches (Achenbach & Rescorla, 2006). Wallander and Varni (1998) also highlighted the importance of adopting a developmental perspective in research, addressing individual adjustment to paediatric chronic conditions. Although they didn't explicitly consider age in the Disability-Stress-Coping Model (more information regarding the model in Section 2.3), they acknowledged the vital need to explore age differences, emphasizing that both children and adolescents and their families are in continuous development (Wallander & Varni, 1992, 1998, Wallander, 2003). Adolescents, for instance, often experience developmental changes that may impact the behaviours of significant others (e.g., mothers' behaviors; Holmbeck, 2002). Moreover, children and adolescents rely on parents differently, not only regarding their eating and physical patterns but also in general health guidance. In fact, younger children may demand more from their caregivers and require more supervision (Pereira, Canavarro, Cardoso, & Mendonça, 2009), while adolescents search for more autonomy (Erikson, 1982). Research has also found developmental differences in the psychosocial function of children/adolescents with obesity (e.g., Swallen, Reither, Haas, & Meier, 2005), with adolescence considered a suitable period of adjustment changes (Frelut & Flodmark, 2002; Steinberg & Morris, 2001). Furthermore, adolescence is considered a critical period for the establishment of risky health-related behaviours, not only in typically developing adolescents but also in those with CHC (Holmbeck, 2002). Moreover, adolescents may have more freedom regarding food and beverage choices, with adolescence also being a stage of less physical activity (World Health Organization, 2016b), which may impact weight.

Children and adolescents are highly susceptible to marketing of unhealthy foods and sugar-sweetened beverages as well as peer pressure and perceptions of ideal body image (World Health Organization, 2016b). Therefore, those are particularly important ages to study and during which to promote better health. Moreover, children/adolescents with an illness (such as overweight/obesity) continues to grow and develop. Therefore, they need to adjust and learn to

cope with their illness and, at the same time, continue their development, although it might be influenced by the presence of the CHC (Kazak et al., 2009).

To address this issue, a number of adapted instruments have been developed or adapted to children/adolescents, mainly because it has been acknowledged that adult measures are inappropriate for use with children/adolescents (Spieth & Harris, 1996). In order to endorse a developmental approach, we used different statistical procedures. For instance, the age of children/adolescents in some articles was entered as a covariate, and statistical analyses differentiating age groups were also performed. Moderation analyses were also executed, testing age as a possible moderator. More details regarding this issue are presented in Chapter II (Section 2.4.2. Mediation, moderation and moderated mediation analyses) as well as in each methodological section of each article.

4.2. Importance of self-reports

When studying individual concepts, such as psychopathology or QoL, self-reports are extremely important and the ideal strategy (Becker, Hagenberg, Roessner, Woerner, & Rothenberger, 2004; Matza, Swensen, Flood, Secnik, & Leidy, 2004). The definition of QoL as a subjective concept implies the importance of assessing the subjective point of view of the youth (Buttitta et al., 2014; WHOQOL Group, 1995). Therefore, the subjective perspective of the child/adolescent should be obtained from the patient's perspective whenever possible, especially when assessing domains that are usually unknown to parents (Matza et al., 2004).

Some findings are in line with those recommendations. For instance, empirical research shows inconsistent response agreement between children and proxy reports in the HrQoL (Van Der Meer, Dixon, & Rose, 2008; Varni, Katz, Colegrove, & Dolgin, 1994; Wake, Salmon, Waters, Wright, & Hesketh, 2002). Also, regarding emotional responses, the parent proxy-report and child self-report correlate only modestly (Eiser & Morse, 2001). Buttitta and colleagues (2014), in a literature review regarding paediatric obesity, suggested that parents may use their own feelings at the time of the evaluation to assess children's outcomes, whereas Tsiros et al. (2009) suggested that parents of children/adolescents with overweight/obesity may catastrophize the effect of their weight, or they may not fully understand experiences of their psychosocial function. Nonetheless, although children are traditionally considered unreliable informants, there is increasing research evidence that they are able to self-report (Riley, 2004). Moreover, although there is an increased interest in assessing the QoL of children/adolescents, few studies used self-reports (Kolotkin et al., 2006).

5. Research gaps and current challenges

In sum, and taking into account the aforementioned information, a series of gaps and challenges have been highlighted in those past years. With this research project we intend to address some of them and try to add some novel finding to the field.

First, and although paediatric obesity studies are increasing, investigating overweight/obesity through a paediatric psychology perspective is in an early stage in Portugal. Given the high prevalence of overweight/obesity in Portuguese children/adolescents and the dramatic psychosocial consequences of this CHC, not only in youths but also in their family members, paediatric obesity has become a considerable concern among families and in the medical field. Thus, the need for studies that contribute to a better understanding of its determinants and consequences has been emphasized (Rolland-Cachera & For the European Childhood Obesity Group, 2011). It is of utmost importance to identify individual, parental, and familial characteristics that correlate with higher paediatric weight and that are important for individual psychosocial adjustment. By identifying these characteristics as well as their potential interrelationships, clinical intervention and prevention programmes may be more efficient, focusing not only on changing important variables that might contribute to paediatric weight but also towards an improvement of psychosocial adjustment (Zeller & Daniels, 2004). Moreover, taking into account the importance of countries' cultural specificities, it is important to understand the role of these variables in the context of Portugal.

Second, and although research focuses on subjective outcomes, researchers have privileged proxy-reports from parents or other caregivers, excluding (or using more scarcely) self-reports, which may allow the assessment of more personal data.

Third, most studies include only children/adolescents with obesity, excluding children/adolescents that are overweight or taking those two groups as a whole. Overweight and obesity have specific requirements. For instance, medical prescriptions tend to be more demanding with obesity, with nutritionists prescribing more rigid diets. The consequences on the individual may also be different. For instance, having overweight or obesity may compromise the body image of the child/adolescent in different ways. Therefore, it is important to assess both groups separately.

Fourth, taking into account the particularities of developmental tasks of childhood and adolescence, and the fact that these phases can be associated with different psychological outcomes, research should take them into account, but separately (Holmbeck, Zebracki, & McGoron, 2009).

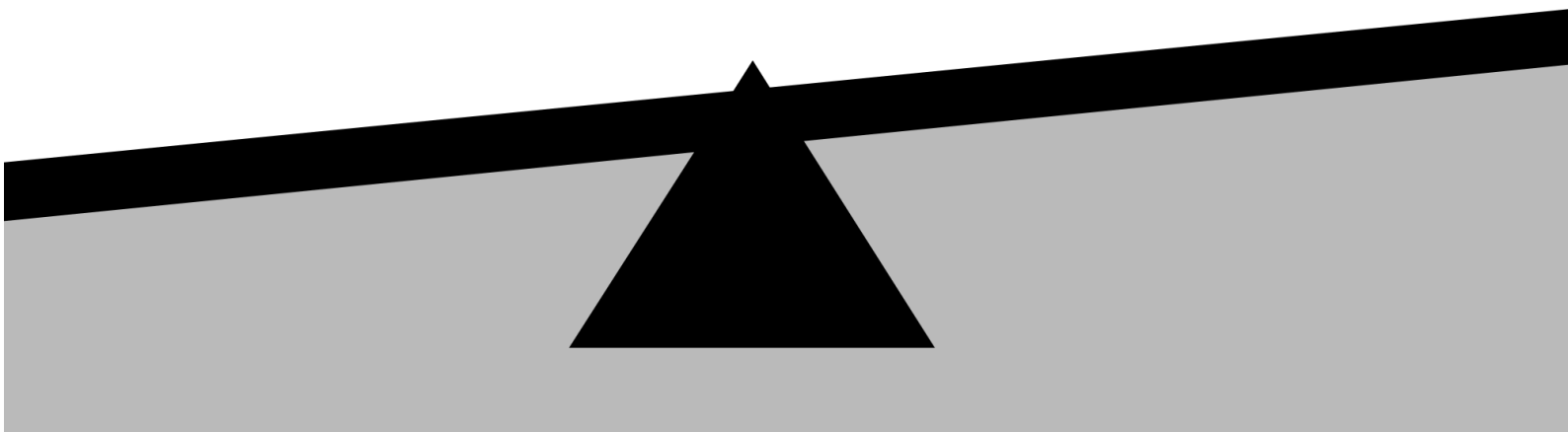
Fifth, although research acknowledges that mothers tend to be more responsible than fathers regarding their children (not only regarding medical appointments but also regarding

children's eating patterns; Haycraft & Blissett, 2011; Holmbeck et al., 2009), research should consider fathers in research settings.

Finally, there is a lack of studies regarding the role of parenting variables on the psychosocial adjustment of children/adolescents with obesity. It is essential to better understand the possible relations between parental variables and the adaptation of these children/adolescents in order to enhance intervention programmes that target young children and their parents (Ventura & Birch, 2008). A better understanding of the relationship of these variables will be important for clinicians and intervention programmes. For example, literature found that parenting stress has a negative effect on parenting functioning (Crnic, Gaze, & Hoffman, 2005; Rodgers, 1993). Literature also states that parenting behaviours may mediate the relationship between parenting stress and child adjustment. Yet, little research has tested this mediation hypothesis (Anthony et al., 2005; Deater-Deckard, 1998). In order to test those relations, parent–child dyadic perspectives are needed. The findings previously explored in the introduction section suggest that researchers and practitioners may benefit from further research on the interrelationship between family environment, parental adaptation, individual adaptation, and paediatric weight.

Chapter II |

Objectives and Method



Chapter II | Objectives and Method

This research project was conducted within the *Relationships, Development & Health* Research Group of the Cognitive and Behavioral Center for Research and Intervention (CINEICC; R&D unit of the Portuguese Foundation for Science and Technology), at the Faculty of Psychology and Education Sciences of the University of Coimbra. This project comprised a period of supplementary research activities, conducted at the School of Sport, Exercise and Health Sciences of the Loughborough University (United Kingdom), between May 1st and July 31st 2015, under the supervision of Professor Emma Haycraft.

This dissertation comprises four scientific articles. Two studies are already published in peer-reviewed journals (study I in a national journal and study II in an international journal). Two other studies (III and IV) were submitted for publication in two different international peer-reviewed journals. Specific and detailed objectives and methods (e.g., participants, instruments, statistical analyses) of each study are described in the articles' appropriate sections (see Chapter III).

1. Research objectives

The aim of this research project was to address important research gaps in literature, previously identified in Chapter I. Therefore, it has two main general objectives:

1) First, it intends to provide an innovative contribution to the understanding of the psychosocial adaptation of children/adolescents with overweight/obesity and their parents. Moreover, we aimed to analyze relevant familial (e.g., family cohesion), parental (e.g., parenting stress and parenting styles) and individual (e.g., QoL, psychopathological symptoms, body image and social life) areas of functioning of children/adolescents with overweight/obesity and their parents.
2) Secondly, we aimed to analyze possible mechanisms that may account for the associations between family and parental characteristics on children's/adolescents' outcomes (e.g., weight; internalizing and externalizing symptoms; and QoL). Therefore, we explored processes that might contribute to the clarification of possible differences in adaptation outcomes between children/adolescents with overweight/obesity and their parents, when compared with children/adolescents with healthy weight and their parents. In sum, we were interested in exploring the role of familial and parenting dimensions as well as the role of maternal and paternal individual dimensions in the psychosocial adjustment and/or weight of children/adolescents with overweight/obesity.

There was a focus on the association between children/adolescents and their parents'

psychosocial functioning and well-being. In order to address it, the sample comprised dyads of children/adolescents and their parents. Depending on the specific objective of each study, both participant effects were tested, with the effects of a person's own characteristics on his/her own outcomes, or the effects of one person characteristics (e.g., mother's characteristics) on the child/adolescent outcomes.

Given the developmental specificities and tasks of childhood and adolescence, age must be considered whenever possible. This scientific project follows a developmental approach by taking age as an important variable. Therefore, statistical analyses that differentiate age groups were preferred (e.g., mean comparisons between age groups; moderation analyses with age as moderator). This issue and some methodological approaches are discussed in detail in Chapter I (4.1. Importance of developmental approaches).

In order to address these general objectives, four empirical studies were conducted. Table **1** presents the specific objectives of each empirical study.

Table 1 | Specific Research Objectives According to the Empirical Study

Empirical study	*Specific objectives*
Empirical study I	• Compare the levels of QoL and psychopathological symptoms of children/adolescents with obesity, overweight and healthy weight; • Compare the levels of QoL, depression and anxiety symptoms of parents of children/adolescents with obesity, overweight and healthy weight; • Analyze the relationship between parents' adaptation (QoL, depression and anxiety symptoms) and the QoL of children/adolescents with obesity, exploring the possible mediator role of the psychopathological symptoms of children/adolescents and the possible moderator role of children's/adolescents' age.
Empirical study II	• Examine the potential differences between mothers of children/adolescents with obesity and healthy weight in parenting stress and parenting styles. • Investigate whether the parenting stress of mothers of children/adolescents with obesity was indirectly associated with their QoL through a particular parenting style (authoritative, authoritarian, or permissive) and whether the direct and indirect effects were moderated by children's/adolescents' age.
Empirical study III	• Investigate differences in family cohesion, maternal QoL, and children's/adolescents' externalizing and internalizing symptoms between families with children/adolescents with overweight/obesity and families with children/adolescents with healthy weight. • Investigate whether mothers' perception of family cohesion was indirectly associated with children's/adolescents' weight status through sequentially mothers' QoL and children's/adolescents' externalizing and internalizing symptoms.
Empirical study IV	• Investigate whether the mothers' perception of family cohesion was indirectly associated with the internalizing or externalizing symptoms of children/adolescents with obesity through children's/adolescents' perceptions of body esteem and social life.

2. Method

2.1. Study design

The present research study (i.e., all empirical studies presented) had a cross-sectional design, with data being collected in a single moment from three non-independent individuals: a child or adolescent (with overweight/obesity in the clinical group and with healthy weight in the

control group), the mother, and the father. Participants were selected in accordance with the non-probabilistic sampling method of convenience.

The studies were quantitative in nature and data was collected through self-completion datasheets and questionnaires. Socio-demographic, clinical data, psychosocial variables and adaptation outcomes were assessed at the individual level.

2.2. Participants and Procedures

Two different samples were recruited for this research project: 1) a clinical sample that comprised children/adolescents with overweight or obesity and their parents; and 2) a control group comprising children/adolescents with healthy weight and their parents.

2.2.1. Clinical group

The sample of children/adolescents with overweight or obesity and their parents (both mothers and fathers) was recruited in the Nutrition consultations of three different public health institutions, between February 2012 and April 2015: (1) Hospital Pediátrico do Centro Hospitalar de Coimbra [CHC] (Serviço de Pediatria Ambulatória); (2) Hospital de Santo André do Centro Hospitalar Leiria-Pombal, EPE (Departamento de Pediatria); and (3) Centro de Saúde de Eiras (which promoted the 2nd Summer School Camp at the Escola Superior Agrária de Coimbra, where some participants were also recruited). The respective Ethical Committees and/or Direction Boards of the three health institutions approved the study, as well as the Portuguese Data Protection Authority (CNPD – Comissão Nacional de Protecção de Dados) and the Centre Regional Health Authority (ARSC - Administração Regional de Saúde do Centro).

Sample collection was conducted by a research team composed by the main researcher of this project and, for a short period of time, two trained research assistants, acquainted with the project objectives and methods (students in the final year of the Integrated Master in Psychology, specialty in Clinical Psychology and Health, at the Faculty of Psychology and Education Sciences of the University of Coimbra). At the three health institutions, children/adolescents were attending nutrition appointments and were followed with the purpose to lose weight through a prescribed diet and exercise. Eligible children/adolescents were identified by their physician/nutritionist, based on their BMI and medical files. In order to participate in the study, the following inclusion criteria were established:

1. Diagnosis of overweight or obesity by the physician or the nutritionist;
2. Chronological age of the child/adolescent between 7 and 18 years;

3. Ability to understand and answer autonomously the questionnaires in the Portuguese language (according to medical files information's and their physician/nutritionist information);
4. No significant mental or developmental delay (diagnosed by the physician/nutritionist, or according to medical files information);
5. Absence of genetic syndromes that could cause or be associated with overweight/obesity.

The diagnosis of overweight or obesity was made by the physician or the nutritionist, based on the growth charts of the National Center for Health and Statistics (Kuczmarski et al., 2002), which are adapted and used in the Portuguese health system since 2006. Based on these growth charts, children/adolescents were clustered into three different weight categories (paediatric obesity: BMI ≥ 95th percentile; overweight: percentile 85 ≤ IMC < percentile 95; and healthy-weight: 5th percentile ≤ BMI < 85th percentile). Weight categories were defined by taking into account the percentile values of the BMI for children/adolescents of the same age and sex, calculated from weight (kg) and height (m) according to the following formula: weight/height^2. Children's/adolescents' BMI was transformed into Z scores (zBMI), which indicate the number of standard deviations the child's/adolescent's measurement stays below the reference value (Cole & Rolland-Cachera, 2002). As explained in the Introduction section, children's/adolescents' weight should be adjusted, making it possible to compare across ages, sexes, and anthropometric measures (Wang & Chen, 2012).

After the nutritionist/physician indication of the eligible cases, the researcher contacted and explained the objectives of the study, inviting children/adolescents and their parents to participate. If they accepted to participate, the protocol was delivered. The assessment protocol was completed in person by the child/adolescent and their parents in a consultation office provided for the purpose, after obtaining the written informed consent form from the parents and the adolescents older than 13 years, and the informal verbal assent from younger children. In the majority of cases, participants completed the assessment protocol before or after the nutritional/medical appointment. When the child/adolescent and/or their parents were unable to complete the questionnaires at the hospital, a pre-addressed and stamped envelope was given to them to answer the questionnaires at home and return them by mail. Adults were instructed that they could help the child/adolescent to understand the items but could not influence their answers. Two weeks later, a text message was sent by phone to remind the participants to return the questionnaires.

Children/adolescents were assessed in different timings. For instance, some children/adolescents were being followed by the nutritionist/physician for several months/years,

while others were having their first clinical appointments. Nonetheless, all children/adolescents were overweight or obese at the moment of recruitment.

2.2.2. Control group

The sample of children/adolescents with healthy weight and their parents (both mothers and fathers) was recruited in three Portuguese public schools of the Monção school unit. Sample was recruited between January 2012 and February 2014. The Direction Board of the school unit as well as the Portuguese Data Protection Authority approved the study.

Teachers from several classes were contacted by the researchers after the obtainment of the authorization from the Direction Board of the schools. Teachers were instructed regarding the study and asked to serve as intermediaries between the researcher and the children/adolescents and their families. Teachers gave children/adolescents a letter explaining the study as well as an informed consent form to be filled in by parents at home. Parents who agreed to participate returned the informed consent form signed and, in return, received an envelope with the set of questionnaires to complete at home and return a week later.

In order to participate in the study, the following inclusion criteria were established:

1. Chronological age of the child/adolescent between 7 and 18 years;
2. Ability to understand and answer the questionnaires autonomously in the Portuguese language (according to their teachers);
3. No significant mental or developmental delay (according to their teachers and educational files).

Although children and adolescents with overweight and obesity also completed the questionnaires, only children/adolescents with healthy weight were retained. In order to be considered as having healthy weight, the growth charts of the National Center for Health and Statistics (Kuczmarski et al., 2002) were used, with a healthy weight being considered when the BMI was between the 5th and the 85th percentiles. Table 2 presents the specific dates and sample size of each institution.

Table 2 | Sample Size of the Clinical Sample by Data Collection Institution

Institution	Specific dates	Sample size[1]	%
Hospital de Santo André - Leiria	From 13th February 2012 to 31st July 2012	*n* = 87	24.4%
Hospital Pediátrico de Coimbra	From 14th March 2012 to 27th April 2015	*n* = 210	58.8%
Centro de Saúde de Eiras	From 10th September 2013 to 27th April 2015	*n* = 49	13.7%
2nd Summer School Camp	From 16th June 2014 to 27th June 2014	*n* = 11	3.1%
Total		***n* = 357**	**100%**

[1]This number comprises dyads of children or adolescents and mothers, or tryads composed of children or adolescents and both parents.

Sampling procedures are described in detail in the methodological sections of each research article. The number and composition of the sample in each empirical study varied significantly, according to the objectives of each study (for instance, the presence of only mothers or both fathers and the child/adolescent).

Table 3 presents an overall view of sample with the specific number of tryads, dyads and individual participations in the study.

Table 3 | Number of Tryads, Dyads and Individual Participations in the Study

Respondent	Mothers *n*	Fathers *n*	Children[1] *n*	Total *n*	%
Tryads					
Both parents and child	60	60	60	180	16.8%
Dyads					
Mother and child	167	-	167	334	46.8%
Father and child	-	23	23	46	6.4%
Mother and father	4	4	-	8	1.1%
Individual participations					
Only mothers	18	-	-	18	5.0%
Only fathers	-	2	-	2	0.6%
Only children	-	-	89	89	23.2%
					100%

[1]Both children/adolescents

Table 4 presents in detail the samples used in each empirical study. The real N of each study is presented as well as some details regarding the sample groups.

Table 4 | Details of the Samples Used in Each Empirical Study (Both Clinical and Control Groups)

Study	Sample details	Respondent details	N
Empirical study I	Three groups were recruited: 1) Children/adolescents with healthy weight and their mothers or fathers; 2) Children/adolescents with overweight and their mothers or fathers; 3) Children/adolescents with obesity and their mothers or fathers.	Children/adolescents with healthy weight Children/adolescents with overweight Children/adolescents with obesity Mothers Fathers **Total**	*n* = 127 *n* = 30 *n = 107* *n = 248* *n = 16* ***n = 528***
Empirical study II	Two groups were recruited: 1) Children/adolescents with healthy weight and their mothers; 2) Children/adolescents with obesity and their mothers.	Children/adolescents with healthy weight Children/adolescents with obesity Mothers **Total**	*n* = 125 *n* = 98 *n* = 223 ***n* = 446**
Empirical study III	Two groups were recruited: 1) Children/adolescents with healthy weight and their mothers; 2) Children/adolescents with overweight/obesity and their mothers.	Children/adolescents with healthy weight Children/adolescents with overweight/obesity Mothers **Total**	*n* = 134 *n* = 163 *n* = 297 ***n* = 594**
Empirical study IV	One group was recruited: 1) Children/adolescents with obesity and their mothers.	Children/adolescents with obesity Mothers **Total**	*n* = 182 *n* = 182 ***n* = 364**

2.3. Variables and instruments

To meet the objectives for this research project and to assess the different variables established, a selection of different measures (socio-demographic and clinical datasheets as well

as self-completion questionnaires) were assembled in a broader assessment protocol. Both children/adolescents and their parents answered. Questionnaires were preferred over other methods because of their economic management (questionnaires are less time and money consuming). Depending on each empirical study objectives, different measures were selected for data analyses. Therefore, details regarding the different use of each instrument are described in the respective section of the empirical studies.

Instruments were selected according to a number of different criteria, including their short size (to minimize the participants' response burden), availability of a translated and adapted version in the European Portuguese language, as well as its psychometric robustness (reliability and validity confirmed in previous studies with Portuguese samples). Table 5 summarizes the variables and instruments chosen for each empirical study.

Table 5 | Variables and Instruments in Each Empirical Study

Variables	Instruments	Informant	I	II	III	IV
Socio-demographic and clinical information						
Socio-demographic and clinical information	Datasheets	Mother and Father	✓	✓	✓	✓
Weight and height		Physician/Nutritionist	✓	✓	✓	✓
Family variables						
Family Cohesion	Cohesion subscale of the Family Environment Scale	Mother			✓	✓
Parental variables						
Parenting Stress	Distress subscale of the Parenting Stress Index – Short Form	Mother		✓		
Parenting Styles	Parenting Styles and Dimensions Questionnaire	Mother		✓		
Psychosocial adaptation outcomes						
Generic QoL	KIDSCREEN-10	Child/adolescent	✓	✓		
	EUROHIS-QOL-8	Mother	✓		✓	
		Father	✓			
Psychopathological symptoms	Strengths and Difficulties Questionnaire	Child/adolescent	✓		✓	✓
Psychopathological symptoms	Hospital Anxiety and Depression Scale	Mother	✓			
		Father	✓			
Body Esteem	Impact of Weight on Quality of Life – Kids	Child/adolescent				✓
Social Life		Child/adolescent				✓

2.3.1. Socio-demographic and clinical information

A datasheet purposely developed for this study was used to collect participants' socio-demographic information, and was completed by the parents. In the clinical group, parents provided information regarding their own age, gender, height and weight, marital status, educational level, as well as their children's/adolescents' age and gender. Children's/adolescents' clinical information (height, weight and comorbid health problems) was reported by the physician/nutritionist. In the control group, all the information was provided by the parents, including the height, weight and comorbid health problems of their children.

2.3.2. Family variables

2.3.2.1. Family Cohesion (*Family Environment Scale - FES*)

The FES is a widely used instrument that evaluates the family social climate (Moos & Moos, 2009). The instrument includes 90 items clustered into 10 subscales that assess three dimensions of the family environment: (1) Family Relationship Index (comprising the Cohesion, Expressiveness and Conflict subscales); (2) Personal Growth (Independence, Achievement-Orientation, Intellectual-Cultural Orientation, Active-Recreational Orientation and Moral-Religious Emphasis subscales); and (3) System Maintenance (Organization and Control subscales; Moos & Moos, 1994). In our study, although the complete Family Relationship Index was administered, the focus was on the Cohesion subscale, since we were interested in assessing parents' perceptions of commitment to the family and the degree to which family members are helpful and supportive of one another (Moos & Moos, 1986). The Cohesion subscale comprises nine items (e.g., "Family members really help and support one another"), answered on a 6-point Likert scale ranging from 1 (*completely disagree*) to 6 (*completely agree*). Higher scores indicate a higher perception of family cohesion.

The original FES was psychometrically tested and presented acceptable reliability, with a Cronbach's alpha value of .78 for the Cohesion subscale (Moos & Moos, 2009). This instrument was adapted for Portuguese by Matos and Fontaine (1992). In previous Portuguese studies this instrument has demonstrated good psychometric characteristics. Moreover, only the Cohesion subscale has been used in some studies (e.g., Moreira, Frontini, Bullinger, & Canavarro, 2013; Moreira, Frontini, Bullinger, & Canavarro, 2014; Mendes, Crespo, & Austin, 2016; Prioste, Narciso, Gonçalves, & Pereira, 2015).

2.3.3. Parental variables

2.3.3.1. Parenting stress (*Parenting Stress Index - Short Form*)

In order to assess parenting stress, the Distress subscale of the Portuguese version of the Parenting Stress Index - Short Form (Abidin, 1995; Santos, 2008) was used. This instrument assesses the level of relative stress in a parent-child relationship and is divided into three subscales: Parental Distress; Parent-Child Dysfunctional Interaction; and Difficult Child. Only the Parental Distress subscale was used in order to assess the stress associated with the parenting role. This subscale assesses the distress that a parent may experience due to individual factors related to parenting and from possible life restrictions caused by parenting demands. The 12 items of this subscale (e.g., "I feel trapped by my responsibilities as a parent") are answered in a 5-point Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). Scores from the items are summed, with higher scores indicating higher levels of parenting stress ranging from 12 to 60. Mothers were instructed to answer the questions considering the way they generally behave with their children.

The original instrument has good psychometric properties, presenting an adequate internal consistency (Cronbach's alpha = .78) and test–retest stability (r = 0.61). Regarding the Portuguese version of the Parental Distress subscale, it has proved to be valid and reliable and presents an adequate internal consistency (Cronbach's alpha = .82). It is important to note that although this instrument was design for parents of children under 12 years old, it has been proved that it is adaptable for both children and adolescents (e.g., Schaaijk, Roeleveld-Versteegh, & Baar, 2013; Streisand, Braniecki, Tercyak, & Kazak, 2001).

2.3.3.2. Parenting styles (*Parenting Styles and Dimensions Questionnaire*)

In order to assess parenting styles, the Portuguese version of the Parenting Styles and Dimensions Questionnaire was used (Carapito, Pedro, & Ribeiro, 2008; Robinson, Mandleco, Olsen, & Hart, 2001). This instrument measures three parenting styles (Authoritative, Authoritarian and Permissive) and consists of 32 items that are rated by parents on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*always*) according to the way they generally behave with their children. The Authoritative parenting style is composed of 15 items and comprises the connection, regulation and autonomy granting dimensions (e.g., "I help my child to understand the impact of behaviour by encouraging my child to talk about the consequences of his/her own actions"). For this scale, scores range from 15 to 75. The Authoritarian parenting style is composed of 12 items (e.g., "When my child asks why he/she has to conform, I state: because I said so, or I am your parent and I want you to"), with scores ranging from 12 to 60. As regards

to the Permissive parenting style, it is a unidimensional scale including 5 items (e.g., 'I give into my child when the child causes a commotion about something"), with scores ranging from 5 to 25. In each subscale, higher scores reflect a more frequent use of that particular parenting style.

This instrument has adequate reliability with the original questionnaire presenting a Cronbach's alpha value of .86 for the Authoritative subscale, a Cronbach's alpha value of .82 for the Authoritarian subscale and a Cronbach's alpha value of .64 for the Permissive subscale (Robinson et al., 2001). Furthermore, the instrument presents an adequate construct validity (convergent and discriminant). The Portuguese version has been widely used (Correia, 2008; Esteves, 2010; Gouveia, Carona, Canavarro, & Moreira, 2016; Marques, 2013; Veríssimo, 2012) presenting acceptable internal consistency values: Cronbach's alpha of .88 for the Authoritative subscale, Cronbach's alpha of .73 for the Authoritarian subscale and Cronbach's alpha of .62 for the Permissive subscale (Pedro, Carapito, & Ribeiro, 2015). It also presented and adequate construct validity (convergent and discriminant).

2.3.4. Individual variables

2.3.4.1. Children's/adolescents' outcomes

2.3.4.1.1. Quality of life (*KIDSCREEN-10*)

To assess children's/adolescents' self-reported generic QoL, the Portuguese version of the KIDSCREEN-10 (Matos, Gaspar, & Simões, 2010; Ravens-Sieberer et al., 2010) was used. This questionnaire assesses general subjective health and wellbeing using 10 items (e.g., "Have you felt fit and well?") and can be completed by children/adolescents aged between 8 and 18 years, with or without a CHC. The child/adolescent answers on a 5-point Likert scale ranging from 1 (*never; not at all*) to 5 (*always; extremely*) regarding the past week. Using the mean score of items, a global score can be calculated and items might be standardized according to the available norms for Portuguese population (Gaspar & Matos, 2008). Higher standardized scores indicate a better QoL ranging from 0 to 100.

The KIDSCREEN-10, by being a short form to assess QoL, is less time and money-consuming and minimizes fatigue, loss of motivation and dropouts while conserving the good psychometric performance of the instrument (Mühlan, Bullinger, Power, & Schmidt, 2008). Moreover, the possibility to have a unified final score allows the simplification of results' discussion. Regarding the psychometric properties of the questionnaire, the instrument was tested in a representative community-based sample of children/adolescents in 13 European countries (Ravens-Sieberer et al., 2010). It presents not only good internal consistency (Cronbach's alpha value of .82 for the self-report version) but also satisfactory criterion validity

with the long version (the KIDSCREEN-52) as well as convergent validity with other QoL measures. The instrument was adapted to the Portuguese language and culture (Gaspar & Matos, 2008) and presented good internal consistency with a Cronbach's alpha of .78 (Matos et al., 2010).

2.3.4.1.2. Psychopathological symptoms (*Strengths and Difficulties Questionnaire – SDQ)*

In order to assess psychopathological symptoms the Difficulties subscale of the Portuguese self-reported version of the Strengths and Difficulties Questionnaire (SDQ; Fleitlich, Loureiro, Fonseca, & Gaspar, 2005; Goodman, 2001) was used. This is a subscale that comprises 20 items that might be clustered into Externalizing (e.g., "I get very angry and often lose my temper") and Internalizing (e.g., "I worry a lot") symptoms, according to the latest recommendations (Goodman, Lamping, & Ploubidis, 2010). The first cluster combine 10 items from the Emotional Symptoms and Peer Problems original sub-scales while the second one combine 10 items from the Hyperactivity-Inattention Symptoms and the Conduct Problems original sub-scales (Goodman, Lamping, & Ploubidis, 2010). Children/adolescents answer on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*certainly true*), with higher values indicating higher levels of psychopathological symptoms. The self-report version of this instrument was originally designed for children/adolescents from 11 to 16 years old. However, it can be used with younger children according to their abilities and educational level (e.g., Frontini, Crespo, Carona, & Canavarro, 2012; Goodman, Meltzer, & Bailey, 1998; Gouveia, Frontini, Canavarro, & Moreira, 2014; Moreira et al., 2013; Serrano Villar et al., 2016).

Regarding the psychometric properties of the SDQ, the internal Cronbach's alpha for the child-report version of the instrument was .82 for the total Difficulties scale (Goodman, Meltzer, & Bailey, 1998). Regarding Internalizing and Externalizing Symptoms, Cronbach's alpha values for the child-report version were .66 for Internalizing symptoms and .76 for Externalizing symptoms (Goodman, Lamping, & Ploubidis, 2010). The Portuguese version of the SDQ have been widely used in research in several studies with different ages and conditions (Frontini et al., 2012; Moreira et al., 2013; Pechorro, Poiares, & Vieira, 2011). Although its psychometric properties resembled those found with British samples (Marzocchi et al., 2004) to the best of our knowledge there is no Portuguese psychometric study specifically to the Internalizing/Externalizing scales.

2.3.4.1.3. Weight and height (BMI)

The weight and height of children/adolescents recruited in health institutions were measured by the physician/nutritionist. The weight and height of children/adolescents recruited in the schools were reported by parents. The weight condition of children and adolescents was classified as normal, overweight or obese according to the growth charts of the National Centre for Health and Statistics (Kuczmarski et al., 2002) used in the Portuguese population since 2006. These charts take into account the percentile values of the BMI for children/adolescents of the same age and gender, calculated from weight (kg) and height (m) according to the following formula: weight/height^2. Children's/adolescents' BMI was transformed into Z scores (zBMI).

2.3.4.1.4. Body Esteem and Social Life (*Impact of Weight on Quality of Life-Kids – IWQOL-Kids*)

In order to assess children's/adolescents' perceptions of their body esteem and social life, the Body Esteem and Social Life subscales of the Impact of Weight on Quality of Life-Kids (IWQOL-Kids; Kolotkin et al., 2006; Palmeira et al., 2008) were used. The IWQOL-Kids is a 27-item questionnaire that assesses the impact that weight has on the QoL of children/adolescents. Each item begins with the sentence, "Because of my weight…" and contains five possible response options, ranging from 1 (*always true*) to 5 (*never true*). The questionnaire provides a score for the total scale and four scores for the subscales Physical Comfort, Body Esteem, Social Life and Family Relations.

The Body Esteem subscale contains nine items (e.g., "Because of my weight I don't like myself") assessing the impact that weight has on body self-perceptions, i.e., how the individual feels about themselves and their body in the context of their weight. Standardized scores range from 0 to 100 with higher scores representing better body esteem.

The Social Life subscale comprises six items (e.g., "Because of my weight I have trouble making friends") assessing the individual's perception of their social relations, i.e., the individual perception of how they are treated within their social environment in the context of their weight. Standardized scores range from 0 to 100 with higher scores representing social life.

The IWQOL-Kids has good internal consistency (ranging from .88 to .95 for subscales, and .96 for total score), and is sensitive to differences among BMI groups and between clinical and community samples. Regarding the Portuguese version, the factorial validity and reliability is acceptable, with a Cronbach's alpha for the total score of .92, and the subscales ranging from .75 to .92 (Palmeira et al., 2008).

2.3.4.2. Parents' outcomes

2.3.4.2.1. Quality of life (*EUROHIS-QOL-8*)

The Portuguese version of the EUROHIS-QOL-8 (Pereira, Melo, Gameiro, & Canavarro, 2011; Schmidt, Mühlan, & Power, 2006) was used to assess mothers' perceptions of their QoL. This instrument is a quick and practical indicator of overall QoL (Da Rocha, Power, Bushnell, & Fleck, 2012) and contains eight items (e.g., "Do you have enough energy for everyday life?") answered on a 5-point Likert scale ranging from 1 (*not at all/very dissatisfied*) to 5 (*completely/very satisfied*). Therefore, higher scores indicate a better perception of QoL. It comprises two items from each domain of the original WHOQOL-BREF (Physical, Psychological, Environmental, and Social). The instrument presented good internal consistency across countries, acceptable convergent and discriminant validity between healthy and ill populations, with a Cronbach's alpha value ranging from .74 to .85 (Da Rocha et al., 2012; Schmidt et al., 2006). Regarding the Portuguese version, the psychometric study found a Cronbach's alpha value of .83.

2.3.4.2.2. Psychopathological symptoms (*Hospital Anxiety and Depression Scale*)

We used the Hospital Anxiety and Depression Scale (HADS; Pais-Ribeiro et al., 2007; Zigmond & Snaith, 1983), which comprises 7 items to assess Depressive Symptoms (e.g., "I have lost interest in my appearance") and 7 items to assess Anxious Symptoms (e.g., "I get a sort of frightened feeling like something awful is about to happen") rated on a 4-point Likert scale ranging from 0 to 3. The respondent should answer according to how he/she has been feeling in the past week. Scores range from 0 to 21 for each subscale.

This instrument has good internal consistency and good face validity. In the Portuguese version, it presented good psychometric characteristics as regards to internal consistency, with a Cronbach's alpha of .76 for the Anxiety scale and a Cronbach's alpha of .81 for the Depression scale. This instrument was developed to screen for depression and anxiety among medical patients. However, the HADS is also an appropriate questionnaire for non-psychiatric populations (Zigmond & Snaith, 1983) and has been used in several studies with different populations (Bjelland, Dahl, Tangen, & Neckelmann, 2002).

2.4. Statistical options

In this section, some broad-ranging analytic options and techniques that guided this research project are discussed, in order to acquaint the reader with the methodological framework that sustained it. More information regarding specific statistical methodology for each

empirical study is thoroughly described forward in the methodological sections of each study (Chapter III). Specifically, three groups of general statistical procedures were used and are described below: 1) comparison analyses; 2) mediation, moderation, and moderated mediation analyses; and 3) structural equation modeling (SEM).

2.4.1. Comparison analyses

Most research questions in paediatric psychology focuses on differences between groups (Holmbeck, Zebracki, & McGoron, 2009). Therefore, comparison analyses were performed to assess differences between weight conditions (e.g., children/adolescents with obesity vs. children/adolescents with healthy weight) and age groups (children vs. adolescents). The examination of age differences was important because in this research project a developmental perspective was assumed (this issue is explored in more detail on Chapter 1, Section 4.1. Importance of a developmental approach). Between-groups comparison analyses, independent samples t-tests for continuous variables and chi-square (χ^2) tests for categorical variables, were performed. The effects of the weight condition (healthy weight, overweight, obesity) and age group (children, aged 7–12 years; adolescents, aged 13–18 years) were assessed by two-way univariate ANOVAs. Whenever there was the need to add a covariate in the analyses, ANCOVAs instead of ANOVAs were performed. Two-way MANOVAs, were performed whenever there was more than one dependent variable (e.g., different types of parenting styles: authoritative, authoritarian and permissive). In this case, when a multivariate effect was found, subsequent ANOVAs were performed, one per dependent variable.

2.4.2. Mediation, moderation and moderated mediation analyses

In some of the empirical studies of the project, and in order to meet the established objectives, it was necessary to investigate indirect effects. In an indirect effect, a mediator is a variable that explains the relationship between two or more variables, i.e., a mechanism explaining why two variables (the predictor variable and the criterion variable) are associated (Baron & Kenny, 1986; Holmbeck, Zebracki, & McGoron, 2009). In line with recent recommendations (Preacher & Hayes, 2008; Williams & MacKinnon, 2008), a bootstrapping procedure was used to examine indirect effects. Bootstrapping is a nonparametric resample procedure (in the three articles using mediation we used 10000 resamples), which does not rely on the assumption of a normally distributed sampling of the indirect effect (Preacher & Hayes, 2004) and that demonstrates higher power with reasonable control over the Type-I error rate through an appropriate control of confidence intervals (Briggs, 2006). Both moderated mediation (explained below after the description of moderation) and sequential mediation analyses were

performed. In a sequential mediation (i.e., serial multiple mediator model), more than one possible mediator is tested sequentially. The researcher intends to explore the direct or indirect effects of a predictor variable to a criterion variable, with the predictor variable causing the first mediator which, in turn, causes a second mediator, and so forth, with the criterion variable being the final consequence (Hayes, 2013). For instance, in one of our studies we were interested in investigating if the relationship between family cohesion and weight status was mediated sequentially by mothers' QoL and children's/adolescents' externalizing and internalizing symptoms.

With moderation analyses researchers are trying to answer to the following question: What factors might influence the magnitude of a relationship between two variables? (Holmbeck, Zebracki, & McGoron, 2009). Moderators are variables that might have an impact on the strength or direction of the association between at least two variables: a predictor variable and a criterion variable (Baron & Kenny, 1986; Holmbeck et al., 2009). For instance, in our first study (Article I; Frontini, Gouveia, Moreira, & Canavarro, 2016), to better understand the moderating role of age in the relationship between the parental anxiety symptoms and the psychological problems of children/adolescents, a moderation analysis was performed and it was found that this relationship was only significant from 12.76 years.

Regarding moderated mediation it occurs when an indirect effect is also moderated (Hayes, 2013). Therefore, it assesses not only how a given effect occurs but also when it occurs (Preacher, Rucker, & Hayes, 2007). For instance, in one of our studies (Article I; Frontini et al., 2016) we estimated three models of moderated mediation (using age as a moderator). Since an interaction in one model was found, we tested a final model and found that the association between parental anxiety symptoms and the QoL of children/adolescents was not direct but rather mediated by their psychological problems but only for adolescents from 12.76 years.

2.4.3. Structural equation modeling (SEM)

With SEM, researchers may test complex relationships based on previous research or theories (Weston & Gore, 2006). This technique tests hypotheses about the relations among observed and latent variables (Hoyle, 1995). The interpretation of model adjustment is made through the analysis of several indicators (goodness-of-fit indicators). In the study where we used SEM, the goodness-of-fit indicators used were the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA) with its associated 90% confidence interval, and the standardized root-mean-square residual (SRMR; Schreiber, Stage, King, Nora, & Barlow, 2006). In this research project we used SEM because the research question suggested the use of this technique, and because the models were theoretically grounded (Schreiber et al., 2006). Moreover, we provided graphic displays of the final models on the article.

2.4.4. Effect sizes

Effect sizes were obtained since they are extremely important to quantify the difference that might exist, indicating the strength that a relationship between variables might have (Durlak, 2009). Researchers should not focus solely on statistical significance (for instance, p-values) or correlations, because their values might be related with sample sizes, being, for example, significant in one sample, but not significant in another (Holmbeck et al., 2009). Hence, in larger samples it is more likely that significant differences appear than in small samples. On the contrary, effect sizes do not depend on sample size. In the empirical studies present in this project we used the following effect sizes indicators: Pearson's correlation coefficient (r); coefficient of determination (R^2); and partial Eta squared (η^2_p). We adopted a level of significance $\alpha = .05$, meaning that we had 5% chance of rejecting a true null hypothesis (type I error).

2.4.5. Using a multi-informant approach

Taking into account the interacting influence between family members variables and individual adjustment (as previously described), as well as the complexity of family systems, it was important to assess multiple family members in order to have complementary information. A multi-informant approach is a method where a researcher assesses more than one informant sharing a close relationship (e.g., a mother and a child; Achenbach, 2006).

Collecting information from multiple informants produces a great amount of information (Reyes et al., 2015). In this research project we were interested in access not only adaptation outcomes but also family relationships and parental variables. Each informant may provide useful information regarding different aspects of a person's functioning (Achenbach, 2006). Therefore, some of the analyses performed in this research study were dyadic because direct and indirect links were investigated between parents and children/adolescents. Thus, a parent characteristic or outcome (e.g., mother's perception of family cohesion) might be related with a youth's outcome (e.g., children's/adolescents' psychopathological symptoms). This is in line with other paediatric psychology guiding principles. In fact, the use of data from more than one informant (separately and simultaneously) should be a common strategy in research (Kraemer et al., 2003) reinforcing the importance of a comprehensive approach. Nonetheless, and although the agreement of the importance of using multiple informants, this is almost never achieved (Kraemer et al., 2003).

2.5. Ethical considerations

Ethical guidelines and requisites established by The Declaration of Helsinki (World Medical Association, 2013) were considered during the preparation of the research project, as well as during their implementation and the dissemination of results. According to the Declaration of Helsinki, scientific research with human beings is encouraged if researchers adopt a guide of principles in order to preserve the well-being of all participants, making it prevail over any other research interest. The Declaration of Helsinki is also integrated in the guidelines published by the American Psychological Association (2010) as well as the Order of Portuguese Psychologists (Regulation No. 258/2011).

Moreover, because this research project was focused on a paediatric population, it required additional ethical concerns. In fact, children are considered as a group of increased vulnerability (Schenk & Williamson, 2005), therefore, were not treated as adults during any time of this research project. Consent was taken from adolescents older than 14 years (inclusive), while younger children (aged from 7 to 13 years) were always asked to assent to their participation. The child/adolescent (but also their parents) were always listened to with respect and were well treated in the process.

This research was also conducted within the boundaries of the researcher's competence that during all the research process had constantly updated their theoretical and practical knowledge. All researchers involved in this project had an academic degree in Clinical Psychology, excluding two students in the final year of their Integrated Master's degree in Psychology that helped, for a short period of time, to recruit the sample. Both have received adequate training and supervision during the task.

2.5.1. Ethical considerations before data collection

Before data was collected, approvals for the research project were taken by Ethics Committees and Direction Boards of the Institutions involved. The research project and the assessment protocol were sent along with a submission for appreciation and approval by the Ethics Committees of all the hospital institutions and the healthcare center. The Direction Board of the School Unit collaborating in the study and the Portuguese Data Protection Authority (CNPD – Comissão Nacional de Protecção de Dados) also approved the research project, allowing the recruitment of a control group (i.e., children/adolescents with healthy weight). The Regional Centre Health Authority (ARSC - Administração Regional de Saúde do Centro) approved the data collection at the healthcare center.

The assessment protocol and ethical considerations were discussed between researchers of this project and other health professionals and the remaining members of the *Relationships, Development & Health* research group, to ensure the practicability of the study. Risks and benefits related to the participation in the study were also investigated through literature revision. Moreover, the assessment protocol was chosen taking into consideration the possible burden related with the extension of the instruments (more information regarding this topic is discussed in this Chapter, on Section 2.3. Variables and instruments).

2.5.2. Ethical considerations during data collection

Researchers made all arrangements to guarantee the confidentiality of the answers. Questionnaires were anonymous and a numeric and alphabetic code was given to each protocol to ensure they belonged to the same family (i.e., to know who was the mother and/or the father of a particular child/adolescent). Nevertheless, the code presented no identification of participants. When the protocol was send to the researcher by mail, the envelopes were pre-stamped with no sender's information required.

Children/adolescents and their parents were informed regarding the voluntary nature of their participation. Therefore, all participants contributed in a voluntary way and had the opportunity to ask questions and clarifications of any piece of information provided. They were reassured that if they eventually refused to participate, or if they decided to quit the participation, it will not interfere on the healthcare provided to them by the hospital or healthcare institution. Expected duration of the assessment was also discussed with children/adolescents and their parents.

Although all the information was stated in an informed consent form, all this information was explained orally to all participants prior to signing the form. After providing the information, researcher gave an informed consent form to participants. The informed consent form specified the research objectives of the study and the procedures regarding recruitment, researcher contact and institutional affiliation, researcher ethical obligations, commitment to protect the confidentiality of participants' data, as well as their right to refuse or quit the participation in the study (as previously explained).

Participants answered the questionnaires in a protected and safe environment that ensured their dignity and privacy. A cordial and supportive atmosphere was ensured during the administration of assessment protocol.

2.5.3. Ethical considerations during dissemination of results

After sample recruitment, all data was entered in an electronic database and treated collectively for research purposes only. Databases were filled manually by the main researcher of the project.

The publication of results was an important part of this research project. All results published are honest, with the ultimate purpose to contribute with precise and detailed data regarding the population in analyses. No fabricated data were submitted for publication, only original results. Limitations of research were always stated in detail in each empirical study. Funding and acknowledgements were stated whenever needed, and co-authorships of all papers were defined by their significant contribution during any phase of the project. Proper credit was given to the authors through citations.

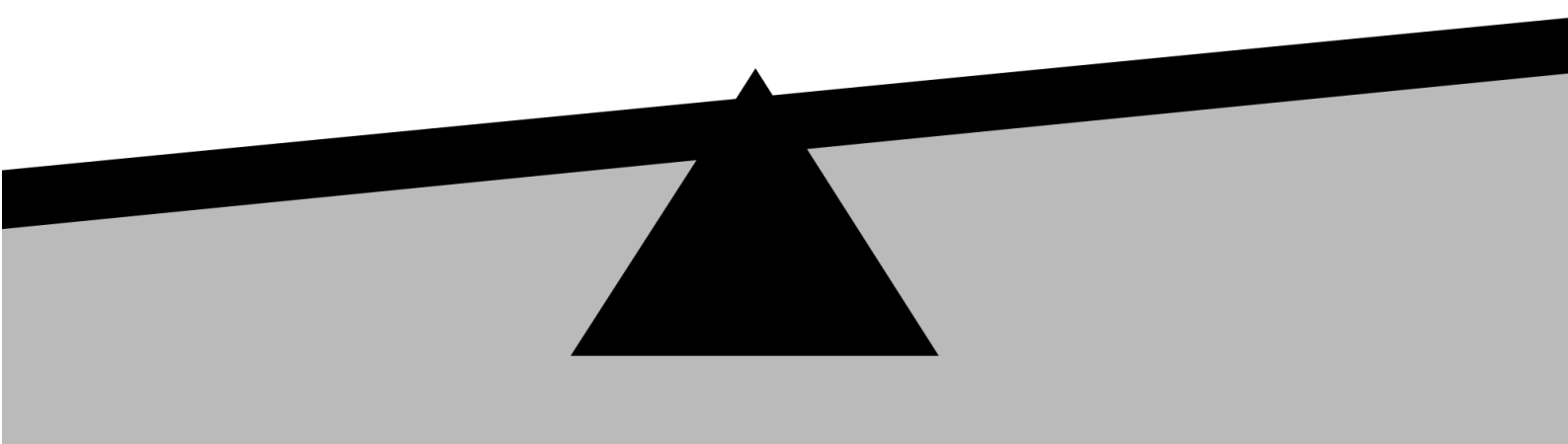
Chapter III | Empirical Studies

Empirical study I - Adaptação psicossocial na obesidade pediátrica: Um estudo com pais, crianças e adolescentes [Psychosocial adaptation to pediatric obesity: A study with parents, children and adolescents]

Empirical study II - Parenting stress and quality of life in pediatric obesity: The mediating role of parenting styles

Empirical study III - The indirect effect of family cohesion on children's weight status through maternal quality of life and children's internalizing and externalizing symptoms.

Empirical study IV – Family cohesion and psychopathological symptoms in pediatric obesity: Is there and indirect effect?



Empirical study I

Adaptação psicossocial na obesidade pediátrica: Um estudo com pais, crianças e adolescentes [Psychosocial adaptation to pediatric obesity: A study with parents, children and adolescents]

Roberta Frontini • Maria João Gouveia • Helena Moreira • Maria Cristina Canavarro

Psychology, Community & Health (2016), Volume 5, Issue 2, pp 85-101

doi: 10.5964/pch.v5i2.182

Empirical study I

Adaptação psicossocial na obesidade pediátrica: Um estudo com pais, crianças e adolescentes

[Psychosocial adaptation to pediatric obesity: A study with parents, children and adolescents]

Frontini, R., Gouveia, M. J., Moreira, H., Canavarro, M. C.

Resumo

Objetivo: Os objetivos do presente estudo são 1) comparar a qualidade de vida (QdV) e os problemas psicológicos de crianças/adolescentes com obesidade, excesso de peso e peso saudável, e a QdV e sintomas de depressão e ansiedade dos seus pais; 2) averiguar se a adaptação psicossocial dos pais está associada à QdV das crianças/adolescentes através dos seus problemas psicológicos e se estas associações são moderadas pela idade da criança/adolescente. Método: A amostra foi constituída por 264 díades pais-filhos divididas em 3 grupos (peso saudável, excesso de peso e obesidade). Resultados: As crianças/adolescentes com obesidade reportaram pior QdV e maiores níveis de problemas psicológicos do que as crianças/adolescentes com peso saudável. Os adolescentes reportaram pior QdV do que as crianças. Os pais das crianças/adolescentes com obesidade reportaram pior QdV e mais sintomas ansiosos e depressivos comparativamente aos pais das crianças/adolescentes com peso saudável. A associação entre ansiedade dos pais e a QdV das crianças/adolescentes foi mediada pelos problemas psicológicos dos adolescentes. Conclusão: É fundamental a implementação de intervenções multidisciplinares focadas na família, que visem a perda de peso da criança/adolescente, mas também a promoção da saúde mental e da QdV das crianças/adolescentes e dos seus pais.

Palavras-Chave: obesidade, excesso de peso, qualidade de vida, problemas psicológicos, família.

Abstract

Aim: This study aims to 1) compare the quality of life (QoL) and psychological problems of children/adolescents with obesity, overweight and healthy weight, as well as the QoL and depressive and anxiety symptoms of their parents; and 2) investigate if parental psychosocial adaptation is associated with the QoL of children/adolescents through their psychological problems, and whether these associations are moderated by the age of the child/adolescent. Method: The sample comprised 264 dyads (parent-child) divided into 3 groups (healthy weight, overweight and obesity). Results: Children/adolescents with obesity reported worse QoL and more psychological problems than children/adolescents with healthy weight. Adolescents reported worse QoL than children. Parents of children/adolescents with obesity reported worse QoL and more anxiety and depressive symptoms compared to parents of normal-weight children/adolescents. The association between parental anxiety and the QoL of children/adolescents was mediated by psychological problems of adolescents. Conclusion: It is fundamental to implement multidisciplinary family focused interventions, aiming not only at the weight loss of children/adolescents with obesity, but also at the promotion of mental health and QoL of these children/adolescents and of their parents.

Keywords: obesity, overweight, quality of life, psychological problems, family

A obesidade pediátrica é considerada pela Organização Mundial de Saúde (OMS) como a pandemia do século XXI (World Health Organization, 2000). Em Portugal, trata-se da condição crónica de saúde (CCS) mais frequente em idade pediátrica (Direcção Geral de Saúde – Divisão das Doenças Genéticas Crónicas e Geriátricas, 2005). Segundo um estudo da OMS, as crianças portuguesas com 11, 13 e 15 anos ocupam respetivamente os 5°, 4° e 6° lugares de um ranking mundial (Currie et al., 2012).

Devido à elevada prevalência da obesidade pediátrica e às graves consequências que pode implicar para a saúde e bem-estar a curto, médio e longo-prazo (Vallis, 2016), tem-se vindo a enfatizar a necessidade de estudos que contribuam para uma melhor compreensão dos seus determinantes e consequências (Rolland-Cachera, 2011). De facto, a obesidade pediátrica tem sido considerada como fator de risco para diversas doenças como a apneia do sono, diabetes, problemas articulares, reumatoides, pulmonares, cardiovasculares (Teixeira & Silva, 2009) e neuropsicológicos, tais como diminuição das funções executivas e problemas de atenção (Liang, Matheson, Kaye, & Boutelle, 2014). Está também associada a um conjunto de consequências psicológicas e sociais negativas, tendo vários estudos mostrado que pode influenciar negativamente a qualidade de vida (QdV) e a saúde mental das crianças/adolescentes (Griffiths, Parsons, & Hill, 2010; Jelalian & Hart, 2009; Wille et al., 2010).

Alguns estudos têm mostrado que crianças/adolescentes com obesidade apresentam pior QdV (Frontini, Moreira, & Canavarro, 2016), mais emoções negativas (Jelalian & Hart, 2009) e problemas psicológicos, tais como problemas emocionais, de comportamento ou hiperatividade (Griffiths et al., 2010), comparativamente às que têm peso saudável (Riazi, Shakoor, Dundas, Eiser, & McKenzie, 2010). Tal pode dever-se a várias dificuldades, como estigmatização por parte dos pares (Stevens, Herbozo, Morrell, Schaefer, & Thompson, 2016), exclusão social e insatisfação com a imagem corporal (Jelalian & Hart, 2009).

Tem-se também verificado que um número considerável de pais de crianças/adolescentes com obesidade reporta maior *distress* psicológico (Zeller, Saelens, Roehrig, Kirk, & Daniels, 2004) e pior QdV do que os pais de crianças/adolescentes com peso saudável (Modi, Guilfoyle, & Zeller, 2009). Num estudo que englobou pais e crianças/adolescentes com várias CCS, Moreira et al., (2013) verificaram que os pais das crianças/adolescentes com obesidade reportavam níveis mais baixos de QdV comparativamente aos pais de crianças/adolescentes saudáveis, com asma e com epilepsia. Concomitantemente, tem-se verificado que o *distress* materno se associa a uma pior QdV das crianças/adolescentes com obesidade (Janicke et al., 2007) e que a presença de psicopatologia nos pais pode contribuir para a manutenção do excesso de peso, em parte através da promoção de ingestão alimentar excessiva (Puder & Munsch, 2010). No entanto, existem ainda poucos estudos que se debrucem sobre o impacto da adaptação parental na adaptação das crianças/adolescentes com excesso de peso e obesidade.

Assim, e dado que a adaptação psicológica dos pais parece desempenhar um papel fundamental na adaptação dos filhos, nomeadamente quando têm uma CCS (Hatzmann, Heymans, Ferrer-i-Carbonell, van Praag, & Grootenhuis, 2008; Kazak, Rourke, & Navsaria, 2009), tem-se vindo a sublinhar a necessidade de se considerar uma abordagem familiar na análise e avaliação da QdV e da saúde mental das crianças/adolescentes e dos seus pais. Uma abordagem focada na família e com a integração dos pais permitirá aumentar a eficácia das intervenções implementadas pelos profissionais de saúde que têm como objetivo a promoção da perda de peso em crianças/adolescentes (Lochrie et al., 2013). Deste modo, é fundamental avaliar a QdV e a adaptação psicológica destes pais, nomeadamente a sintomatologia depressiva e ansiosa.

Contudo, a investigação na psicologia pediátrica em geral e na obesidade pediátrica em particular, tem sido caracterizada por algumas lacunas. Em primeiro lugar, ao estudarem-se conceitos tão subjetivos como a QdV e a psicopatologia, têm-se privilegiado heterorrelatos de pais ou cuidadores. Apesar de, tradicionalmente, as crianças serem consideradas respondentes pouco fiáveis, existe evidência empírica de que se devem privilegiar os seus autorrelatos (Riley, 2004). Em segundo lugar, a maioria dos estudos inclui apenas crianças/adolescentes com obesidade, excluindo as crianças/adolescentes com excesso de peso, ou avaliando estes dois grupos como um todo. As exigências específicas que cada grupo comporta (e.g., as prescrições médicas tendem a ser mais exigentes na obesidade) e o impacto diferenciado que têm no indivíduo (e.g., a obesidade acarreta mais consequências físicas e psicológicas) reforçam a importância de se avaliarem estes dois grupos separadamente. Por fim, a maioria dos estudos tem considerado as crianças e os adolescentes como um grupo homogéneo no que concerne à fase de desenvolvimento. Dadas as especificidades das tarefas desenvolvimentais da infância e da adolescência, e o facto de estas fases poderem estar associadas a resultados psicológicos diferentes, importa analisá-las separadamente (Holmbeck, Zebracki, & McGoron, 2009).

O presente estudo pretende ultrapassar estas limitações apresentando como objetivos: (1) comparar os níveis de QdV e os problemas psicológicos de crianças/adolescentes com obesidade, excesso de peso e peso saudável, averiguando possíveis diferenças entre crianças e adolescentes; (2) comparar os níveis de QdV, sintomas de depressão e ansiedade de pais de crianças/adolescentes com obesidade, excesso de peso e peso saudável, averiguando possíveis diferenças entre pais de crianças e pais de adolescentes; (3) analisar a relação entre a adaptação dos pais (QdV e sintomas de depressão e ansiedade) e a QdV das crianças e adolescentes com obesidade, averiguando o possível papel mediador dos problemas psicológicos da criança/adolescente, considerando simultaneamente o possível papel moderador da idade das crianças/adolescentes.

Espera-se que as crianças/adolescentes com obesidade e os seus pais reportem uma pior QdV e níveis mais elevados de problemas psicológicos comparativamente aos grupos de excesso

de peso e de peso saudável. Tendo em conta as tarefas desenvolvimentais próprias da adolescência, espera-se que os adolescentes e respetivos pais apresentem piores níveis de QdV e de problemas psicológicos. Por fim, espera-se que uma melhor adaptação parental esteja associada a uma melhor QdV das crianças/adolescentes, através de um menor número de problemas psicológicos.

Método

Participantes

A amostra foi constituída por 264 díades compostas por uma criança (8-12 anos) ou adolescente (13-18 anos) e um dos pais. Estas díades organizaram-se em 3 grupos, em função do Índice de Massa Corporal (IMC) da criança/adolescente: (1) grupo de "obesidade" (*n* = 107); (2) grupo de "excesso de peso" (*n* = 30); e (3) grupo de "peso saudável" (*n* = 127), com base nas curvas de crescimento do *National Centre for Health and Statistics* adaptadas pela Direção Geral de Saúde (Direcção Geral de Saúde – Divisão de Saúde Materna Infantil e dos Adolescentes, 2006) e utilizadas nas consultas onde a amostra foi recrutada. De acordo com as mesmas, a categoria de peso (obesidade pediátrica: IMC ≥ percentil 95; excesso de peso: percentil 85 ≤ IMC < percentil 95; peso saudável: percentil 5 ≤ IMC < percentil 85) define-se tendo em conta o percentil do IMC calculado através dos valores do peso (Kg) e altura (m), pela fórmula: peso/[altura]^2, e considerando a idade e o género da criança/adolescente.

Foram considerados como critérios de inclusão: (1) idade da criança/adolescente entre os 8 e os 18 anos; (2) capacidade para compreender e responder aos itens dos questionários (informação fornecida pelo médico/nutricionista que acompanhava a criança/adolescente); (3) ausência de patologia mental ou atraso desenvolvimental graves; (4) ausência de síndromes genéticas cuja obesidade resulte das mesmas; (5) crianças/adolescentes do grupo de peso saudável não poderiam ter nenhuma CCS.

Instrumentos

Características clínicas e sociodemográficas. A informação sobre a criança/adolescente (idade, género, peso e altura) e o pai respondente (idade, género, peso, altura, estado civil, escolaridade e rendimento mensal) foi avaliada por uma ficha construída para o efeito, preenchida pelo pai ou mãe. O peso e a altura da criança/adolescente foram reportados pelo nutricionista nos grupos de obesidade e excesso de peso e pelos pais no grupo de peso normal.

Qualidade de vida das crianças/adolescentes. Utilizou-se a versão portuguesa de autorrelato do KIDSCREEN-10 (Gaspar & Matos, 2008; Ravens-Sieberer et al., 2010) para avaliar a QdV das crianças/adolescentes. É constituído por 10 itens (e.g., "Sentiste-te triste?"), respondidos numa escala de Likert de cinco pontos desde 1 (*nada; nunca*) a 5 (*totalmente; sempre*), sobre a última semana. Quanto mais elevada a pontuação total, melhor a perceção de QdV. No presente estudo, o alpha de Cronbach variou entre .67 (grupo obesidade) e .78 (grupo peso saudável).

Problemas psicológicos das crianças/adolescentes. Foi utilizado o Questionário de Capacidades e Dificuldades (SDQ; Fleitlich, Loureiro, Fonseca, & Gaspar, 2005; Goodman, 1997) para avaliar os problemas psicológicos das crianças/adolescentes. Este instrumento de autorresposta permite obter um índice geral de "dificuldades", constituído por 20 itens (e.g., "Preocupo-me muito"), respondidos numa escala de Likert de três pontos, desde 0 (*não é verdade*) a 2 (*é muito verdade*), tendo como referência temporal os últimos seis meses. Resultados mais elevados indicam a presença de mais problemas psicológicos. Os valores do alpha de Cronbach variaram neste estudo entre .69 (grupo peso saudável) e .76 (grupo excesso de peso).

Qualidade de vida dos pais. A QdV dos pais foi avaliada através do EUROHIS-QOL-8 (Pereira, Melo, Gameiro, & Canavarro, 2011; Power, 2003). Este instrumento permite obter um índice global de QdV e é constituído por 8 itens (e.g., "Até que ponto está satisfeito(a) com a sua saúde?"), respondidos numa escala de Likert de cinco pontos, desde 1 (*muito insatisfeito/ nada*) a 5 (*muito satisfeito/ completamente*), tendo em conta as duas últimas semanas. Pontuações mais elevadas correspondem a uma melhor perceção de QdV. No presente estudo, o valor de consistência interna variou entre .73 (grupo excesso de peso) e .85 (grupo peso saudável).

Sintomas de ansiedade e depressão dos pais. Para avaliar a presença de sintomas de ansiedade e depressão nos pais utilizou-se a Escala de Ansiedade e Depressão Hospitalar (EADH; Pais-Ribeiro et al., 2007; Zigmond & Snaith, 1983). Este instrumento é constituído por duas subescalas (ansiedade e depressão), compostas por 7 itens cada (e.g., "Sinto-me tenso(a) ou nervoso(a)"), nos quais o indivíduo deverá posicionar-se numa escala ordinal de quatro pontos. Os valores de consistência interna variaram entre .72 (grupo peso saudável – subescala depressão) e .83 (grupo obesidade – subescala ansiedade).

Procedimentos

O grupo de excesso de peso e obesidade foi recrutado nas consultas de nutrição dos serviços de pediatria de dois hospitais públicos da região centro de Portugal, após a aprovação

das Comissões de Ética e Conselhos de Administração, entre Fevereiro de 2012 e Dezembro de 2014. As consultas tinham como objetivo o controlo de peso pela prescrição de dieta, atividade física e modificação de comportamentos e hábitos alimentares. As crianças/adolescentes que preenchessem os critérios de inclusão eram identificadas pelo médico/nutricionista e encaminhadas para o investigador, mediante o acordo dos pais e da criança, que explicava os objetivos e os procedimentos do estudo. Após a obtenção do consentimento informado dos pais e dos adolescentes com mais de 14 anos, e do assentimento verbal das crianças/adolescentes com menos de 14 anos, estes preenchiam os protocolos de avaliação. O investigador estava presente para prestar esclarecimentos caso necessário, evitando a troca de informações entre os participantes. Quando os pais ou as crianças/adolescentes não tinham disponibilidade para preencher os questionários no hospital, era-lhes solicitado que os levassem num envelope selado e os devolvessem pelo correio.

O grupo de peso saudável foi recolhido num agrupamento de escolas do primeiro ciclo ao ensino secundário público. Professores de várias turmas foram contactados e informados acerca dos objetivos do estudo e solicitou-se a sua colaboração. Os professores entregaram às crianças/adolescentes uma carta dirigida aos pais com os objetivos e procedimentos do estudo e o consentimento informado. Foi entregue aos pais que, assinaram o consentimento informado, um envelope com os questionários, solicitando-se a sua devolução dentro de uma semana. Esclareceu-se que os pais poderiam ajudar os filhos na compreensão dos itens, mas não poderiam influenciar as suas respostas.

Análises Estatísticas

Os dados foram analisados estatisticamente com recurso à versão 20.0 do SPSS (IBM SPSS, Chicago, IL). Foram calculadas as estatísticas descritivas para os dados clínicos e sociodemográficos. Para comparar os três grupos de estudo relativamente a estas características, usaram-se testes de qui-quadrado e ANOVAs. Foram selecionadas como covariáveis nas análises comparativas, as variáveis clínicas e sociodemográficas cujas diferenças entre os grupos foram estatisticamente significativas, com exceção do IMC da criança/adolescente e dos pais, por caracterizarem o próprio grupo.

Os efeitos principais do grupo de peso e da faixa etária (crianças; adolescentes), e a sua interação (tipo de grupo x faixa etária) foram avaliados através de ANOVAS (QdV e problemas psicológicos das crianças/adolescentes), ANCOVAS (QdV dos pais) e MANCOVAS (sintomas de ansiedade e depressão dos pais). No caso da MANCOVA, quando se encontrou um efeito multivariado realizaram-se ANCOVAS (uma para cada variável dependente). Os testes *post-hoc* Bonferroni foram utilizados quando o efeito das ANOVAS ou ANCOVAS foi significativo, para

detetar entre que grupos se encontravam as diferenças e qual a direção das mesmas. O eta quadrado parcial (η_{P^2}) foi usado como medida da magnitude do efeito.

O efeito mediador dos problemas psicológicos das crianças/adolescentes na associação entre a adaptação psicossocial dos pais e a QdV das crianças/adolescentes foi testado através da análise de três modelos de mediação moderada, um para cada indicador de adaptação parental (QdV, sintomas de ansiedade e sintomas de depressão). Testou-se também se estas relações eram moderadas pela idade das crianças/adolescentes. Estas análises foram efetuadas com recurso ao PROCESS (Hayes, 2013). Inicialmente foram testados modelos de mediação nos quais todas as trajetórias entre as variáveis eram moderadas pela idade da criança/adolescente, ou seja, a trajetória entre a variável independente e o mediador (*path a*), a trajetória entre o mediador e a variável dependente, controlando o efeito da variável independente (*path b*) e o efeito direto da variável independente na variável dependente, controlando o efeito do mediador (*path c'*). Todas as variáveis usadas na construção dos produtos de interação foram centradas para facilitar a interpretação dos coeficientes de regressão. Em cada modelo testaram-se, assim, três interações (idade x variável dependente na *path a* e *path c'*; idade x mediador na *path b*). Na ausência de interações significativas entre o moderador e uma das variáveis, as análises eram repetidas mantendo-se apenas as interações previamente significativas. Os efeitos indiretos condicionais (a*b) foram estimados para a média, um desvio-padrão acima e um desvio-padrão abaixo da média da idade da criança/adolescente, utilizando o procedimento *bootstrapping* (10 000 amostras). Este procedimento cria intervalos de confiança a 95%, considerando-se que um efeito indireto é significativo quando o zero não está incluído. As interações significativas foram exploradas através de análises de moderação simples, considerando-se três níveis de idade (média, um desvio-padrão acima e um desvio-padrão abaixo da média).

Resultados

Características Clínicas e Sociodemográficas

A Tabela 1 apresenta as características clínicas e sociodemográficas dos grupos. Verificou-se que os três grupos são homogéneos no que concerne à idade e género da criança/adolescente, e à idade, estado civil e rendimento dos pais. Encontraram-se diferenças estatisticamente significativas no IMC, categoria de peso, género e escolaridade dos pais. Especificamente, os pais das crianças/adolescentes com obesidade e excesso de peso apresentaram um IMC superior ao dos pais das crianças/adolescentes de peso saudável, e a proporção de homens e mulheres e de níveis de escolaridade variou significativamente entre os grupos.

Tabela 1 | Características Clínicas e Sociodemográficas da Amostra

	Peso saudável (1) *n* = 127	**Excesso de peso (2)** *n* = 30	**Obesidade (3)** *n* = 107	***F* | χ^2 *(p)***	**Post-Hoc**
Criança/adolescente					
Idade (anos)[a]	12.17 (3.24); 8-18	13.27 (2.23); 10-18	12.76 (2.56); 8-18	2.29 (.103)	---
IMC[a]	18.21 (2.56); 12.24-24.46	23.92 (2.55); 19.44-30.86	29.53 (4.42); 21.03-40.56	315.40 (.001)	---
Género[b]				2.13 (.345)	
Masculino	50 (39.4)	15 (50.0)	51 (47.7)		---
Feminino	77 (60.6)	15 (50.0)	56 (52.3)		
Pais					
Idade (anos)[a]	41.75 (5.44); 30-56	43.21 (4.30); 36-55	41.10 (4.83); 30-54	2.01 (.137)	
IMC[a]	24.23 (3.03); 17.58-35.03	27.89 (5.67); 19.36-44.53	29.69 (5.73); 19.11-48.07	38.39 (.001)	1< 2 1< 3
Género[b]				14.16 (.001)	
Masculino	1 (0.8)	5 (16.7)	10 (9.3)		
Feminino	126 (99.2)	25 (83.3)	97 (90.7)		
Estado civil[b]				11.42 (.076)	
Solteiro	2 (1.6)	0 (0.0)	4 (3.4)		
Casado/União de facto	114 (89.8)	26 (86.7)	83 (77.6)		
Separado/Divorciado	11 (8.7)	3 (10)	14 (13.1)		
Viúvo	0 (0.0)	0 (0.0)	5 (4.7)		
Informação em falta	0 (0.0)	1 (3.3)	1 (0.9)		
Escolaridade[b]				12.33 (.002)	
≤ 12° ano	92 (35.4)	23 (8.8)	97 (37.3)		
≥ Ensino superior	33 (12.7)	6 (2.3)	9 (3.5)		
Informação em falta	2 (1.6)	1 (3.3)	1 (0.9)		
Rendimento mensal do agregado familiar[b]				11.86 (.065)	
< 800€	46 (36.2)	6 (20)	51 (47.7)		
800€-2000€	56 (44.1)	16 (53.3)	45 (43.7)		
2000€-3500€	19 (15.0)	4 (13.3)	6 (5.6)		
>3500€	3 (2.4)	0 (0)	1 (0.9)		
Informação em falta	3 (2.4)	4 (13.3)	4 (3.7)		
Categoria de peso[b]				68.37 (<.001)	
Normal	77 (60.6)	8 (26.7)	19 (17.8)		
Excesso de peso	40 (31.5)	9 (30.0)	28 (26.2)		
Obesidade	4 (3.1)	9 (30.0)	44 (41.1)		
Informação em falta	6 (4.7)	4 (13.3)	16 (15.0)		

[a]Valores para (1) - (3) = Média (*DP*); amplitude. Teste estatístico = *F*. [b]Valores para (1) - (3) = *n* (%). Teste estatístico = χ^2

Adaptação Psicossocial dos Pais e das Crianças/Adolescentes: Comparação entre os Grupos

A Tabela 2 apresenta as estatísticas descritivas e os resultados dos testes de comparação da QdV e dos problemas psicológicos das crianças/adolescentes e dos seus pais, em função do grupo e faixa etária. Tendo-se encontrado diferenças significativas entre os grupos no género (0 = masculino; 1 = feminino) e escolaridade dos pais (0 = ≤ 12º ano; 1 = ≥ ensino superior), estas variáveis foram introduzidas como covariáveis nas análises relativas à QdV e aos sintomas de ansiedade e depressão dos pais, para se controlar o seu efeito. Encontrou-se um efeito principal do grupo em todas as variáveis em estudo e um efeito principal da idade apenas na QdV das crianças/adolescentes. Nenhuma interação entre o grupo e a faixa etária foi estatisticamente significativa.

Relativamente à QdV das crianças/adolescentes, verificou-se uma diferença significativa entre os grupos de peso e da faixa etária. Os testes *post-hoc* evidenciaram que as crianças/adolescentes com obesidade reportaram níveis de QdV significativamente mais baixos, comparativamente ao grupo de peso saudável; e que as crianças reportaram melhor QdV do que os adolescentes, independentemente do grupo de peso.

Relativamente aos problemas psicológicos das crianças/adolescentes, verificaram-se diferenças estatisticamente significativas entre os grupos. Os testes *post-hoc* evidenciaram que as crianças/adolescentes com obesidade reportaram níveis mais elevados de problemas psicológicos do que as crianças/adolescentes com peso saudável.

Quanto à QdV dos pais, encontraram-se diferenças no tipo de grupo, verificando-se que os pais das crianças/adolescentes com obesidade apresentaram pior QdV do que os pais das crianças/adolescentes com peso saudável.

Nos sintomas de depressão e ansiedade dos pais, verificou-se um efeito multivariado do grupo (Pillai's trace = 0.08, $F(4, 504) = 5.39$, $p = .001$, $\eta^2_p = .04$), mas não da faixa etária (Pillai's trace = 0.02, $F(2, 251) = 2.09$, $p = .126$, $\eta^2_p = .02$), nem da interação entre o grupo e a faixa etária (Pillai's trace = 0.00, $F(4, 504) = 0.28$, $p = .892$, $\eta^2_p = 0.00$). As análises univariadas subsequentes evidenciaram diferenças significativas entre os grupos nos sintomas de ansiedade dos pais, tendo as análises *post-hoc* mostrado que os pais das crianças/adolescentes com obesidade apresentaram níveis superiores de sintomas de ansiedade, comparativamente aos pais das crianças/adolescentes com excesso de peso e peso saudável. Relativamente aos sintomas de depressão, encontraram-se também diferenças entre os grupos, tendo o grupo de pais das crianças/adolescentes com obesidade apresentado níveis mais elevados de sintomas de depressão comparativamente aos pais das crianças/adolescentes com peso saudável.

Tabela 2 | QdV e Problemas Psicológicos: Comparações entre os Grupos

			Peso saudável (1) *n* = 127		**Excesso de Peso (2)** *n* = 30		**Obesidade (3)** *n* = 107		**Efeito do grupo**		**Efeito da faixa etária**		**Efeito da interação**		**Post-Hoc**
			Criança ***n* = 67**	**Adolescente** ***n* = 60**	**Criança** ***n* = 12**	**Adolescente** ***n* = 18**	**Criança** ***n* = 53**	**Adolescente** ***n* = 54**							
			M (*DP*)	*M* (*DP*)	*M* (*DP*)	*M* (*DP*)	*M* (*DP*)	*M* (*DP*)	*F*	η^2_p	*F*	η^2_p	*F*	η^2_p	
Crianças Adolescente		QdV	84.11 (11.22)	73.67 (12.41)	80.63 (9.61)	75.42 (13.59)	75.43 (11.23)	70.51 (13.22)	7.31***	0.05	14.04***	0.05	1.69	0.01	1 > 3
		Problemas psicológicos	0.54 (0.30)	0.46 (0.28)	0.53 (0.31)	0.62 (0.33)	0.61 (0.27)	0.65 (0.31)	5.76**	0.04	0.14	0.00	1.93	0.02	1 < 3
Pais		QdV	70.36 (13.48)	69.07 (13.06)	68.47 (6.32)	59.72 (13.21)	60.67 (14.92)	60.08 (12.43)	12.37***	0.09	2.49	0.01	0.94	0.01	1 > 3
		Sintomas de Ansiedade	7.23 (3.27)	7.88 (3.29)	6.64 (2.42)	6.83 (4.48)	9.76 (4.56)	9.47 (3.64)	9.81**	0.07	0.01	0.00	0.35	0.00	3 < 1 3 < 2
		Sintomas de Depressão	4.29 (2.71)	5.58 (3.90)	4.55 (2.25)	6.06 (4.11)	6.43 (4.19)	6.79 (3.84)	5.10**	0.04	2.59	0.01	0.37	0.00	3 < 1

*p < .05. **p < .01. ***p < .001.

Relação entre a Adaptação Parental e a QdV das Crianças e Adolescentes com Obesidade

Inicialmente, três modelos de mediação moderada foram estimados, um para cada indicador de adaptação parental (QdV, sintomas de ansiedade e sintomas de depressão). No modelo da QdV, verificou-se a ausência de interações significativas entre a idade e a QdV dos pais na *path a* (*b* = -0.00, *SE* = 0.00, *p* = .398), entre a idade e os problemas psicológicos das crianças na *path b* (*b* = -2.53, *SE* = 1.30, *p* = .054), e entre a idade e QdV dos pais na *path c'* (*b* = -0.01, *SE* = 0.03, *p* = .770). Deste modo, excluiu-se a idade do modelo e estimou-se um modelo de mediação simples, no qual se verificou a inexistência tanto de um efeito direto (*b* = 0.05, *SE* = 0.08, *p* = .519, 95% IC [-0.11; 0.21]), como indireto (*b* = 0.06, *SE* = 0.04, 95% IC [-0.02; 0.17]) da QdV dos pais na QdV das crianças/adolescentes.

Do mesmo modo, no modelo dos sintomas de depressão, verificou-se a ausência de interações significativas entre a idade e a depressão na *path a* (*b* = 0.00, *SE* = 0.00, *p* = .835), entre a idade e os problemas psicológicos da criança na *path b* (*b* = -2.30, *SE* = 1.30, *p* = .080) e entre a idade e a depressão na *path c'* (*b* = -0.08, *SE* = 0.12, *p* = .482). Como tal, as interações foram excluídas, estimando-se um modelo de mediação simples, no qual tanto o efeito direto (*b* = -0.16, *SE* = 0.27, *p* = .561, 95% IC [-0.69; 0.38]), como indireto (*b* = -0.03, *SE* = 0.15, 95% IC [-0.35; 0.24]) não foram significativos.

Por fim, no modelo dos sintomas de ansiedade verificou-se uma interação significativa entre a idade e a ansiedade na *path a* (*b* = -0.01, *SE* = 0.00, *p* = .031). As interações entre a idade e os problemas psicológicos na *path b* (*b*= -2.44, *SE* = 1.40, *p* = .084) e entre a idade e a ansiedade na *path c'* (*b* = 0.02, *SE* = 0.11, *p* = .837) foram excluídas do modelo por não serem significativas. No modelo final, apenas moderado pela idade na *path a* (ver Figura 1), observou-se que a associação entre a ansiedade dos pais e a QdV das crianças/adolescentes não era direta (*b* = -0.27, *SE* = 0.26, *p* = .308, 95% IC [-0.79; 0.25]), mas mediada pelos problemas psicológicos dos adolescentes, a partir dos 12.76 anos (10.20 anos: a*b = -0.06, *SE* = 0.18, 95% IC [-0.45; 0.32]; 12.76 anos: a*b = -0.34, *SE* = 0.16, 95% IC [-0.72; -0.08]; 15.32 anos: a*b = -0.62, *SE* = 0.24, 95% IC [-1.18; -0.21]).

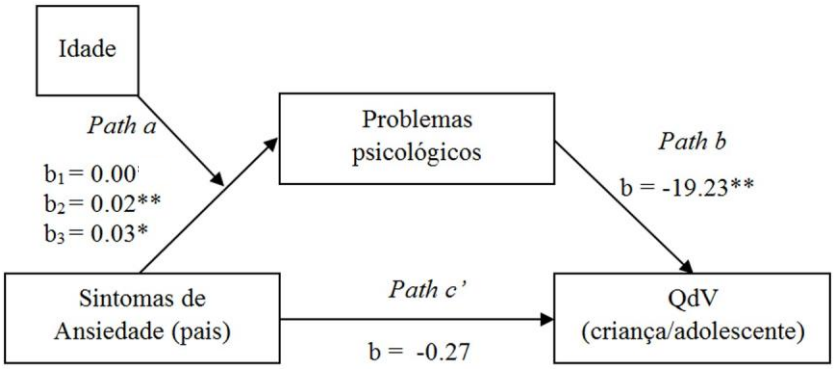


Figura 1 | O papel moderador da idade e o papel mediador dos problemas psicológicos dos filhos na relação entre sintomas de ansiedade dos pais e a QdV das crianças/adolescentes

Nota. Os três valores que se encontram na *path a* correspondem aos valores de *b* do efeito dos sintomas de ansiedade dos pais nos problemas psicológicos nos três níveis de idade das crianças (b_1, b_2, e b_3 correspondem a 10.20, 12.76, e 15.32 anos, respetivamente).

$^*p < .05$. $^{**}p < .01$.

Para melhor se compreender a interação significativa entre a idade e os sintomas de ansiedade dos pais encontrada na *path a*, ou seja, o papel moderador da idade na relação entre os sintomas de ansiedade dos pais e os problemas psicológicos das crianças/adolescentes, procedeu-se a uma análise de moderação. Esta análise evidenciou que a relação entre os sintomas de ansiedade dos pais e os problemas psicológicos das crianças apenas é significativa a partir dos 12.76 anos de idade (Tabela 3). A Figura 2 permite observar graficamente o efeito moderador descrito.

Tabela 3 | *O Papel Moderador da Idade da Criança/Adolescente na Relação entre os Sintomas de Ansiedade nos Pais e os Problemas Psicológicos das Crianças/Adolescentes*

	Problemas Psicológicos			
Variáveis	*b*	*SE*	*t*	*p*
Ansiedade (X)	0.02	0.01	2.69	.008
Idade da criança (M)	0.00	0.01	0.26	.793
Ansiedade x Idade da criança (XM)	0.01	0.00	2.18	.031
	$R^2 = 0.10$; $F(3, 103) = 3.67$, $p = .015$			
	Interação $\Delta R^2 = 0.04$; $F(1, 103) = 4.76$, $p = .031$			
Efeito moderador da idade na relação entre X e Y				
	b	*SE*	*t*	*p*
10.20 anos	0.00	0.01	0.36	.721
12.76 anos	0.02	0.01	2.69	.008
15.32 anos	0.03	0.01	3.24	.002

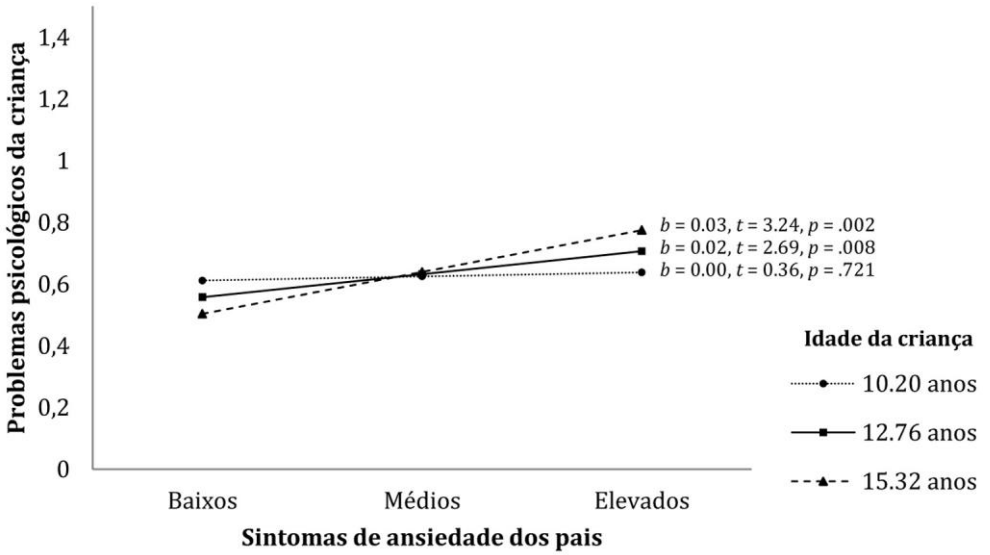


Figura 2 | Efeito condicional dos sintomas de ansiedade dos pais nos problemas psicológicos das crianças/adolescentes aos 10.20 anos, 12.76 anos, e 15.32 anos de idade

Discussão

Os resultados encontrados evidenciaram que as crianças/adolescentes com obesidade, bem como os seus pais, apresentaram piores resultados psicossociais do que as crianças/adolescentes com excesso de peso ou peso saudável e respetivos pais. Paralelamente, observou-se que os sintomas ansiosos dos pais estão relacionados com a QdV dos filhos através dos problemas psicológicos destes, apenas a partir dos 13 anos de idade.

Corroborando as hipóteses estabelecidas e os resultados que têm sido encontrados na literatura (e.g., Direcção Geral de Saúde – Divisão de Saúde Materna Infantil e dos Adolescentes, 2006; Griffiths et al., 2010; Wille et al., 2010; Zeller & Modi, 2006, 2008), verificou-se que as crianças/adolescentes com obesidade reportaram pior QdV e níveis mais elevados de problemas psicológicos em comparação com as crianças/adolescentes com peso normal. Estes resultados poderão estar relacionados com uma maior insatisfação com a imagem corporal (Jelalian & Hart, 2009), bem como com a vitimização e a exclusão social que frequentemente experienciam (Griffiths et al., 2010; Hayden-Wade et al., 2005). Também as consequências físicas decorrentes do excesso de peso corporal, tais como a fadiga, problemas musculares, ou a presença de outras CCS comórbidas (Kistler et al., 2010), poderão ter um impacto significativo nos níveis de adaptação psicossocial destes jovens. É importante notar que a literatura tem demonstrado que a relação entre o excesso de peso/obesidade e a adaptação psicossocial tende a efetuar-se de forma recíproca (Frankel, Sinton, & Wilfley, 2007; Luppino et al., 2010; Puder & Munsch, 2010). Assim, se por um lado, a presença de obesidade pode levar a problemas psicossociais, por outro lado, o *distress* psicológico clinicamente significativo pode também promover o ganho de

peso (Puder & Munsch, 2010). De facto, a potencial associação entre alguns problemas psicopatológicos (e.g., depressão) e a presença de obesidade tem sido sistematicamente examinada na literatura (Luppino et al., 2010). Será, contudo, necessário que se desenvolvam modelos que permitam compreender os efeitos recíprocos, por exemplo, entre a QdV das crianças/adolescentes e dos seus pais e a manutenção da obesidade (Modi et al., 2009).

Relativamente ao efeito da idade verificou-se, como esperado, que os adolescentes apresentaram níveis mais baixos de QdV comparativamente às crianças, independentemente do seu peso. As alterações físicas e psicossociais normativas da adolescência, a crescente preocupação com a opinião e aceitação dos pares, e a maior procura de autonomização relativamente aos pais (Erikson, 1982; Ricciardelli & McCabe, 2011) podem estar na origem destes resultados. Deste modo, as tarefas desenvolvimentais podem conduzir a diferenças etárias na QdV no sentido de um pior ajustamento psicossocial nos adolescentes (Currie et al., 2012; Moreira et al., 2013). Por outro lado, os adolescentes tendem a consumir alimentos mais calóricos nesta fase desenvolvimental (Thompson et al., 2004), o que também poderá estar associado a uma pior QdV.

De acordo com o esperado e com os resultados que têm sido encontrados (e.g., Modi et al., 2009; Moreira et al., 2013; Zeller et al., 2004; Zeller et al., 2007), os pais das crianças/adolescentes com obesidade reportaram uma pior QdV e níveis mais elevados de sintomas de depressão comparativamente aos pais das crianças com peso saudável, e de sintomas de ansiedade comparativamente aos pais das crianças/adolescentes com peso saudável e com excesso de peso. Cuidar de uma criança/adolescente com obesidade poderá ser particularmente desafiante para os pais, uma vez que estes têm a seu cargo tarefas que acrescem às responsabilidades parentais normativas. Por exemplo, as idas às consultas ou as alterações dos hábitos alimentares impostas pelas dietas prescritas podem constituir motivos de ansiedade acrescida para estes pais (Zeller et al., 2007). Neste estudo verificou-se que a maioria dos pais das crianças/adolescentes com obesidade apresentava também excesso de peso (26.2%) e obesidade (41.1%). Este resultado é consistente com a literatura, dado que vários estudos têm mostrado que um número considerável de pais de crianças/adolescentes com obesidade apresenta também problemas de peso, o que poderá explicar os piores resultados de adaptação que estes apresentam (Modi et al., 2009). Efetivamente, estes pais poderão confrontar-se com um conjunto de dificuldades de natureza psicológica e física que poderá ter um impacto significativo na sua adaptação psicossocial. Por exemplo, maior insatisfação com a imagem corporal, estigmatização por parte dos outros, níveis elevados de vergonha são encontrados frequentemente e podem ter um importante impacto na sua saúde mental e QdV (Latner, Durso, & Mond, 2013; Teixeira & Silva, 2009). Para além disso, esta CCS tende a associar-se a uma série de problemas físicos (e.g., fadiga, problemas ósseos, articulares, respiratórios e musculares), que

poderão ajudar a explicar os níveis mais baixos de QdV destes pais.

Tal como esperado, verificou-se que mais sintomas de ansiedade nos pais estão associados a uma pior QdV nos adolescentes com obesidade com mais de 13 anos, através dos seus problemas psicológicos. De facto, uma pior adaptação parental pode gerar um ambiente familiar menos coeso e mais conflituoso que, consequentemente, poderá conduzir ao desenvolvimento de problemas de adaptação nestes adolescentes e, como tal, à sua pior QdV. Adicionalmente, a relação pais-filho sofre uma transformação nesta altura desenvolvimental e é esperado que possa haver um aumento do stress parental (Moreira et al., 2013). Este resultado é concordante com a literatura que aponta para o stress materno (por exemplo) como um importante correlato na obesidade pediátrica e um preditor de mau ajustamento psicológico das crianças/adolescentes (Zeller et al., 2004). Contudo, importa referir que outros fatores poderão explicar esta relação, tal como a adoção de hábitos alimentares e físicos menos saudáveis ou o menor tempo despendido em refeições em família (Zeller & Modi, 2008), com o consequente aumento de peso nos diferentes elementos (Jelalian & Hart, 2009), que pode ocorrer quando os pais apresentam mais ansiedade ou uma pior adaptação psicológica em geral. Estes resultados, ainda que preliminares, parecem sugerir a existência de um "ambiente obesogénico" (i.e., ambiente familiar que promove o ganho de peso contribuindo para o aparecimento e manutenção da obesidade) no qual estas crianças/adolescentes muitas vezes crescem (Lochrie et al., 2013; Zeller et al., 2007). São resultados que se revestem de importância, especialmente tendo em conta que o ambiente familiar partilhado pelos diversos membros é fulcral nos comportamentos e hábitos alimentares das crianças/adolescentes (Jelalian & Hart, 2009). No modelo de mediação apresentado, os problemas psicológicos dos adolescentes mediaram a relação entre os sintomas de ansiedade dos pais e a QdV dos adolescentes. Estudos futuros poderão tentar compreender se esta relação se processa apenas neste sentido ou se a relação entre os problemas psicológicos dos adolescentes e a QdV dos mesmos é mediada pelos sintomas de ansiedade dos pais. Estudos longitudinais poderão ser importantes no esclarecimento destas questões. Sugere-se que investigações futuras procurem compreender se esta pior adaptação psicossocial das crianças/adolescentes e dos seus pais está associada à atividade física e ao desempenho cognitivo/escolar das crianças/adolescentes com obesidade.

O presente estudo apresenta algumas limitações. Em primeiro lugar, trata-se de um estudo transversal, não permitindo inferências de causalidade (e.g., a presença de obesidade pode originar problemas psicológicos, mas os problemas psicológicos podem, igualmente, conduzir ao aumento de peso). Em segundo lugar, o método de recolha da amostra (por conveniência, apenas numa região de Portugal) não garante a representatividade da mesma e a generalização dos resultados. Em terceiro lugar, ao dividirmos a amostra em crianças e adolescentes, o grupo de excesso de peso ficou reduzido. Em estudos futuros, deve-se procurar aumentar o tamanho

deste grupo. Este poderá ter sido um dos motivos pelos quais não se observaram diferenças significativas entre este grupo e os restantes nas variáveis analisadas. Em quarto lugar, a informação sobre o peso e a altura do grupo de crianças/adolescentes com peso normal foi reportada pelos pais, enquanto nos grupos de obesidade e excesso de peso foi reportado pelo nutricionista. O preenchimento dos dados pelos pais pode diminuir a probabilidade de respostas mais precisas. Por fim, e apesar das investigações na área da psicologia pediátrica frequentemente apresentarem uma grande disparidade na participação de mães e pais (i.e., as mães tendem a participar em maior número), seria importante aumentar o número de pais e avaliar possíveis diferenças de género.

Apesar destas limitações, o presente estudo representa um contributo significativo para a investigação e a prática clínica nesta área, permitindo colmatar importantes limitações na literatura. Por exemplo, ao utilizarem-se autor-relatos das crianças/adolescentes foi possível ter-se acesso à visão subjetiva e pessoal da criança acerca dos seus próprios problemas e da sua vida. Adicionalmente, tomou-se em consideração o facto de a infância e a adolescência serem etapas desenvolvimentais distintas, ao avaliar-se o efeito da idade das crianças/adolescentes nas análises realizadas. Por fim, as crianças/adolescentes com excesso de peso e com obesidade foram considerados em grupos independentes, ao invés de serem englobados na mesma categoria.

Relativamente às implicações para a prática clínica, os resultados deste estudo sugerem que a adaptação psicossocial das crianças/adolescentes com obesidade deve ser alvo de atenção, avaliação e intervenção por parte dos profissionais de saúde. A melhoria destes resultados de adaptação reveste-se de particular importância, na medida em que a investigação tem mostrado que o ajustamento psicossocial destas crianças e adolescentes é crucial para uma boa adesão ao tratamento (La Greca & Mackey, 2009) e, consequentemente, para a obtenção de bons resultados terapêuticos, tais como a perda de peso saudável (Lochrie et al., 2013). Os resultados deste estudo mostraram também que, se por um lado é fundamental intervir diretamente com estas crianças/adolescentes, por outro lado, é igualmente importante adotar uma abordagem familiar no tratamento destes jovens. A avaliação da adaptação psicológica dos pais e a intervenção, quando necessária, são particularmente importantes no contexto da obesidade pediátrica, dado que, para além de ser frequente estes pais apresentarem também dificuldades, o seu funcionamento psicológico (particularmente os sintomas de ansiedade) parece influenciar o funcionamento psicológico da criança/adolescente. A promoção da QdV e da saúde mental dos pais poderá influenciar positivamente a adoção de hábitos alimentares e estilos de vida mais saudáveis em toda a família. Sendo os pais os principais responsáveis pela alteração dos hábitos alimentares e físicos da criança/adolescente (Karp et al., 2014), e estando um bom funcionamento psicológico associado a uma maior disponibilidade para adotar estilos de vida mais saudáveis (Jelalian & Hart,

2009; Teixeira & Silva, 2009), parece então ser fundamental a promoção da QdV e saúde mental dos pais destes jovens.

Em suma, este estudo permite caracterizar esta população no que concerne a questões psicossociais possivelmente associadas à obesidade pediátrica, tanto nas crianças/adolescentes como nos seus pais, e reforça a importância de uma avaliação e intervenção ecológicas e multidisciplinares. Ter em conta a adaptação psicossocial destas crianças/adolescentes e dos seus pais sempre que estas realizem algum tratamento médico com vista à perda de peso, e focar o tratamento em ambos afigura-se fundamental. Estas recomendações são também preconizadas pelo Grupo de Estudos sobre a Família, da Associação Americana de Pediatria (Schor & American Academy of Pediatrics Task Force on the Family, 2003), que perspetiva a família e os pais como um elemento central na vida e nos cuidados de saúde da criança/adolescente, e considera o bem-estar físico e emocional dos pais como um fator essencial na compreensão do bem-estar e da saúde dos filhos. Assim, e de acordo com as recomendações deste grupo, consideramos que os profissionais de saúde que trabalham com estas famílias devem adotar uma perspetiva orientada para a família que se traduza na triagem, avaliação e encaminhamento das crianças/adolescentes e dos pais que apresentem dificuldades psicossociais que possam comprometer o bem-estar dos seus filhos.

Financiamento

Este estudo foi realizado com o apoio de uma bolsa de doutoramento da Fundação para a Ciência e Tecnologia da primeira autora [SFRH/BD/86063/2012].

Conflito de Interesses

Os autores do artigo declaram que não há conflitos de interesses.

Agradecimentos

Os autores agradecem ao Dr. Sérgio Cunha Velho do Hospital Pediátrico do Centro Hospitalar de Coimbra (CHC), à Dr.ª Ana Carvalhas do Centro de Saúde de Eiras e ao Dr. Pascoal Moleiro do Hospital de Santo André - Centro Hospitalar de Leiria, pelo apoio na recolha de amostra.

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Empirical study II

Parenting stress and quality of life in pediatric obesity: The mediating role of parenting styles

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Journal of Child and Family Studies (2016), Volume 25, Issue 3, pp 1011-1023

doi:10.1007/s10826-015-0279-3

Empirical study II

Parenting stress and quality of life in pediatric obesity: The mediating role of parenting styles

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Abstract

Pediatric obesity is a serious health condition associated with lower psychosocial adjustment in children/adolescents and their families. Mothers of children/adolescents with obesity usually present higher levels of parenting stress, and investigation shows that the authoritarian and permissive parenting styles are more used by those mothers. However, little is known about the influence of parental variables on children/adolescent outcomes. This study intended to: (1) investigate differences in the quality of life (QoL) between children/adolescents with obesity and healthy weight, (2) investigate differences between mothers regarding parenting stress and parenting styles, and (3) assess the mediating role of parenting styles in the relationship between parenting stress and the QoL of children/adolescents with obesity. The sample comprised 223 children/adolescents and their mothers (125 children/adolescents with a healthy weight and 98 with obesity). Children/adolescents completed measures of QoL (KIDSCREEN-10) and mothers completed measures of parenting stress (Parenting Stress Index) and parenting styles (Parenting Styles and Dimensions Questionnaire). Mothers of children/adolescents with obesity presented higher levels of parenting stress than mothers of children/adolescents with healthy weight. Mothers of adolescents with obesity used more a permissive parenting style than mothers of adolescents with healthy weight. Higher levels of parenting stress were associated with poorer QoL in children/adolescents through the use of permissive parenting style. This study emphasizes the connection between parenting stress, parenting styles and children's/adolescent's QoL, providing innovative input to the field by identifying mechanisms that might account for the link between family and child variables.

Keywords: Parenting stress; Parenting styles; Pediatric obesity; Quality of life

Introduction

The prevalence of pediatric obesity has increased dramatically worldwide in recent decades (Steele et al., 2008). In Portugal, approximately 20% of 11-year-old children and 15 and 19% of 15-year-old adolescent girls and boys, respectively, have overweight or obesity (Currie et al., 2012). Because of its increasing prevalence and consequences, pediatric obesity has become a considerable concern among families, and it is considered a major public health concern (Jelalian and Hart 2009), particularly considering that it has reached epidemic proportions (Ohleyer et al., 2007).

In addition to its well-known negative consequences for children's physical health, which can have a significant effect on their adult life (Vivier and Tompkins 2008; Yang et al., 2007), pediatric obesity has important psychosocial consequences. Studies consistently link this condition to poorer emotional adjustment. In fact, children/adolescents with obesity usually show higher levels of negative emotions, depression, anxiety, and a decreased quality of life (QoL) and self-worth (Jelalian and Hart 2009; Zeller and Modi 2008; Zeller et al., 2006) compared to children/adolescents with a healthy weight (Falkner et al., 2001; Ottova et al., 2012; Swallen et al., 2005) or with other chronic health conditions (Moreira et al., 2013).

Pediatric obesity not only affects the child/adolescent, but it also affects and is affected by family members, particularly mothers. For instance, it has been shown that parents of children/adolescents with overweight or obesity report higher levels of parenting stress compared to parents of healthy weight youths (Moens et al., 2009). Parenting stress is a complex concept that comprises behavioral, cognitive and affective components related to the stress of parenting demands (Abidin 1995; Haskett et al., 2006). It has been defined as the affective response to parenting demands, resulting from the balance between parents' perceptions of their resources for meeting parenting demands and the real demands (Deater-Deckard 1998), but it can also be attributed to the behavior of the child or the presence of a dysfunctional relationship between the child and the parent (Abidin 1995). Mothers of children/adolescents with obesity seeking treatment can experience higher levels of parenting stress because they have to manage personal emotions that are directly linked to the health status of their child and because they are responsible for several burdensome caregiving tasks that include attending regular clinical appointments and guaranteeing daily adherence to a prescribed diet (Guilfoyle et al., 2010).

It is well known that parenting stress can compromise the psychological well-being of children/adolescents and contribute to the development of children's/adolescents' behavioral and emotional problems (Ohleyer et al., 2007). In the context of pediatric obesity, poor caregiver functioning and higher parenting stress have been associated with impaired health-related quality of life (Guilfoyle et al., 2010; Janicke et al., 2007). Moreover, parenting stress may compromise

the successful outcome of treatment, that is, a significant weight loss (Ohleyer et al., 2007; Zeller and Modi 2008). In fact, parents with higher levels of parenting stress possibly will lack the time to be physically active with their children which would model active and healthy behaviors (Dwyer et al., 2008). In a recent study, Walton et al., (2014) found that highly stressed parents were less likely to set limits on the amount of time their children spent watching TV and that their children were less likely to engage in the physical activity recommendations than were children of parents who reported normal levels of parenting stress.

Nevertheless, the relationship between parenting stress and poor well-being in children/adolescents appears to be not straightforward but mediated by negative parenting behaviors, such as a stricter disciplinary style or less nurturing behavior (Anthony et al., 2005; Crnic and Low 2002). In fact, research has consistently shown a negative association between parental stress and parenting dimensions (Crnic et al., 2005; Rodgers 1993). In addition, previous studies suggest that parental behavior (such as parenting styles) mediate the relationship between stress and child adjustment (Deater-Deckard 1998; Deater-Deckard and Scarr 1996). However, despite the assumption that parenting stress has a negative effect on parenting functioning (Crnic et al., 2005; Rodgers 1993) and that parenting behaviour mediates the relationship between parenting stress and child adjustment, little research has tested this mediation hypothesis (Anthony et al., 2005; Deater-Deckard 1998). Parenting style has been defined as a stable characteristic of the parent that provides the context for child socialization (Baumrind 1989). The most frequent categorization of parenting styles is the typology proposed by Baumrind (1971), which includes the authoritative, permissive and authoritarian parenting styles. An authoritative parenting style is characterized by a fusion of warmth, involvement and monitoring of activities with flexible but firm control; authoritarian parenting is characterized by low warmth, high control, and harsh discipline; and permissive parenting is defined as a lack of warmth, monitoring, control, and discipline (Zeller and Modi 2008). The authoritative parenting style has been associated with a lower risk for obesity (Jelalian and Hart 2009; Pinquart 2014), whereas both permissive and authoritarian parenting styles have been associated with a higher risk for children/adolescents to become overweight or obese (Matos et al., 2013; Rhee et al., 2006).

There is a well-established association between parenting styles and child weight status, and research has highlighted the importance of the home environment and parenting styles and practices in eating and activity behaviors (Davison and Birch 2001; Jelalian and Hart 2009). For instance, in a longitudinal study, Lohaus et al., (2009) found that parents who used an authoritative parenting style had children with higher levels of positive health behaviors and lower levels of negative health behaviors, particularly regarding fruit and vegetable consumption, in contrast with parents using the other two parenting styles. However, there is a lack of

evidence on how parenting variables influence the psychosocial adjustment of children/adolescents with obesity.

Parenting styles appear to be an important variable linked with both parenting stress and children/adolescents adjustment. The importance of parenting behavior (e.g., parenting styles) as a mediator between parenting stress and children adjustment (e.g., child psychopathology) was highlighted by Deater-Deckard (1998). The author emphasized that most theories regarding parenting stress and parenting behavior are related to three important testable hypothesis. Studying these hypotheses is truly important to understand the impact of parenting stress on child outcome. The first testable hypothesis relates parenting stress with poor parenting, and states that parenting stress causes poor parenting behavior (Deater-Deckard 1998), with high parenting stress being associated, for example, with more authoritarian discipline (e.g., Deater-Deckard and Scarr 1996). The second hypothesis states that the deterioration of positive aspects of parenting behavior (e.g., use of an authoritarian parenting) will have an impact on children's behavior (Deater-Deckard 1998). Finally, the third hypothesis states that individual parenting differences could mediate the link between parenting stress and child outcome (Deater-Deckard 1998). Therefore, according to this author, higher parenting stress would be correlated with more authoritarian parental style which would be in turn correlated with more behavioral problems. Walton et al., (2014) also stated that parenting stress compromises parenting, which in turn can promote unhealthy behaviors in children/adolescents.

It is thus fundamentally important to understand whether and how parental functioning is associated with children's/adolescents' adjustment, particularly considering that the frequent psychological distress of obese children/adolescents tends to have negative consequences for their development and in the fulfillment of important developmental tasks (Mash and Dozois 2003). To the best of our knowledge, the relationship between parenting stress and the psychosocial adjustment of children/adolescents with obesity, through the mediation of parenting styles, has not been examined. Furthermore, pediatric obesity studies have been increasing, but investigation in this field is in an early stage in Portugal. Taking into account the importance of countries' cultural specificities, it is important to understand the role of these variables in Portugal. Moreover, given the high prevalence of obesity in Portuguese children/adolescents (Currie et al., 2012), the study of the possible relations between parental variables and the adaptation of these youths is of high importance.

Therefore, this study has three main goals. First, we intended to investigate the possible differences between children/adolescents with obesity and healthy weight in terms of QoL, exploring possible age differences. We hypothesized that children/adolescents with obesity would report lower levels of QoL than their healthy weight peers. Second, we aimed to examine the potential differences between mothers of children/adolescents with obesity and healthy

weight in terms of parenting stress and parenting styles, also exploring the possible differences between mothers of children and mothers of adolescents. We hypothesized that mothers of children/adolescents with obesity would report higher levels of parenting stress, higher levels of the permissive and authoritarian parenting styles, and lower levels of the authoritative parenting style than mothers of children/adolescents with a healthy weight. Finally, we intended to investigate whether the relationship between parenting stress and the QoL was mediated by a particular parenting style (authoritative, authoritarian, or permissive) in children/adolescents with obesity. We expected that higher levels of parenting stress would be associated with an increased use of the permissive and authoritarian parenting styles and a decreased use of the authoritative parenting style, which, in turn, would be associated with a decreased QoL in obese children/adolescents. Although many studies consider childhood and adolescence as a homogeneous group, the developmental specificities and tasks of each group reinforce the need to use age as a primary developmental variable that must be considered in pediatric psychosocial research (Holmbeck 2002). Therefore, following a developmental approach (Carona et al., 2014), we intended to understand the role of children's age in the associations analyzed and determine whether the proposed mediating model was moderated by children's/adolescent's age. The study of parental demands should be studied taking age in considerations, especially because there are developmental changes in adolescence that impact the behaviors of significant others (Holmbeck 2002).

Method

Participants

The sample included 223 dyads composed of a child (8–12 years old, *n* = 104) or an adolescent (13–18 years old, *n* = 119) and the individual's mother. These dyads were organized in two groups according to their body mass index (BMI): (1) a group of children/adolescents with obesity (*n* = 98) and (2) a group with healthy weight (*n* = 125). For participants to be included in this study, we considered the following criteria: (1) The ages of the children/adolescents were between 8 and 18 years, (2) the participants were able to understand and answer the questionnaire items, (3) they had no significant mental or developmental delay as diagnosed by the physician/nutritionist, (4) there was an absence of genetic syndromes that could cause obesity, and (5) children with healthy weight could not have a chronic health condition. Participation in the study was voluntary. Children and adolescents were diagnosed with obesity by the physician or the nutritionist based on the growth charts of the National Center for Health and Statistics (Kuczmarski et al., 2000) adapted and used in the Portuguese health system since 2006. The weight category (pediatric obesity: BMI ≥ 95th percentile; healthy weight: 5th percentile ≤ BMI < 85th percentile) was defined by taking into account the percentile values of

the BMI for children of the same age and sex, calculated from weight (kg) and height (cm) according to the following formula: weight/height^2. Children's/adolescents' BMI was transformed into Z scores (zBMI).

Procedure

Children/adolescents with obesity and their mothers were recruited in the pediatric departments of two Portuguese public and urban hospitals and in one healthcare center between February 2012 and February 2014. The Ethics Committee and Board of Directors of the hospitals and healthcare center approved the study. Children/adolescents were attending nutrition appointments and were followed with the purpose to lose weight through a prescribed diet and exercise. If the child/adolescent fulfilled the inclusion criteria, they were identified by the nutritionist and referred to the researcher, who explained the aims of the study, the roles of the participants and the researcher, and the research procedures. The mother signed an informed consent form, and children were asked to assent to their own participation. Children who refused to participate were not included even if their parents had consented. Informed consent was obtained from all individual participants included in the study. Participants completed the self-report questionnaires in a consultation office provided for this purpose, and a researcher was available to provide assistance whenever it was needed. When the children/adolescents and/or their mothers could not complete the questionnaires at the hospital, a pre-addressed and stamped envelope was given for them to answer the questionnaires at home and return them by mail. Adults were instructed that they could help the child/adolescent to understand the items but could not influence their answers. Two weeks later, a text message was sent to remind the participants to return the questionnaires.

A convenience sample of children/adolescents with a healthy weight and no medical conditions and their mothers was also recruited in Portuguese regular public schools. Authorizations from the Board of Directors of schools were obtained, and teachers from several classes were contacted and asked to serve as intermediaries between the researchers and the participants. Teachers had a meeting with the researchers in order to be trained for this task. Teachers provided mothers with an explanatory letter describing the study, an informed consent form, and questionnaires to be completed at home and returned a week later.

Measures

Children's QoL

To assess children/adolescent's QoL, we used the Portuguese self-report version of the KIDSCREEN-10 (Matos et al., 2010; Ravens-Sieberer et al., 2010). This 10-item questionnaire assesses general subjective health and well-being (e.g., "Have you felt fit and well?") and can be used by children/adolescents with or without a chronic health condition. The respondent answers on a 5-point Likert scale ranging from 1 (*never; not at all*) to 5 (*always; extremely*) in regards to the past week. A global score was calculated from the mean score of items, and items were standardized according to the available norms for Portuguese population (Gaspar and Matos 2008). Higher standardized scores indicate a better QoL and ranged from 0 to 100. In this study, Cronbach's alpha was .76.

Parenting Stress

To assess the stress associated with the parenting role, we used the Parental Distress subscale of the Portuguese short form version of the Parenting Stress Index (Abidin 1995; Santos 2008). The respondent answers 12 items that are summed (e.g., "I feel trapped by my responsibilities as a parent") regarding several aspects associated with parenting distress. Using a 5-point Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*), mothers answered regarding the way they generally behave with their children. Higher scores indicate higher levels of parenting distress and ranged from 12 to 60. In this study, Cronbach's alpha was .87.

Parenting Styles

Parenting styles were assessed using the self-report Portuguese version of the Parenting Styles and Dimensions Questionnaire (Carapito et al., 2008; Robinson et al., 2001), which measures three parenting styles: authoritative, authoritarian and permissive. This instrument consists of 32 items rated on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*always*) according to the way mothers generally behave with their children. The authoritative parenting style is composed of 15 items and comprises the connection, regulation and autonomy granting dimensions (e.g., "I encourage our child to talk about his/her troubles"), with scores ranging from 15 to 75. The authoritarian parenting style is composed of 12 items including the physical coercion, verbal hostility and non-reasoning/punitive dimensions (e.g., "I physically punish my son in order to discipline him"), with scores ranging from 12 to 60. The permissive parenting style is unidimensional and includes 5 items (e.g., "I find it difficult to discipline our child"), with scores ranging from 5 to 25. Higher scores on each subscale reflect a more frequent use of that

particular parenting style. In the present study, Cronbach's alpha ranged from .59 (permissive subscale) to .86 (authoritative subscale).

Sociodemographic and Clinical Data

Sociodemographic and clinical data were reported by the mothers and included the children's/adolescents' gender and age, the mother's age, the family income and the mothers' education. The weight and height of the healthy weight youth were reported by the parents of children under 14 years and by adolescents, and the weight and height of obese youth were measured by the nutritionist.

Data Analyses

Data analyses were performed using the Statistical Package for the Social Sciences (IBM SPSS, version 22.0; IBM SPSS, Armonk, NY). Descriptive statistics were computed for all sociodemographic, clinical and study variables. ANOVA and χ^2 tests were used for between-group comparisons of sociodemographic characteristics. To assess the associations between the study variables, Pearson's bivariate correlation coefficients were computed. Their strength was classified as "small" for correlations of approximately .10, "medium" for those near .30, and "large" for correlations at .50 or higher (Cohen 1988). Correlations between the sociodemographic and study variables were analyzed to select the appropriate covariates for introduction into the mediation model.

The effects of the weight condition (healthy weight or obesity) and age group (children, aged 8–12 years; adolescents, aged 13–18 years) on children/adolescent's QoL and maternal parenting stress were assessed by two-way univariate ANOVAs. A two-way MANOVA, with weight condition and age group as independent variables, was also performed on the three dimensions of parenting styles (authoritative, authoritarian and permissive). When a multivariate effect was found, subsequent ANOVAs were performed, one per dependent variable. Significant interaction effects between the weight condition and age group were explored using simple effects tests that compared the effect of the weight condition on each age group and the effect of age group on each weight condition.

To ascertain whether the direct and indirect effects of parenting stress on children's QoL through parenting styles were moderated by children's age, a moderated mediation analyses was performed in the PROCESS (Model 59 in Hayes 2013), a computational tool for path analysis. Maternal parenting stress was used as an independent variable; parenting styles (authoritative, authoritarian and permissive) were entered as mediators; children/adolescents' QoL was tested as dependent variables; and children/adolescents' age was tested as a moderator. In the current

study, the moderator was hypothesized to affect the path that linked the independent variable and the mediator (Path a), the path that linked the mediator and the dependent variables (Path b), and the direct effect (Path c'). Therefore, three interactions were tested in the model (parenting stress x age group in Paths a and c'; and parenting styles x age group in Path b). Prior to the model estimation, the variables used in the construction of products were mean-centered (Aiken and West 1991).

In the absence of a significant interaction in one or more paths, the model was re-estimated after the removal of nonsignificant interactions. This re-estimation resulted in the estimation of a multiple mediation model (Model 4 in Hayes 2013), i.e., without including the children's/adolescents' age as a moderator or in the analysis of the unconditional indirect effects. Clinical and sociodemographic variables that were significantly correlated with any mediator and/or the dependent variable were introduced as covariates. We used a bootstrapping procedure to assess the unconditional indirect effects (using 10,000 resamples), which is a nonparametric resample procedure that does not require the assumption of a normal distribution and demonstrates higher power with reasonable control over the Type-I error rate through an appropriate control of confidence intervals. Bias-corrected and accelerated confidence intervals (BCa CIs) were created, and an indirect effect was significant if zero was not contained within the lower and upper CIs. The significance was set at the .05 level. The empirical power tables proposed by Fritz and MacKinnon (2007) for mediation models suggest that the sample size of this study was sufficient to find a mediated effect, including medium α and β paths (α and β = .39) with an .80 power.

Results

Preliminary Analyses

Prior to conducting the main analysis, differences in comorbidities between children/adolescents with obesity (25%) were analyzed. On both groups, no significant differences were found for children's/adolescents QoL, $F(1, 97) = 1.37$, $p = .712$, and for parenting stress, $F(1, 97) = .155$, $p = .695$. As for parenting styles, no significant multivariate effects were found, Wilks' Lambda = 0.951, $p = .188$. Due to the absence of significant differences, all children/adolescents with obesity were studied as a single group, regardless of the presence of comorbidity.

Participants' Characteristics, Means, Standard Deviations and Correlations Among Study Variables

The sociodemographic and clinical characteristics of children/adolescents and their mothers are presented in Table 1. No group differences were found in children/ adolescents' age and gender or for maternal age, maternal marital status and education level. Significant differences were only found in children/adolescents' zBMI and maternal BMI. However, these variables were not entered as covariates on subsequent analyses because children/adolescents' zBMI is a characterizing variable of the weight condition, and maternal BMI presented a significant amount of missing information (n = 18).

Table 1 | Demographic and Clinical Characteristics of Children/Adolescents and their Mothers

	Healthy Weight ***N* = 125**	**Obesity** ***N* = 98**	***F*/*p***
	Mean (*SD*); observed range	**Mean (*SD*); observed range**	
Child/adolescents' age (years)	12.49 (3.05); 8-18	12.98 (2.53); 8-18	1.66/.199
Children	9.74 (1.34); 8-12	10.67 (1.48); 8-12	
Adolescents	15.11 (1.50); 13-18	14.78 (1.50); 13-18	
Mothers' age (years)	42.00 (5.44); 30-56	41.16 (4.79); 30-54	1.44/.231
zBMI (children/adolescents)	-0.08 (0.75); -2.51-1	2.05 (0.30); 1.32-2.71	698.56/.001
Mothers' BMI	24.26 (2.98); 18.47-35.03	29.29 (5.92); 19.11-48.07	63.57/.001
	***n* (%)**	***n* (%)**	**χ^2/*p***
Child/adolescents' age category			
8-12 years	61 (48.8)	43 (43.9)	0.54/.467
13-18 years	64 (51.2)	55 (56.1)	
Child/adolescents' gender			
Male	50 (40.0)	50 (51.0)	2.70/.109
Female	75 (60)	48 (49.0)	
Child/adolescents' comorbidities			
Asthma	-	13 (52.0)	-
Diabetes	-	2 (8.0)	-

Epilepsy	-	1(4.0)	-
Heart condition	-	4 (16.0)	-
Polycystic kidneys	-	1 (4.0)	-
Arterial hypertension	-	1 (4.0)	-
More than one condition	-	3 (12.0)	-
Mothers' marital status			
Not living with a partner	14 (11.2)	19 (19.4)	2.95/.086
Living with a partner	110 (88)	78 (79.6)	
Missing data	1 (0.8)	1 (1.0)	
Mothers' Education Levels			
≤ High school	102 (81.6)	89 (90.8)	3.69/.55
≥ College or graduate degree	21 (16.8)	8 (8.2)	
Missing data	2 (1.6)	1 (1.0)	

As presented in Table 2, medium-to-high correlations were found among the study variables in both groups. Parenting stress was significantly and negatively correlated with children's QoL and positively correlated with the authoritarian and permissive parenting styles. Among mothers of children/adolescents with healthy weight, parenting stress was significantly and negatively associated with the authoritative parenting style, contrary to the mothers of children/adolescents with obesity, for whom the correlation was nonsignificant. In addition, the authoritative parenting style was significantly and positively associated with children's QoL but only among mothers of children/adolescents with healthy weight. The authoritarian parenting style was significantly and positively correlated with the permissive parenting style. Finally, the permissive parenting style was significantly associated with children's/adolescents' QoL only in the obesity group.

In the obesity group, bivariate associations between sociodemographic variables (children's age, sex, comorbidities and zBMI; maternal age, education, and marital status) and the mediating and dependent variables were also analyzed to identify potential covariates to introduce into the mediating model. Significant correlations were found between children's/adolescents' age and QoL (r = -.214, p = .035) and the authoritative parenting style (r = -.259, p = .010); between children's/adolescents' zBMI and the mothers' permissive parenting styles (r = .265, p = .008); between children's/adolescents' comorbidities and the authoritative parenting style (r = -.205, p = .043); between maternal age and the permissive parenting style (r = .224, p = .027); between maternal marital status (0 = not living with a partner, 1 = married or

living with a partner) and the children's/ adolescents' QoL (r = .231, p = .023). No other significant associations were found.

Group Differences in Study Variables

Table 2 presents the descriptive statistics of the study variables according to weight condition (healthy weight, obesity) and age group (children, adolescents) and the main and interaction effects.

Regarding the QoL of children/adolescents, a significant effect of weight condition was found, $F(1, 219) = 10.31$, $p = .002$, $\eta^2_p = .045$, with children/adolescents with a normal weight reporting higher levels of QoL than children/adolescents with obesity. We also found a significant effect of age group, with children reporting higher levels of QoL compared to adolescents, $F(1, 219) = 27.13$, $p < .001$, $\eta^2_p = .110$. The interaction between weight condition and age group was not significant, $F(1, 219) = 2.76$, $p = .098$, $\eta^2_p = .012$.

With regard to maternal parenting stress, a main effect of the weight condition was found, $F(1, 219) = 3.88$, $p = .050$, $\eta^2_p = .017$, with mothers of children/adolescents with obesity reporting higher levels of parenting stress than mothers of healthy weight children/adolescents. No significant effects were found for age group, $F(1, 219) = 2.70$, $p = .102$, $\eta^2_p = .012$, or for the interaction between the weight condition and age group, $F(1, 219) = 0.40$, $p = .530$, $\eta^2_p = .002$.

Regarding parenting styles, significant multivariate effects were found for the weight condition, Wilks' Lambda = 0.92, $F(3, 217) = 6.36$, $p < .001$, $\eta^2_p = .081$, age group, Wilks' Lambda = 0.92, $F(3, 217) = 6.14$, $p = .001$, $\eta^2_p = .078$, and the interaction between weight condition and age group, Wilks' Lambda = 0.96, $F(3, 217) = 2.72$, $p = .046$, $\eta^2_p = .036$. Regarding the main effect of weight condition, subsequent univariate analyses revealed significant differences between groups on all parenting styles. Specifically, mothers of children/adolescents with healthy weight reported a greater use of the authoritative parenting style, $F(1, 219) = 4.10$, $p = .044$, $\eta^2_p = .018$, whereas mothers of children/adolescents with obesity reported a greater use of the authoritarian parenting style, $F(1, 219) = 8.46$, $p = .004$, $\eta^2_p = .037$, and the permissive parenting style, $F(1, 219) = 13.48$, $p < .001$, $\eta^2_p = .058$. Regarding the main effect of age group, univariate analyses revealed a significant group difference only on the authoritative parenting style, $F(1, 219) = 17.77$, $p < .001$, $\eta^2_p = .075$, with mothers of children using this parenting style more than mothers of adolescents. Finally, a significant interaction was found only for the permissive parenting style, $F(1, 219) = 5.14$, $p = .024$, $\eta^2_p = .023$. Simple effects tests that compared the effect of the weight condition for each age group demonstrated that parents of adolescents with obesity reported using the permissive parenting style more frequently than those of children

with obesity, $F(1, 117) = 19.04$, $p < .001$, $\eta^2_p = .140$. Among parents of children, no significant differences between parents of children with obesity and parents of children with healthy weight were found. Similarly, when comparing the two age groups in each weight condition, no significant differences were found.

Table 2 | Means, Standard Deviations, and Comparisons Between Children/Adolescents with Healthy Weight and Obesity and their Mothers

	Healthy Weight ***N* = 125**		**Obesity** ***N* = 98**		**Group Effect**		**Age effect**		**Interaction effect**		**Correlations**				
	8-12 years ***n* = 61**	**13-18 years** ***n* = 64**	**8-12 years** ***n* = 43**	**13-18 years** ***n* = 55**											
Variables	M (*SD*)	M (*SD*)	M (*SD*)	M (*SD*)	*F*	η^2_p	*F*	η^2_p	*F*	η^2_p	1	2	3	4	5
1. Children's quality of life	84.39 (11.32)	74.20 (12.72)	76.45 (10.78)	70.68 (12.79)	10.31*	.045	27.13**	.110	2.76	.012	-	-.20*	-.01	-.19	-.34**
2. Parenting stress	25.44 (6.60)	28.05 (8.27)	28.42 (9.57)	29.58 (9.51)	3.88*	.017	2.70	.012	0.40	.002	-.23*	-	-.15	.47**	.42**
3. Authoritative parenting style	4.22 (0.47)	4.02 (0.58)	4.19 (0.48)	3.73 (0.74)	4.10*	.018	17.77**	.075	2.58	.012	.30**	-.36**	-	-.04	.05
4. Authoritarian parenting style	1.91 (0.45)	1.93 (0.61)	2.09 (0.46)	2.16 (0.51)	8.46*	.037	0.40	.002	0.14	.001	-.01	.36**	-.10	-	.41**
5. Permissive parenting style	1.90 (0.60)	1.79 (0.51)	2.02 (0.64)	2.29 (0.73)	13.48**	.058	0.90	.004	5.14*	.023	-.01	.27**	-.15	.45**	-

Note. Correlations for healthy weight are presented below the diagonal, and correlations for obesity are presented above the diagonal.

Note. *$p < .05$, **$p < .01$

The Mediating Role of Parenting Styles in the Relationship Between Parenting Stress and QoL on Children/Adolescents with Obesity

Initially, we examined a multiple moderated mediation model to test whether the indirect effect of parenting stress on children/adolescents' QoL through parenting styles was moderated by children's age. Children's zBMI and comorbidities, mother's age and mother's marital status were entered as covariates. Because no significant interactions were found, a simplified version of the initial model was tested, which represents a multiple mediation model without age as a moderator. Thus, age was introduced as a covariate because it was negatively correlated with QoL and the authoritarian parenting style. As presented in Fig. 1, parenting stress was significantly associated with the permissive parenting style (b = 0.03, p < .001), explaining 26.07% of its variance, along with the authoritarian parenting style (b = 0.03, p < .001), explaining 24.00% of its variance. Children's QoL was significantly associated with the permissive parenting style (b = -4.63, p = .024) but was not associated with the authoritative (b = -1.98, p = .306) and authoritarian (b = -0.24, p = .933) parenting styles, in a model explaining 20.79% of the QoL variance. Finally, although the total effect of parenting stress on QoL was significant (b = -0.27, p = .039) and explained 12.87% of the QoL's variance, the direct effect was not significant (b = -0.16, p = .288).

Only a significant indirect effect was found in the association between parenting stress and children/adolescents' QoL with the permissive parenting style as mediator (point estimate = -0.12, 95% CI = -0.319/-0.038), indicating that higher levels of parenting stress were associated with poorer children's QoL through the use of the permissive parenting style.

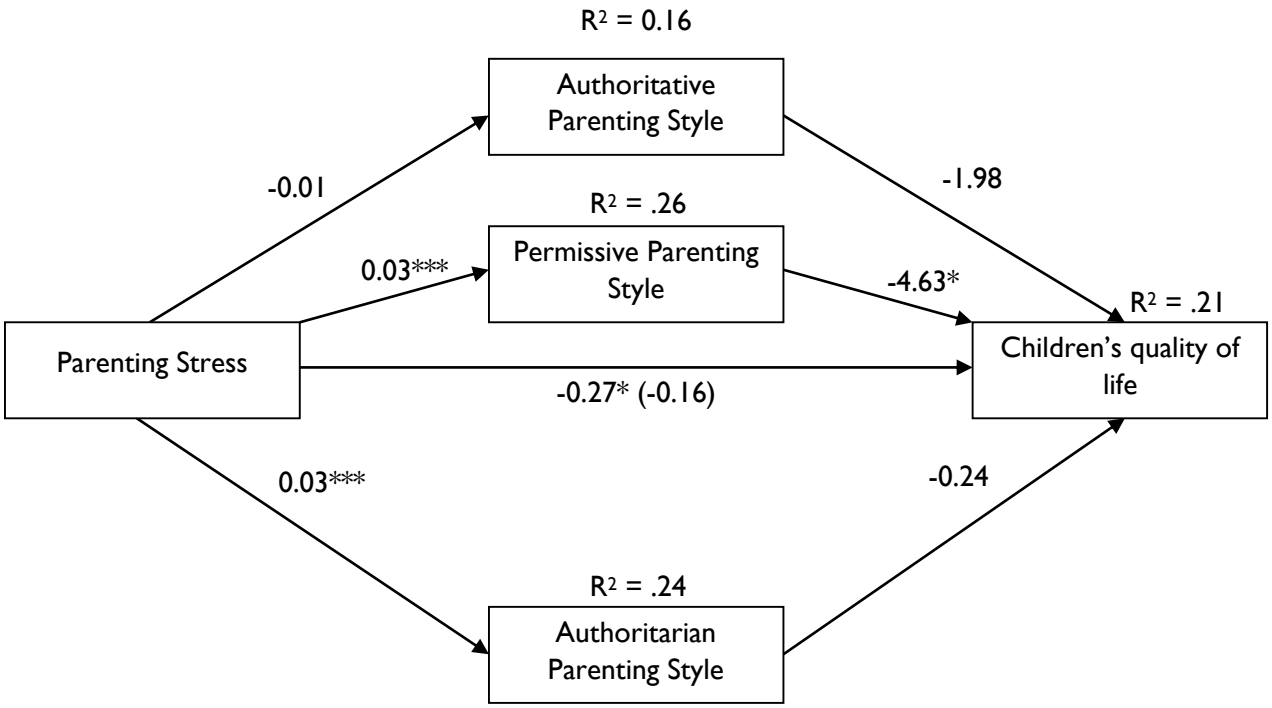

Figure 1 | Statistical diagram of the multiple mediator model for the presumed influence of parenting styles on the association between parenting stress and children's QoL

Path values represent unstandardized regression coefficients. In the *arrow* linking parenting stress and children's QoL, the *value outside parentheses* represents the total effect of parenting stress on children's QoL before the inclusion of the mediating variables. The *value in parentheses* represents the direct effect, from the bootstrapping analysis, of parenting stress on children's QoL after inclusion of the mediators. *$p < .05$; **$p < .01$; ***$p < .001$.

Discussion

The current study provides innovative data regarding parental and individual adjustment in pediatric obesity. Mothers of children/adolescents with obesity presented higher levels of parenting stress than mothers of children/adolescents with healthy weight, and higher levels of use of the authoritarian parenting style. Mothers of children/adolescents with healthy weight reported a greater use of the authoritative parenting style. Mothers of adolescents with obesity also reported higher levels of use of the permissive parenting styles than mothers of adolescents with healthy weight. We also found that children/adolescents with obesity reported lower levels of QoL than children/adolescents with a healthy weight. One of the most important results of the current study was that higher levels of parenting stress were shown to be associated with higher levels of the permissive parenting style, which, in turn, was associated with lower levels of children's/adolescents' QoL. This study draw attention to the fact that mothers of children/adolescents with obesity and their children's have more adapting difficulties compared to children/adolescents with healthy weight and their mothers. It outlines the importance of maternal adaptation for the adaptation of their children/adolescents, highlighting the role of parenting styles.

As expected, mothers of children/adolescents with obesity presented higher levels of parenting stress than those of children/adolescents with a healthy weight. These results are in line with previous studies that suggest a worse adaptation of mothers of children/adolescents with obesity than mothers of children/adolescents with healthy weight (Guilfoyle et al., 2010; Moens et al., 2009). Having a child with obesity can be challenging due to the physical and psychological consequences of the disease itself and also because of the treatment that is sometimes prescribed, which entails additional stress and management needs in family lives (Barlow and Dietz 1998). Caregivers often have additional tasks and worries on top of regular parenting responsibilities (Guilfoyle et al., 2010), such as clinic appointments or the struggle with monitoring the daily adherence to prescribed treatment regimens. Those tasks are usually difficult for children/adolescents and the whole family to maintain. In addition, many parents of obese children also struggle with excessive weight (e.g., Guilfoyle et al., 2010; Modi et al., 2009),

which suggests a multi-generational nature of obesity (Modi et al., 2009). In our study, 73.3% of mothers of children/adolescents with obesity were overweight or obese; their mean BMI was 29.29 (*SD* = 5.92). It is likely that these mothers experience physical and psychological negative consequences and maladjustment similar to their children (e.g., stigmatization and depressive and anxiety symptoms) that could have a negative effect on their adaptation and on their levels of parenting stress. However, taking into account the minimum and maximum values of the subscale, the scores obtained in our samples suggest that, in general, values of parenting stress are not very high, even for mothers of children/adolescents with obesity. Nevertheless, due to the lack of Portuguese norms, we are unable to understand if the respondents fall within the normal stress category, or if they present high levels of parenting stress. Nonetheless, a significant difference between the two samples was found.

We also found, as expected, that mothers of children/adolescents with obesity reported a greater use of the authoritarian and permissive parenting styles, whereas mothers of children/adolescents with healthy weight reported a greater use of the authoritative parenting style. Research has consistently shown that the authoritarian and permissive parenting styles are both associated with a higher risk for obesity in children/adolescents (Rhee et al., 2006). This study shows that Portugal follows the same trend. Mothers who more frequently use authoritarian parenting styles will likely make prohibited food more desirable and thus more consumed by the children/adolescents (Birch et al., 2003), which will be reflected in weight gain. In contrast, mothers who use frequently the permissive parenting style will set less limits in the amount and in the quality of the food presented to the youth because this parenting style cannot provide the guidance children/adolescents need to develop self-regulation in eating (Lengua et al., 2007). In our study, we also found that mothers of adolescents with obesity had higher levels of use of the permissive parenting style than mothers of adolescents with healthy weight. These findings are in line with previous research that suggests that mothers of children/adolescents with obesity tend to more frequently use the authoritarian and permissive parenting styles (Matos et al., 2013; Rhee et al., 2006). However, we found that this difference was only present in the group of mothers of adolescents with obesity. Young children require more caregiver demands and supervision (Pereira et al., 2009) because of their greater dependency, whereas adolescence is a developmental period marked by a demand for autonomy by adolescents (Erikson 1982). Adolescents with obesity are searching for autonomy and independence from their parents in a moment marked by important challenges. Simultaneously, they are struggling to be accepted by their peer groups while fighting with inherent weight issues (e.g., shame and stigmatization or dissatisfaction with body image). Mothers of adolescents with obesity may also have a greater willingness for their children/adolescents to be accepted by peers because they want their infants to have a normal adolescence despite their appearance. Therefore, they may

more frequently use a permissive parenting style with less interactive or monitoring behaviors toward their child. A greater use of a permissive style in adolescents with obesity may also be a manifestation of a general family disorganization. It may also reflect a difficulty to establish stable rules and lack of cohesion and structure, which is typical of families with children/adolescents with obesity (Zeller et al., 2007). It is also important to note that in Portuguese middle childhood children, there seems to be common patterns, with parents using higher levels of emotional support but also parental control (Pereira et al., 2009).

According to our initial hypothesis, children/adolescents with obesity presented poorer QoL than their healthy weight peers, which is in line with previous studies (e.g., Moreira et al., 2013; Zeller and Modi 2008). This finding may be related to wide range of factors, such as a greater dissatisfaction with body image (Jelalian and Hart 2009), the victimization and social exclusion to which those children are often subject (Griffiths et al., 2010), or the physical consequences of excess body weight, including fatigue, muscle problems or even the presence of comorbid conditions. Regarding the age effect, it was found that adolescents showed lower levels of QoL than children, regardless of their weight. This finding could be due to normative physical and psychosocial changes in this period linked to a growing concern about the opinion of peers, their acceptance and, in parallel, the increased demand for autonomy in relation to parents that is typical in this developmental period (Erikson 1982).

We found that there was an association between parenting stress and parenting styles. Research has consistently shown a negative association between negative parental well-being and stress and negative parenting (Crnic et al., 2005; Rodgers 1993). Burke (2003) suggested, for instance, that maternal psychopathology disrupts parenting. Higher levels of parenting stress could lead to more difficulties in managing parenting tasks, influence feeding interactions and meals, and lead to less adaptive strategies to deal with children/adolescents. Thus, it is possible that more stressed mothers tend to use less adaptive parental strategies. To cope with their parenting stress mothers may be more focused on themselves and be unable to effectively monitor or control what their children do. The significant association between parenting stress and children's/adolescents' QoL was no longer significant when parenting styles were introduced in the model, suggesting the important role of parenting styles in this relationship, which is in line with research that shows that parenting is important for child development (Kotchick and Forehand 2002). The study of the association between parental behaviors on child's adjustment has gained increasing interest in Portugal (e.g., Pereira et al., 2009). Mothers who use more a permissive parenting style (characterized by a lack of warmth, monitoring, control and discipline with their youths) will likely have more difficulties monitoring the food their children/adolescents consume or the amount of TV they watch and in applying appropriate boundaries. Moreover, parenting styles have effects on all types of parenting interactions, not only in behaviors related

to food or physical habits. Therefore, it is expected that parenting styles may have an impact on the global adaptation of the child, which was one of the most important findings in this study. It is also important to note that parental feeding practices are important because they may "teach" children to use food to cope with emotional feelings (Blissett et al., 2010). Parental modeling of eating behaviors could also play an important role in determining food intake (Jelalian and Hart 2009). Thus, parenting styles should be taken into account not only in research but also in clinical settings.

In sum, the model we presented is in line with research that suggests that the psychosocial adaptation of mothers is related to the psychosocial adaptation of children/adolescents. Poor caregiver functioning is associated with worse QoL in children/adolescents with obesity (Janicke et al., 2007). Examining parental variables related to poorer adjustment of children/adolescents with obesity is critical, particularly because a worse adaptation in children/adolescent is likely to have an impact on their weight. Deater-Deckard and Scarr (1996) suggested that parenting stress may be indirectly related to child outcomes through parenting behaviors, which could be the case for parenting styles. In our study, the relationship between those variables was mediated through the permissive parenting styles, which, notably, is one of the parenting styles that literature and research show are more commonly used in this population (e.g., Golan 2006; Jelalian and Hart 2009; Matos et al., 2013; Rhee et al., 2006). Previous research suggests that positive parenting approaches (e.g., authoritative parenting style) could have a protective effect on pediatric obesity (Rhee et al., 2006) and be a good predictor of children's BMI, healthier eating, healthier physical activity, sedentary behaviors, and the consumption of fruit and vegetables (e.g., Kremers et al., 2003; Schmitz et al., 2002). Our study showed that parenting styles are probably responsible for a significant percentage of the variance of the QoL of children/adolescents with obesity. However, there are other variables that should be studied and taken into account. A significant percentage of the variance still needs to be found, and the influence of other variables should be explored.

The current study presents several limitations that should be noted. The first limitation is the cross-sectional design of the study. A longitudinal design is needed to provide solid and causal evidence for the direction of these associations, specifically in the case of a chronic health condition. The adjustment to a disease is a dynamic process possibly better understood with longitudinal designs. Because of the bidirectional association between the study variables, causal inferences are not possible. In fact, parenting stress can lead to lower levels of QoL in children and adolescents, but QoL could also be the source of parenting stress. Second, the sample was one of convenience and participants were only recruited in the central region of Portugal, which does not allow the generalization of results. Also, our clinical sample was comprised of children and adolescents attending nutrition appointments with the purpose to lose weight. Therefore,

it does not allow the generalization of results to the entire population of children/adolescents with obesity. Third, in our study we used two different sample collection procedures: height and weight of children/adolescents with obesity were measured by the nutritionist/physician, whereas height and weight of children/adolescents with healthy weight were self-reported. This could prevent accurate answers regarding those measures, especially since some studies demonstrated that children and adolescents might inaccurately self-report weight and height (e.g., Beck et al., 2012; Brener et al., 2003). At last, only mothers were recruited in this study. Although it is broadly acknowledged that mothers tend to be more responsible than fathers regarding their children (and therefore, their children's eating patterns; Haycraft and Blisset 2011), future research should try to enlarge the recruitment, adding fathers and other caregivers to test these mediations.

Despite these limitations, the current study has a number of strengths. We used self-report measures that allow children and adolescents to report about their subjective experiences. We focused our study on family and individual variables that are important in the scientific domain of pediatric obesity but whose mechanisms, along with the pathways accounting for these relationships, are scarcely studied. Additionally, in this study, mother–child dyads were used. Our study highlighted the association between parents and child variables and the importance of parental factors, such as parenting styles, as a mediating variable. Therefore, it contributes to the study of pathways, which are important for intervention programs that target young children and their parents (Ventura and Birch 2008), providing a better understanding of variables that may benefit from greater attention from clinicians. Increasing awareness among caregivers and mothers concerning the association of parenting styles and children/adolescents outcomes is an important first step (Rhee et al., 2006).

This study has several clinical implications. In spite of the recognition of family as a key component of therapeutic success (Barlow and Expert Committee 2007), the majority of intervention programs in this area attribute the responsibility of obesity change to the child/adolescent (Golan and Weizman 2001). Our study reinforces the importance of including family members to improve the QoL of children/adolescents with obesity. The family is the first social context of children/adolescents, with parenting styles providing an important context for their development (Ventura and Birch 2008). Family-oriented approaches to pediatric care (and pediatric obesity) are of utmost importance (Barlow and Expert Committee 2007; Epstein et al., 2007), particularly because parents are the main people responsible for taking their children to clinical settings and for starting and continuing the prescribed treatment (Shor and American Academy of Pediatrics Task Force on the Family 2003). In addition, because mothers of obese children/adolescents experienced higher levels of parenting stress, which were indirectly associated with the QoL of their children, it seems to be important to offer mothers (and likely

other caregivers) the opportunity to receive psychological support. Health professionals should be aware of psychosocial difficulties in caregivers when they prescribe treatment to children/adolescents to lose weight. A routine assessment of parenting stress and an identification of mothers of children/adolescents with obesity who may benefit from greater clinical attention could be important because literature has suggested that psychological adjustment is important in the adherence to prescribed treatment (Guilfoyle et al., 2010; La Greca and Mackey 2009). Moreover, an inquiry of the parenting styles used by those parents and a discussion about the benefits of using an authoritative parenting style seems to be important. Referring these parents to a psychologist (or other professionals in the area) to provide parental education towards the adoption of a more appropriate parenting style appears relevant. The prevention and the promotion of strategies to address parenting styles seems to be important in the prevention of childhood overweight (Rhee et al., 2006), particularly because parental practices and emotional climates usually influence eating behaviors (Golan 2006). Thus, a multidisciplinary team composed of pediatricians, nutritionists and psychologists is fundamental.

Acknowledgments

This study was supported by the Portuguese Foundation for Science and Technology, under Grant [SFRH/BD/ 86063/2012].

Compliance with Ethical Standards

Conflict of interest

The authors declare that they have no conflict of interest.

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Empirical study III

The indirect effect of family cohesion on children's weight status through maternal quality of life and children's internalizing and externalizing symptoms

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Accept with minor revisions to Child & Youth Care Forum

Empirical study III

The indirect effect of family cohesion on children's weight status through maternal quality of life and children's internalizing and externalizing symptoms

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Abstract

Background: Obesity has serious psychosocial consequences for youth and family members and has reached epidemic levels in Portugal.

Objective: This study had two goals: 1) to investigate differences in family cohesion, mothers' quality of life (QoL), and externalizing/internalizing symptoms between children/adolescents with healthy-weight and overweight/obesity; 2) to assess the mediating role of maternal QoL and children/adolescents' externalizing/internalizing symptoms in the association between family cohesion and weight.

Methods: Children/adolescents with healthy-weight (n = 134) and with overweight/obesity (n = 163) and their mothers participated in the study. Mothers completed measures of family cohesion (FC) and QoL and children/adolescents completed measures of externalizing and internalizing symptoms. This study used a cross-sectional design.

Results: Children/adolescents with overweight/obesity reported higher levels of externalizing and internalizing symptoms than children/adolescents with healthy-weight. Mothers of children/adolescents with overweight/obesity reported lower levels of FC and QoL than mothers of children/adolescents with healthy-weight. Mothers' QoL and children/adolescents' externalizing symptoms sequentially mediated the relationship between FC and weight status. Specifically, an increase in FC and QoL resulted in a decreased likelihood of the child/adolescent reporting overweight or obesity, whereas an increase in externalizing symptoms resulted in a higher likelihood of the child/adolescent reporting overweight or obesity.

Conclusions: This study identifies mechanisms that might account for the link between FC and weight, suggesting the importance of mothers' QoL and children's externalizing symptoms. Moreover, it provides a better understanding of the psychosocial outcomes related to pediatric obesity, highlighting the relevance of working with the parents to promote weight reduction in youths.

Keywords: Family Cohesion; Externalizing Symptoms; Internalizing Symptoms; Pediatric Obesity; Maternal Quality of Life.

Introduction

Pediatric obesity reached epidemic levels in Portugal, one of the European countries with the highest prevalence (OECD/EU, 2016; Rito et al., 2012). As in other chronic health conditions (CHC), obesity has negative consequences for the child/adolescent and the family system, but at the same time, it is influenced by the family in an interacting way (e.g., Fiese & Sameroff, 1989; Kazak, Rourke, & Navsaria, 2009). Hence, when studying pediatric overweight/obesity, a systems-oriented conceptualization may be useful (Hooper, Burnham, & Richey, 2009). Given the higher prevalence and alarming physical and psychosocial consequences related to pediatric obesity, the prevention of this CHC and studies in this area are a priority not only in Portugal but worldwide (Filipe, Godinho, & Graça, 2016).

One of the negative consequences of overweight/obesity is in the psychological functioning of children/adolescents. Research has found higher levels of psychopathological symptoms in children/adolescents with overweight/obesity, compared to children/adolescents with healthy-weight or other CHCs (e.g., Braet, Mervielde, & Vandereycken, 1997; Britz et al., 2000; Moreira et al., 2013), suggesting a link between psychological health and weight status. Although some studies point to a strong association between childhood obesity and externalizing symptoms (e.g., impulsivity, hyperactivity, conduct problems; Puder & Munsch, 2010; Zeller & Modi, 2008), much more attention has been paid to the link between obesity and children's internalizing symptoms (e.g., anxiety, depression, isolation; Zeller, & Modi, 2008). Therefore, in order to overcome this important gap, studies focusing on both internalizing and externalizing symptoms are essential to more thoroughly understand the links between overweight/obesity and the psychological adjustment in youths. Moreover, some studies suggested that parents of children/adolescents with overweight/obesity often describe lower levels of quality of life (QoL) compared, not only to parents of children/adolescents with healthy-weight, but also to parents of children/adolescents with other CHCs (e.g., Modi, Guilfoyle, & Zeller, 2009; Moreira et al., 2013). Understanding the role of maternal QoL on children/adolescents' weight is of utmost importance given that maternal QoL and psychopathology are strongly related to the nutritional status of their child (Feijó et al., 2011) and to their child's feeding problems (Blissett, Meyer, & Haycraft, 2007). Additionally, more research is needed on the family and parenting characteristics that might be associated with children's weight as well as with their psychological functioning. By identifying which parental and familial characteristics are important correlates of higher pediatric weight and pediatric psychological adjustment, intervention programs may be more efficient, focusing on changing important variables that might contribute to pediatric weight. In fact, dietary and physical activity patterns occur in the context of the family thus, examining family and child factors, and their potential interrelationships, are needed and will help enhance prevention and intervention (Zeller & Daniels, 2004).

Nonetheless, despite the increasing interest in studying the impact of family functioning in the psychological adaptation of obese youths and on their weight (e.g., Blissett, Meyer, & Haycraft, 2011; Houldcroft, Farrow, & Haycraft, 2014; Washington, Rose, Colombo, Hong, & Coard, 2015), there has been little investigation regarding the sequential association between family environment, parents' adaptation and their child's adaptation (e.g., internalizing and externalizing symptoms). Moreover, the relationship between family and weight does not appear to be straightforward and the mechanisms that may account for this association remain unclear. If research is able to clarify and highlight how familial and parental variables/characteristics are associated with higher weight status, interventions and preventions programs may be better designed in order to decrease or prevent overweight/obesity. The incorporation of a parent–child dyadic perspective in research is important given that parents (most commonly mothers) are usually responsible for accompanying their children at nutritional appointments (Holmbeck, Zebracki, & McGoron, 2009). Therefore, assessing the mother's adjustment and understanding their role in their child's weight may help expand the focus of clinical theory and intervention.

The presence and maintenance of overweight/obesity of a child/adolescent is usually influenced not only by family environment but also by maternal adaptation (Jelalian & Hart, 2009; Puder & Munsch, 2010). For instance, taking into account a key dimension on family environment, which is family cohesion (FC; Holmbeck, Coakley, Hommeyer, Shapera, & Westhoven, 2002), research acknowledged that pediatric obesity arises in families with lower levels of FC (e.g., Mendelson, White, & Schliecker, 1995; Zeller et al., 2007). Additionally, lower FC appears to be a risk factor for lower parental adaptation (e.g., QoL; Field & Duchoslav, 2009) and poor child/adolescent outcomes (Drotar, 1997). Lower FC is also a risk factor for higher weight status, especially because of the effect that FC has on healthy eating (Franko, Thompson, Bauserman, Affenito, & Striegel-Moore, 2008). In a study examining the association between FC and behaviors linked to health or overweight in adolescents, Franko and colleagues (2008) suggested that higher FC could be linked to healthy eating behaviors in a direct way or through the psychological health of the child.

Because childhood obesity has multiple processes interacting mutually (Puder & Munsch, 2010), further studies are needed in this area to better understand the relationships between the variables discussed. In fact, since the etiology of obesity is multifactorial (Loche & Ozanne, 2016; Sancho et al., 2014) with environmental factors being considered as major contributors to the obesity epidemic (Maggi, Busetto, Noale, Limongi, & Crepaldi, 2015), it is of utmost importance to study which family/parent characteristics may contribute to the development of pediatric overweight/obesity, and how these factors may interconnect with child/adolescent outcomes (Zeller & Daniels, 2004). Individual and personal factors from the mother and the child/adolescent could account for the relationship between family factors and weight, as

suggested in Kazak's (1989) and Bronfenbrenner's (1979) socio-ecological models. Those models consider the importance of the interaction of many systems, providing a framework that helps identify common parameters of illness and family responses (Kazak et al., 2009). Using those models as frameworks may help us to understand and explain the multiple influences on body weight and have been considered as important models when addressing childhood obesity (Cauchi, Glonti, Petticrew, & Knai, 2016). Moreover, research consistently acknowledges the importance of maternal adaptation on the adaptation of children/adolescents (e.g., Abidin, Jenkins, & McGaughey, 1992; Field & Duchoslav, 2009; Guilfoyle, Zeller, & Modi, 2010), as well as the interrelationship between parents' and children's outcomes (Kazak et al., 2009), especially in the context of pediatric CHCs such as overweight/obesity (Wallander & Varni, 1998). Taken as a whole, these findings suggest that researchers and practitioners can benefit from further research on the interrelationship between family environment, maternal adaptation, children/adolescents adaptation, and pediatric weight.

The Current Study

This study had two main aims. First, to investigate differences in FC, maternal QoL, and children/adolescents' externalizing and internalizing symptoms between families with children/adolescents with healthy-weight and families with children/adolescents with overweight/obesity seeking treatment. It was hypothesized that mothers of children/adolescents with overweight/obesity would report lower levels of FC and QoL compared to mothers with children/adolescents with healthy-weight. We further hypothesized that children/adolescents with overweight/obesity would report higher levels of externalizing and internalizing symptoms compared to children/adolescents with healthy-weight. Children and adolescents were examined separately in the analyses to explore possible age differences for several reasons: 1) these two phases have different specificities regarding their developmental tasks and so should be considered separately in research (Holmbeck, 2002); 2) Wallander and Varni (1998) reinforce the need to implement a developmental perspective in research on individual and family adjustments to pediatric chronic conditions since youth and their families are in continuous development (Wallander, Thompson, & Alriksson-Schmidt, 2003); 3) finding differences between children and adolescents may help tailor more specific intervention programs for pediatric obesity; 4) adolescents often experience developmental changes that might impact the behaviors of significant others (e.g., mothers' behaviors; Holmbeck, 2002); 5) research has found developmental differences in psychosocial functioning (e.g., Swallen, Reither, Haas, & Meier, 2005); finally, 6) children and adolescents rely on parents differently not only in relation to eating and physical patterns but also in general health guidance, but, younger children may demand more of caregivers and require more supervision (Pereira, Canavarro, Cardoso, & Mendonça,

2009) and adolescents have more autonomy (Erikson, 1982) which may be reflected, for instance, in the use of different parenting styles (Frontini, Moreira, & Canavarro, 2016). By examining the role of age, this study will provide a more comprehensive understanding of the variables at different developmental stages.

Second, because of the known association between parents' adaptation and children's adaptation, this study investigated whether the relationship between FC and weight status was mediated sequentially by mothers' QoL and children/adolescents' externalizing and internalizing symptoms. No previous research has tested the relationships between these variables altogether. Nonetheless and taking into account the relationship between the variables (previously explored), we expect that lower levels of FC would be associated with lower levels of maternal QoL which, in turn, would be associated with higher levels of externalizing (or internalizing) symptoms and, in turn, with higher weight. Mediation analyses are important in this study field because they help complement simple descriptive analyses, creating a more functional understanding of the relationships between variables (Preacher & Hayes, 2004). Therefore, by exploring these associations, this study intends to overcome important limitations of previous research. In fact, by enlightening possible mechanisms linking family environment, maternal adaptation, children/adolescents adaptation, and pediatric weight, potential targets of interventions may be acknowledged, adding information to the scarce literature on mediators that may explain the aforementioned associations of the variables.

Methods

Participants

The sample included 297 dyads, comprising a child (8-12 years old) or an adolescent (13-18 years old) and their mothers, organized into two groups according to their BMI: (1) children/adolescents with overweight/obesity (BMI ≥ 85th percentile; *n* = 163) seeking treatment; (2) children/adolescents with healthy-weight (BMI: 5th–84th percentile; *n* = 134). The weight condition was based on the growth charts of the National Centre for Health and Statistics (Kuczmarski, Ogden, Guo, et al., 2002) adapted and used in the Portuguese Health System since 2006. The inclusion criteria were: (1) aged between 8-18 years; (2) ability to understand and answer the set of questionnaires; (3) no mental/developmental delay; (4) absence of genetic syndromes that could cause obesity or other CHC; (5) healthy-weight children had no CHC.

Materials and Procedure

The sample of children/adolescents with overweight/obesity undergoing treatment (i.e. attending nutrition appointments to lose weight) and their mothers was recruited in two

Portuguese public and urban hospitals and one healthcare center (February 2012 to December 2014). The study was approved by the Ethics Committee and Direction Boards of these institutions. Informed consent was obtained from all individual participants included in the study. The researcher explained the aims of the study, the research procedures, and asked the parent to sign an informed consent form. Children were asked to assent to their own participation. Mothers and children/adolescents completed the self-report questionnaires in a consultation office and a researcher was available to provide assistance.

Children/adolescents with healthy-weight and their mothers were recruited in Portuguese public schools. Authorizations from the Direction Boards were obtained. Children and mothers were each given an informed consent form and the questionnaires and asked to complete them at home and return them a week later. Children were asked to assent to their own participation. Children/adolescents recruited in schools with overweight/obesity were excluded from analyses.

Measures

Family Cohesion. The Cohesion subscale of the Portuguese version of the Family Environment Scale (FES) was used (Matos & Fontaine, 1992; Moos & Moos, 1986) to assess mothers' perceptions of commitment to the family and the degree to which family members are helpful and supportive of one another. It comprises nine items (e.g., "Family members spend a lot of time together and pay attention to each other") answered on a 6-point Likert scale ranging from 1 (*completely disagree*) to 6 (*completely agree*). Higher scores indicate a higher perception of family cohesion. In previous studies with Portuguese samples, this instrument has demonstrated good psychometric characteristics. In the present study, the Cronbach's alphas were .83 (healthy-weight group) and .81 (overweight/obesity group).

Quality of Life. Mothers' perceptions of their QoL were assessed using the Portuguese version of the EUROHIS-QOL-8 (Pereira, Melo, Gameiro, & Canavarro, 2011; Schmidt, Mühlan, & Power, 2006), a quick indicator of overall QoL. This instrument is a quick and practical indicator of overall QoL (Da Rocha, Power, Bushnell, & Fleck, 2012), containing eight items (e.g., "How would you rate your quality of life") answered on a 5-point Likert scale ranging from 1 (*not at all/very dissatisfied*) to 5 (*completely/very satisfied*). Higher scores indicate a better perception of QoL. In the present study, the Cronbach's alphas were .84 (healthy-weight group) and .80 (overweight/obesity group).

Externalizing and internalizing symptoms. Externalizing and internalizing symptoms of children/adolescents were assessed using the Difficulties subscale of the Portuguese self-reported version of the Strengths and Difficulties Questionnaire (Fleitlich, Loureiro, Fonseca, &

Gaspar, 2005; Goodman, 2001). This subscale comprises 20 items clustered into externalizing (e.g., "I get very angry and often lose my temper") and internalizing (e.g., "I worry a lot") symptoms, according to recent recommendations (Goodman, Lamping, & Ploubidis, 2010). Items are answered on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*certainly true*). Higher values indicate more psychopathological symptoms. This instrument has better coverage of dimensions such as inattention and peer relationships than other instruments assessing externalizing/internalizing symptoms. Moreover, it has a shorter format providing a balanced coverage of youths' behaviors, emotions, and relationships (Goodman, 1997). The Portuguese version of this instrument has been widely used in clinical practice and research with different ages and health conditions. In the present study, the Cronbach's alphas ranged from .65 (internalizing symptoms in overweight/obesity group) to .73 (externalizing symptoms in the overweight/obesity group).

Weight condition. The weight and height of children/adolescents recruited in health institutions were measured by the nutritionist. The weight and height of children/adolescents recruited in schools were self-reported by the mothers. The weight condition of children and adolescents was classified as normal, overweight or obese according to the growth charts of the National Centre for Health and Statistics (Kuczmarski et al., 2002) that take into account the percentile values of the BMI for children/adolescents of the same age and gender, calculated from weight (kg) and height (cm) according to the following formula: weight/height^2. Children/adolescents' BMI was transformed in Z scores (zBMI).

Sociodemographic data. These were reported by the mothers and included children/adolescents' age and gender, and maternal age, marital status and education.

Data Analyses

Data analyses were performed using the Statistical Package for the Social Sciences (IBM SPSS, version 22.0; Armonk, NY). Descriptive statistics were computed for all sociodemographic and study variables. Analysis of variance (ANOVA) and Chi-squared (χ^2) tests were used for between-group comparisons of sociodemographic and clinical characteristics. To assess the associations between study variables, Pearson's bivariate correlation coefficients were computed. Correlations coefficients ≥ .10 were classified as "small", those ≥ .30 were classified as "medium", and those ≥ .50 were classified as "large" (Cohen, 1988).

Differences between weight conditions (healthy-weight or overweight/obesity) and age groups (children and adolescents) on FC and mothers' QoL were assessed through two-way ANCOVAs, controlling for sociodemographic variables that were significantly different between

groups. A two-way multivariate analysis of covariance (MANCOVA), with weight condition and age group as independent variables, was performed on internalizing and externalizing symptoms. When a multivariate effect was found, subsequent ANCOVAs were examined, one per dependent variable.

To ascertain whether the direct and indirect effects of FC on children/adolescents' weight condition were mediated by mothers' QoL and children/adolescents' externalizing and internalizing symptoms, two serial mediation models (Model 6, Hayes, 2013) were estimated using PROCESS (Hayes, 2013); an SPSS macro for path analysis-based moderation and mediation analysis. Mothers' perception of FC was used as the independent variable; children/adolescents' weight condition as the dependent variable (DV); and mothers' QoL and children/adolescents' psychopathological symptoms were used as mediators. Internalizing and externalizing symptoms were tested separately in two different models. Children's age was entered as a covariate since it was correlated with the dependent variable, along with maternal education levels, since there were significant differences on these between the two groups. To assess the unconditional indirect effects, a bootstrapping procedure was used (with 10,000 resamples). Bias-corrected and accelerated confidence intervals (95% BCaCIs) were created with an indirect effect being significant if zero was not contained within the lower and upper CIs. Since the criterion variable (DV) is binary, the procedure for the path analyses is binary logistic regression. The use of logistic regression allows the analysis of statistical indicators such as Cox and Snell and Nagelkerk, specifically indicated to evaluate the explained variance of the criterion variable. We used Wald statistic in order to obtain the significant level for unstandardized regression coefficient. Significance was set at the .05 level.

Results

Participants' Characteristics

Sociodemographic characteristics are presented in Table 1. No group differences were found for mothers' age and marital status, and for children/adolescents' age category or gender. Significant group differences were found in children/adolescents' age and zBMI, and in mothers' BMI and education levels. However, children/adolescents' zBMI was not entered as a covariate in subsequent analyses because it is a characterizing variable of the weight condition, and maternal BMI presented a significant amount of missing information (n = 18).

Table 1 | Demographic Characteristics of Children/Adolescents and Their Mothers

	Healthy-Weight ***N* = 134**	**Overweight/Obesity** ***N* = 163**	***F/p***
	Mean (*SD*); observed range	**Mean (*SD*); observed range**	
Child/adolescent age (years)	12.13 (3.19); 8-18	12.90 (2.60); 8-18	5.31/.022
Maternal Age (years)	41.69 (5.54); 29-56	41.35 (4.76); 30-59	0.33/.564
zBMI (children/adolescents)	-0.11 (0.81); -3.84-1	1.86 (0.43); 0.62-2.73	723.05/<.001
Mothers' BMI	24.13 (2.99); 17.58-35.03	28.60 (5.63); 17.53-48.07	65.72/<.001
	***n* (%)**	***n* (%)**	χ^2/p
Child/adolescent age category			
8-12 years	71 (53)	72 (44.2)	2.29/.130
13-18 years	63 (47)	91 (55.8)	
Child/adolescent gender			
Male	51 (38.1)	76 (46.6)	2.21/.138
Female	83 (61.9)	87 (53.4)	
Mothers' marital status			
Not living with a partner	18 (13.4)	30 (18.5)	1.40/.237
Living with a partner	116 (86.6)	132 (81.5)	
Mothers' Education Level			
≤ High school	98 (73.1)	142 (87.1)	9.27/.002
≥ College or graduate degree	36 (26.9)	21 (12.9)	

Group Differences and Correlations among Study Variables

Table 2 presents the descriptive statistics for the study variables according to weight condition (healthy-weight, overweight/obesity) and age group (children, adolescents), as well as the main and interaction effects and the correlations among some study variables.

With regard to FC, a main effect of weight condition was found, with mothers of children/adolescents with healthy-weight reporting higher levels of FC compared to mothers of children/adolescents with overweight/obesity. No significant effects were found for age group, or for the interaction between weight condition and age group.

Regarding mothers' QoL, a main effect of weight condition was also found, with mothers of children/adolescents with healthy-weight reporting higher levels of QoL compared to mothers of children/adolescents with overweight/obesity. No significant effects were found for age group, or for the interaction between weight condition and age group.

With regard to internalizing and externalizing symptoms, a significant multivariate effect was found for weight condition, Wilks' Lambda = 0.94, $F(2, 291) = 8.70$, $p < .001$, $\eta^2_p = .056$. Subsequent univariate analyses revealed significant differences between groups on externalizing symptoms, and marginal differences approaching significance ($p = .059$) for internalizing symptoms. Children/adolescents with overweight/obesity reported higher levels of externalizing and internalizing symptoms compared to children/adolescents with healthy-weight. No significant multivariate effect was found for age group, Wilks' Lambda = 0.99, $F(2, 291) = 1.74$, $p = .177$, $\eta^2_p = .012$, or for the interaction between weight condition and age group, Wilks' Lambda = 0.99, $F(2, 291) = 0.13$, $p = .878$, $\eta^2_p = .001$.

Table 2 | Means, Standard Deviations, and Comparisons between Children/Adolescents with Healthy-Weight and Children/Adolescents with Overweight/Obesity and Their Mothers

	Healthy-Weight			**Overweight/Obesity**			**Group Effect**		**Age Effect**		**Interaction Effect**		**Correlations**			
		***N* = 134**			***N* = 163**											
Variables	**8-12 years** ***n* = 71** M (*SD*)	**13-18 years** ***n* = 63** M (*SD*)	**Total** ***n* = 134** M (*SD*)	**8-12 years** ***n* = 72** M (*SD*)	**13-18 years** ***n* = 91** M (*SD*)	**Total** ***n* = 163** M (*SD*)	*F*	η^2_p	*F*	η^2_p	*F*	η^2_p	1	2	3	4
1. Family Cohesion	5.18 (0.76)	5.11 (0.65)	5.15 (0.71)	4.75 (0.83)	4.60 (0.73)	4.67 (0.77)	26.09***	.082	1.24	.004	0.27	.001	-			
2. Quality of Life	70.69 (12.88)	69.00 (13.06)	69.89 (12.94)	63.59 (12.86)	60.58 (11.68)	61.91 (12.27)	24.48***	.077	2.05	.007	0.28	.001	.520**	-		
3. Externalizing symptoms	4.73 (2.79)	4.76 (2.82)	4.75 (2.79)	6.31 (3.63)	6.46 (3.19)	6.39 (3.38)	16.84***	.055	0.01	.000	0.07	.000	-.193**	-.185**	-	
4. Internalizing symptoms	5.44 (3.07)	4.67 (2.97)	5.08 (3.04)	6.03 (3.18)	5.58 (3.08)	5.78 (3.12)	3.59~	.012	3.16	.011	0.25	.001	-.081	-.157**	.296**	-

Note. *p < .05; **p < .01; ***p < .001; ~ p = .059.

The mediating role of mothers' QoL and children/adolescents' externalizing and internalizing symptoms in the relationship between FC and weight status

Mediation model using externalizing symptoms. We tested whether mothers' QoL and children/adolescents' externalizing symptoms sequentially mediated the association of FC with children/adolescents' weight (0 = healthy-weight; 1 = overweight/obesity). Children/adolescents' age and maternal educational level were entered as covariates. All paths for the full process model, as well as unstandardized regression coefficients, are illustrated in Figure 1. FC was significantly associated with mothers' QoL (b = 8.76, p < .001) explaining 27% of its variance. For children/adolescents' externalizing symptoms, the significant predictor FC (b = -0.55, p = .046) and the non-significant variable of mothers' QoL (b = -0.03, p = .084), explained 4.72% of its variance. Mothers' QoL (b = -0.03, Wald = 6.03, p = .014, OR = 0.97), children/adolescents' externalizing symptoms (b = 0.13, Wald = 9.29, p = .002, OR = 1.14) and FC (b = -0.57, Wald = 7.16, p = .007, OR = 0.57) have a significant effect on children/adolescents' weight. The binary criterion children/adolescents' weight (DV) has an explained variance of between .17 (Cox & Snell's R^2) and .23 (Nagelkerke's R^2).

Regarding the relationships expressed in this model, considering FC and mothers' QoL, an increase in these variables will result in a decreased likelihood of the participant reporting overweight or obesity. An increase in externalizing symptoms will result in a higher likelihood of the participant reporting overweight or obesity.

Three significant indirect effects were found in the association between FC and weight condition. A significant specific indirect effect of FC on weight condition through mothers' QoL and children/adolescents' externalizing symptoms was found with an estimate value of -0.03, (95% BCaCIs = -.095/-.005). Also an indirect effect was found for FC on weight through only mothers' QoL with an estimate value of -0.26, (95% BCaCIs = -.486/-.053). Finally, another specific indirect effect was found of FC on children/adolescents' weight through only externalizing symptoms, with an estimate value of -0.07, which is also a significant indirect negative effect (95% BCaCIs = -.193/-.013).

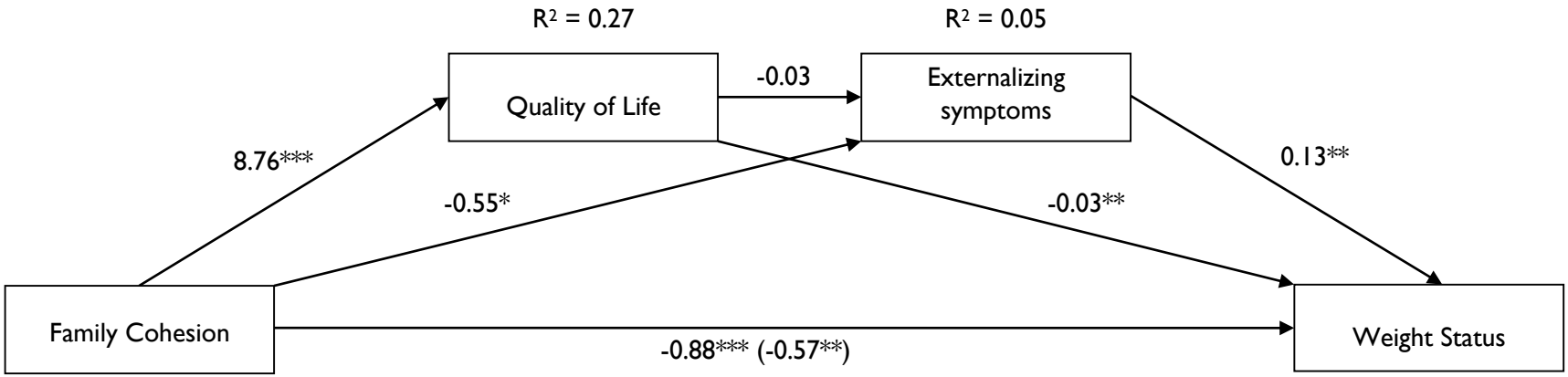

Figure 1 | Statistical diagram of the serial mediation model for the presumed influence of maternal QoL and children's/adolescents' externalizing symptoms on the association between family cohesion and weight (controlling for child/adolescent age and maternal education).

Note. Path values represent unstandardized regression coefficients. In the arrow linking family cohesion and weight, the value without parentheses represents the total effect of family cohesion on weight before the inclusion of the mediators. The value in parentheses represents the direct effect, from the bootstrapping analysis, of family cohesion on weight after the inclusion of the mediators.

*p < .05; **p < .01; ***p < .001.

Mediation model using internalizing symptoms. In a second model we tested if mothers' QoL and children/adolescents' internalizing symptoms sequentially mediate the influence of FC on children/adolescents' weight. Children/adolescents' age and maternal educational level were entered as covariates. All paths for the full process model, as well as unstandardized regression coefficients, are illustrated in Figure 2. FC was significantly associated with mothers' QoL (b = 8.76, p < .001), explaining 27% of its variance. For children/adolescents' internalizing symptoms the non-significant variable FC (b = 0.01, p = .982) and the significant variable of mothers' QoL (b = -0.04, p = .020) explained 2.47% of its variance. The binary criterion children/adolescents' weight has an explained variance of between .15 (Cox & Snell's R^2) and .20 (Nagelkerke's R^2). Mothers' QoL (b = -0.03, Wald = 6.34, p = .012, OR = 0.97) and FC (b = -0.62, Wald = 8.80, p = .003, OR = 0.54) have a significant effect on this criterion. Children/adolescents' internalizing symptoms (b = 0.05, Wald = 1.68, p = .195, OR = 1.06) did not have a significant effect on weight condition.

The model suggests that an increase in FC and mothers' QoL will result in a decreased likelihood of the child/adolescent reporting overweight/obesity. When using internalizing symptoms instead of externalizing symptoms, only one significant indirect effect was found, which was the mediating effect of mothers' QoL in the relation between FC and weight status with an estimate value of -0.26, (95% BCaCIs = -.50/-.07).

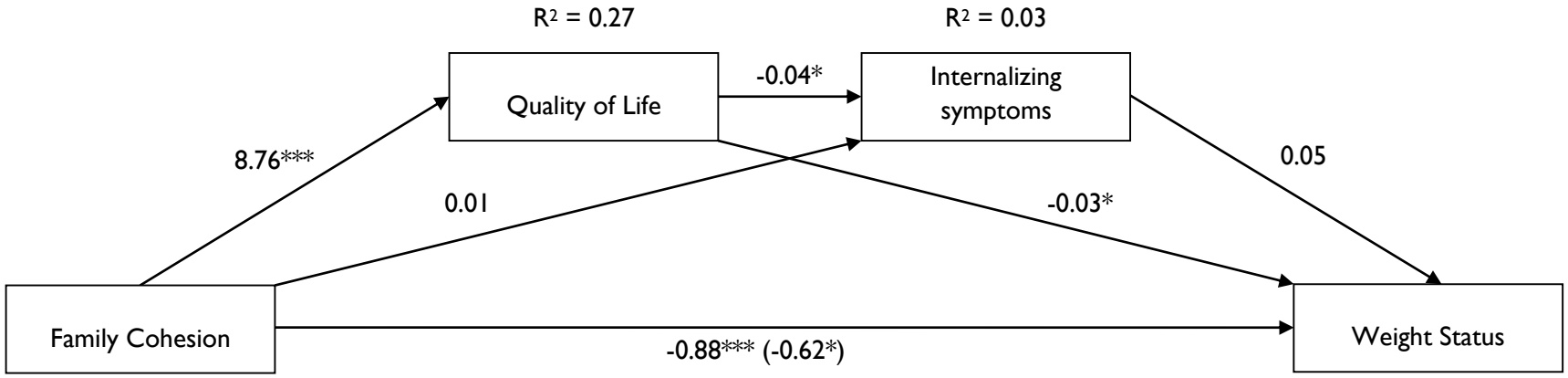

Figure 2 | Statistical diagram of the serial mediation model for the presumed influence of maternal QoL and children's/adolescents' internalizing symptoms on the association between family cohesion and weight (controlling for child/adolescent age and maternal education).

Note. Path values represent unstandardized regression coefficients. In the arrow linking family cohesion and weight, the value without parentheses represents the total effect of family cohesion on weight before the inclusion of the mediators. The value in parentheses represents the direct effect, from the bootstrapping analysis, of family cohesion on weight after the inclusion of the mediators.

*p < .05; **p < .01; ***p < .001.

Discussion

The current study provides innovative data regarding parental and child/adolescent adaptation in pediatric obesity. Mothers of children/adolescents with overweight/obesity reported lower levels of FC and QoL than mothers of children/adolescents with healthy-weight. Children/adolescents with overweight/obesity reported higher levels of externalizing and internalizing symptoms than children/adolescents with a healthy-weight. One of the main findings was that mothers' QoL and children/adolescents' externalizing symptoms sequentially mediated the relationship between FC and weight status. Internalizing symptoms were not a mediator of the relationship between FC and weight status.

Consistent with previous literature, mothers of children/adolescents with overweight/obesity reported lower levels of FC (Mendelson et al., 1995; Zeller et al., 2007) compared with mothers of children/adolescents with healthy-weight. This is particularly important given that familial variables and FC are known to impact healthful eating habits of children/adolescents (Franko et al., 2008; Welsh, French, & Wall, 2011) which, consequently, could impact weight status. Cohesive families may spend more time together sharing mealtimes (Franko et al., 2008) which has been related to healthier eating (Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003; White, Haycraft, & Meyer, 2014).

Mothers of children/adolescents with overweight/obesity reported lower levels of QoL than mothers of children/adolescents with healthy-weight, which is consistently found in the literature (e.g., Guilfoyle, Zeller, & Modi, 2010; Modi et al., 2009). These lower levels of QoL in mothers of children/adolescents with overweight/obesity could be at least partly related to caring for a child/adolescent with overweight/obesity which typically involves a complete change to family lifestyles (e.g., changing eating/activity habits, food provision, etc.). Moreover, it could be related to family environment, specifically, lower levels of FC, which would be reflected in a lower QoL of its members. In this study mothers of children/adolescents with overweight/obesity reported higher BMI than mothers of children/adolescents with healthy-weight, which is typically found in literature (e.g., Zeller & Daniels, 2004). The presence of overweight/obesity in those mothers and the physical and psychological consequences of this health condition (e.g., lower self-esteem; stigmatization; dissatisfaction with body image) could contribute to explaining the presence of lower levels of QoL in those mothers. The impact of healthy diets on QoL has been emphasized by recent literature (e.g., Godinho & Marques, 2016). Some research with adults with obesity reports that losing weight may enhance the levels of QoL because losing weight improves overall physical functioning as well as mental health, self-esteem and thus, general satisfaction with life (Fontaine & Barofsky, 2001). Accordingly, sticking to healthy diets may help to raise the levels of QoL (Godinho & Marques, 2016) and, as suggested

by the results of mediation in this study, mothers' higher levels of QoL may be important in the weight status of their children/adolescents.

Group differences were found in children/adolescents with overweight/obesity reporting significantly higher levels of externalizing and marginally higher levels of internalizing symptoms than children/adolescents with a healthy-weight, a finding consistent with previous literature (Braet et al., 1997; Britz et al., 2000; Pine et al., 2001). These results may be a consequence of the social stigma, weight-related teasing and victimization that sometimes children/adolescents with overweight/obesity may face, or even a lower satisfaction with their body image (Jelalian & Hart, 2009).

A novel finding was that mothers' QoL and children/adolescents' externalizing symptoms sequentially mediated the relationship between FC and children/adolescents' weight status whereas internalizing symptoms didn't. Both the mediators and independent variable are each showing incremental prediction. The mediators carried a substantial (statistically significant) portion of the variance in the partial mediation (Weems & Stickle, 2012). As previously discussed, some authors suggest that the link between FC and healthy eating and activity behaviors could be direct (Franko et al., 2008) or mediated by the psychological health of the child (Lucia & Breslau, 2006), but to the best of our knowledge this is the first study to examine sequentially maternal QoL and children's/adolescents' outcomes as mediators in the relationship between FC and weight status. Since the family is a bigger system, it might affect the individual adaptation of its members (e.g., maternal adaptation) and, consequently, the adaptation of the child. In fact, the interrelationship between parents' and children's outcomes has been acknowledged in past research (Kazak, Rourke, & Navsaria, 2009). A more cohesive family may positively interact with healthy eating (Franko et al., 2008), because it may provide sharing moments between their members (e.g., family meals). Those sharing moments may be associated with the mothers' adaptation. Mothers who perceive a lower QoL may be less prone to share meals, time and healthy activities with their child which could be related to the symptoms in their youths. Members of a more cohesive family may be encouraged to openly express feelings (Overstreet et al., 1995), worries and emotions, as well as offer support to one another, which may contribute to a better maternal perceived QoL and also be link to fewer externalizing symptoms in the family members. Mothers with less cohesive families may lack the support, help and commitment from other members of the family (Moos & Moos, 1986) which can increase parental maladjustment, especially since FC appears to be a protective factor for parental adaptation (Field & Duchoslav, 2009). Receiving more support may help mothers feel better adjusted which impact on the way mothers and children could positively interact. This is highlighted also from the negative correlation we found between mothers' QoL and externalizing symptoms.

Regarding the mediating role of externalizing symptoms, the results are in line with previous studies on other CHCs that suggest that a cohesive family can protect children against poor outcomes (e.g., Soliday, Kool, & Lande, 2001). This result was particularly interesting given that existing literature suggests that externalizing symptoms can be related to external eating (that is, eating in the absence of hunger cues); a behavior which has been related to higher energy intake and weight in children/adolescents (Braet & Strien, 1997; Webber, Hill, Saxton, Jaarsveld, & Wardle, 2009). Braet and Strien (1997) found a positive association between externalizing behaviors and external eating in children with obesity, which could contribute to explaining the mediational role that externalizing symptoms play in the relationship between FC and weight status. Some authors suggest that externally regulated eating behavior is a personality disposition (Schachter & Rodin, 1974) and so it is possible that externalizing symptoms are more common in children/adolescents with more externalizing traits, which could be related to weight status via more external eating. This could also be due to a possible increased reward sensitivity or the dysfunctional capacity of self-regulation usually present in children/adolescents with externalizing symptoms such as hyperactivity (Puder & Munsch, 2010). Furthermore, children/adolescents with higher levels of externalizing symptoms may use food to regulate their emotions which may lead to increasing weight. In fact, research has shown that youths with higher externalizing symptoms may have difficulty decreasing negative emotions (Macklem, 2008). Therefore, they may use food in order to influence their emotions, or in order to help express them (Murphy, Bui, & Grier, 2013), which may impact their weight status.

While this study generates some novel findings, it also has some limitations. Because of the bidirectional association between the study variables and the cross-sectional design of the study, causal inferences are not possible. A convenience sample was enrolled, and participants were only recruited in the central region of Portugal. The clinical sample comprised children/adolescents already attending nutrition appointments, limiting the generalizability of our results. Due to the lower number of children/adolescents with overweight/obesity in schools, it was not possible to create a group of children/adolescents with overweight/obesity not seeking treatment to compare on the analyses. Finally, two different data collection procedures were used regarding height and weight of children/adolescents. In children/adolescents with overweight/obesity they were measured by the nutritionist whereas for children/adolescents with healthy-weight these data were self-reported. This could prevent accurate answers regarding these measures in the healthy-weight group, specifically taking into account that research has found that mothers can be unreliable at reporting their child's weight (Aparício et al., 2013; Silva, Junior, Nascimento, Bertoli, & Gallo, Leone, 2016).

Strengths of this study include: a good sample size; the recruitment of a clinical sample of children/adolescents seeking weight loss treatment and a control group; the use of self-reported

measures to assess more personal outcomes (e.g., QoL, internalizing and externalizing symptoms) instead of relying on proxy reports, which gives the possibility to access to the subjective and personal point of view of the child/adolescent about their own problems and life; the assessment of children's and parents' adaptation; and, a focus on developmental differences (by considering children and adolescents separately). We also brought together various important parent and child variables in a sequential mediation model in order to better understand the relations between the variables, therefore contributing to the study of pathways which is likely to be important for intervention programs targeting young children and their parents.

Conclusions

These results have theoretical and practical relevance. They provide a better understanding of the psychosocial outcomes related to pediatric obesity, and suggest that it may not be enough to work only with a child to promote weight reduction. Rather than including just the child/adolescent in interventions, and instead of focusing only on youth's adjustment, interventions should take into consideration family environment and maternal adjustment as well. The results may help clinicians to identify vulnerable groups of children/adolescents and mothers that might benefit from greater attention (e.g., families with lower FC; mothers with low QoL; children with more externalizing symptoms). By being aware of some of these factors, clinicians can refer children/adolescents and/or their mothers to other health professionals, or work together with them towards a greater weight loss. This is particularly important considering that a mother's adjustment has important implications not only for her child's weight but also for her child's adjustment (Drotar, 1997). Thus, health professionals should assess maternal QoL and intervene whenever possible. Addressing mothers' QoL in family-centered interventions may be important to promote better psychological adjustment in children/adolescents with overweight/obesity with possible repercussions on their weight. Moreover, mothers are usually primarily responsible for their children's health concerns, and those results emphasize the importance of having a family-oriented approach to pediatric care (Schor & American Academy of Pediatrics, 2003). Furthermore, understanding the role of FC and the way it impacts children's/adolescents' weight status is extremely important for the development of preventing programs (Franko et al., 2008). Family-centered interventions (promoting, for example, positive communication patterns and support between family members) may help mothers to cope with the demands of their children/adolescents' CHC, and consequently promote their QoL. Raising the levels of FC may be particularly useful for reducing their externalizing symptoms and, consequently, their youth's weight. In fact, this study also highlights the importance of youth's externalizing symptoms and maternal adaptation for

children's weight status. Thus, parenting approaches and strategies should also be addressed when working with children/adolescents with overweight/obesity to optimally support positive changes. Interventions towards pediatric obesity should focus not only on weight reduction through alteration of diet patterns, but also through the formation of positive and cohesive relationships between family members.

Compliance with Ethical Standards:

Funding: This study was funded by the Portuguese Foundation for Science and Technology (grant number SFRH/BD/86063/2012 and number SFRH/BPD/70063/2010).

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Integrity of the data and accuracy of the data analysis: This study includes original data. All authors had access to the data. The authors take responsibility for the integrity of the data and the accuracy of the data analysis.
We declare no conflict of interest.

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Empirical study IV

Family cohesion and psychopathological symptoms in pediatric obesity: Is there an indirect effect?

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Accepted in Children's Health Care

Empirical study IV

Family cohesion and psychopathological symptoms in pediatric obesity: Is there an indirect effect?

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Abstract

The prevalence of pediatric obesity is increasing worldwide, which is particularly concerning given its negative impact on adjustment (e.g., quality of life, psychopathological symptoms) and physical health (e.g., high blood pressure, cardiovascular problems). It is important to understand the factors that may improve children's/adolescents' adjustment to overweight/obesity. This study aims to assess the indirect effect of family cohesion on children's/adolescents' internalizing/externalizing symptoms through body esteem and social life. The sample comprises 182 treatment-seeking children/adolescents with overweight/obesity and their mothers. Mothers completed a measure of family cohesion (Family Environment Scale), and children/adolescents completed measures of body esteem, social life (Impact of Weight on Quality of Life-Kids) and internalizing/externalizing symptoms (Strengths and Difficulties Questionnaire). Path analyses indicated a significant indirect effect between family cohesion and internalizing symptoms through children's/adolescents' body esteem and social life. Higher levels of family cohesion were linked to higher levels of body esteem, which were linked to higher levels of social life that, in turn, were associated with lower levels of internalizing symptoms. The results suggest the importance of body esteem and social life in explaining the link between family cohesion and children's/adolescents' internalizing symptoms. The results also suggest that belonging to a more cohesive family may improve the mental health of children/adolescents with overweight/obesity.

Keywords: Family Cohesion; Body Esteem; Social Life; Externalizing Symptoms; Internalizing Symptoms

As pediatric obesity reaches epidemic levels worldwide, concerns regarding its medical and psychosocial consequences are increasing (Pulgarón, 2013). Pediatric obesity is a risk factor for numerous medical conditions (Vallis, 2016), such as type 2 diabetes, high blood pressure or cardiovascular problems (Daniels, 2006). Additionally, pediatric obesity has important psychosocial consequences for youth, such as a decreased quality of life and higher levels of psychopathological symptoms (Jelalian & Hart, 2009; Zeller & Modi, 2008).

Portugal is one of the European countries with the highest prevalence of pediatric obesity (OECD/EU, 2016; Rito et al., 2012). More than 35% of children from 6 to 8 years old have a high body mass index, and more than 14% have obesity. Among youth aged 10 to 18 years, over 30% have overweight, and approximately 8% have obesity (Direção-Geral da Saúde, 2015). Due to the increasing prevalence and related consequences, several intervention programs for children/adolescents have been developed in Portugal with the aim to control weight gain and obesity (Filipe, Godinho, & Graça, 2016). Recently, the Portuguese Directorate-General of Health (Direção-Geral da Saúde, 2015) released a report suggesting that inadequate eating habits (foods with high levels of salt, sugar, processed meat and trans fats, along with an inadequate intake of fruit, vegetables, nuts and seeds) and sedentary lifestyles explain the high prevalence rates of pediatric overweight/obesity. The report also highlighted the importance of promoting the well-being of the population in order to avoid the risk factors that could contribute to the total years of healthy life lost within the population.

Although children/adolescents diagnosed as overweight/obese frequently experience psychosocial difficulties, the impact of this condition varies for different youth. Therefore, it is important to identify potential factors that could promote the psychosocial adjustment of youth at risk of psychosocial suffering (e.g., family functioning) and clarify why certain children/adolescents are more resilient to the negative psychosocial consequences of overweight/obesity than others are (Griffiths, Parsons, & Hill, 2010), particularly because the family environment is linked to the health and well-being of its members (Halliday, Palma, Mellor, Green, & Renzaho, 2013).

This study focuses on family cohesion (FC), a key dimension of the family environment (Holmbeck, Coakley, Hommeyer, Shapera, & Westhoven, 2002) that has been found to be a protective factor for children's/adolescents' psychological adjustment (Drotar, 1997). Specifically, FC has been found to have a beneficial effect on children's/adolescents' internalizing (Lucia & Breslau, 2006) and externalizing symptoms (Hamlett, Pellegrini, & Katz, 1992) and to lessen behavior problems (Matherne & Thomas, 2001). Moreover, it has been acknowledged that pediatric obesity arises in families with lower FC (De Sousa, 2009; Halliday et al., 2013).

Although studies have established the importance of FC to the psychological adjustment of children/adolescents with chronic health conditions (Drotar, 1997; Mendes, Crespo, & Austin,

2016; Moreira, Frontini, Bullinger, & Canavarro, 2014), additional studies are required to understand the mechanisms that may account for this association. This study focuses on the role of body esteem (i.e., the way children/adolescents feel about themselves and their body with respect to their weight) and social life (i.e., children's/adolescents' perception of how they are treated within their social environment) as potential sequential mediators for the relationship between FC and children's/adolescents' internalizing and externalizing symptoms. The family system (namely, the family environment, the dynamics between family members and the acceptance among family members) is often identified as important for developing a healthy body esteem (Smolak, Levine, & Schermer, 1999) and positive social relations (Lakic, 2012) among children/adolescents. In fact, research suggests that acceptance by family members is a protective factor against excessive body dissatisfaction (Barker & Galambos, 2003). This acceptance is particularly important because dissatisfaction with body shape and weight is correlated with poor mental health (Verplanken & Velsvik, 2008). Children/adolescents with overweight/obesity are also more preoccupied with their body image than are other youth, so their psychosocial adaptation may depend on their satisfaction with this image (Mendelson et al., 1996; Neumark-Sztainer, 2011; Shin & Shin, 2008).

Overweight/obesity can also impact social life. Children/adolescents who are overweight/obese are frequently stigmatized, teased and disliked by others (Latner & Stunkard, 2003; Stunkard, Faith, & Allison, 2003), particularly friends, educators and parents (Puhl & Latner, 2007). Their negative social life can adversely affect their mental health (National Obesity Observatory, 2011; Thompson, Coovert, Richards, Johnson, & Cattarin, 1995). For instance, a recent study found that a more negative social life was significantly associated with psychopathological problems, specifically, depression and binge eating (Zeller et al., 2015). The family environment may play an important protective role in the development of social difficulties, particularly because the first exchange of emotional signals occurs in this environment, thus informing subsequent relationships with friends and cooperation with others in everyday life (Lakic, 2012).

The Current Study

Because of the well-known impact of family factors on children's/adolescents' psychosocial outcomes, this study investigated whether FC was associated with internalizing or externalizing symptoms through body esteem and social life. Considering the aforementioned data, we hypothesized that higher levels of FC would be associated with lower levels of internalizing (e.g., anxiety, depression) and externalizing symptoms (e.g., impulsivity, hyperactivity) because of higher levels of body esteem and social life. Additionally, we hypothesized that higher levels of

body esteem would be linked to higher levels of social life. The way children/adolescents with overweight/obesity address their body and their (dis)satisfaction with it may be linked to the way they believe they will be treated by others or even the social interactions they might participate in. Such social experiences may also impact their mental health. To the best of our knowledge, these known relationships have not been tested together. Specifically, the model presented and tested was influenced by the known relationship between the variables and not by a theoretical model that represents this framework.

Given the specificities of the developmental tasks of childhood and adolescence, and following the recommendations of Wallander and Varni (1998) to adopt a developmental perspective to address individual adjustment to pediatric chronic conditions, the moderating role of age was investigated. Moreover, considering the important role of gender in determining body esteem (Mendelson et al., 1996), the moderating role of gender was also tested to explore whether the proposed indirect effect differs between males and females.

Materials and method

Participants

The sample included 182 dyads composed of a treatment-seeking child (7-12 years old) or adolescent (13-18 years old) with overweight/obesity and his/her mother. The following inclusion criteria were used to recruit children/adolescents: (1) age between 7-18 years; (2) the possession of the ability to comprehend and complete the questionnaires; and (3) the presence of overweight or obesity (BMI ≥ 85th percentile) based on the growth charts published by the National Centre for Health and Statistics (Kuczmarski, Ogden, Guo, et al., 2002) and adapted and used in the Portuguese Health System since 2006.

Procedure

Children/adolescents and their mothers were recruited in one medical center and in the pediatric departments of two Portuguese public and urban hospitals between February 2012 and April 2015. The ethics committees and boards of directors of these hospitals and the National Commission of Data Protection approved the study. Children/adolescents who satisfied the inclusion criteria were identified by the nutritionist or physician and referred to the researcher, who explained the aims of the study and the research procedures. The mothers were asked to sign an informed consent form, while the children were asked to provide verbal assent. Participants completed the questionnaires in a private office. A researcher was available to provide assistance when required.

Measures

Family Environment Scale (FES). To assess mothers' perception of FC, the Cohesion subscale of the Portuguese version of the FES was used (Matos & Fontaine, 1992; Moos & Moos, 1986). This subscale assesses the degree to which family members help and support one another and the individual perceptions of family commitment. The subscale comprises nine items (e.g., "Family members really help and support one another") scored on a 6-point Likert scale ranging from 1 (*completely disagree*) to 6 (*completely agree*). Higher scores indicate a higher perception of FC. This instrument was adapted for Portuguese by Matos and Fontaine (1992). Since the focus of this study was on the Cohesion subscale, only this subscale was used. The Cohesion subscale has been used alone in some studies (e.g., Moreira, Frontini, Bullinger, & Canavarro, 2013; Moreira et al., 2014; Mendes, Crespo, & Austin, 2016; Prioste, Narciso, Gonçalves, & Pereira, 2015). The original version of the FES (Moos & Moos, 2009) was psychometrically tested and showed appropriate psychometric characteristics: the subscales generally showed adequate internal consistency reliability, stability over time, and good content and face validity, and a wide body of research supports the construct, concurrent, and predictive validity of the subscale (Moos, 1990). The Cohesion subscale presented acceptable reliability (with a Cronbach's alpha value of .78) and, regarding test-retest, presented a .86 value.

In previous Portuguese studies, this instrument has demonstrated good psychometric characteristics, with the Cohesion subscale values of internal consistency ranging from .69 (Santos, & Fontaine, 1995) to .81 (Gonçalves, 1997). In this study, the Cronbach's alpha for FC was .79.

Impact of Weight on Quality of Life-Kids (IWQOL-Kids). To assess children's perceptions of their body esteem and social life, two subscales of the Portuguese version of the IWQOL-Kids were used (Kolotkin et al., 2006; Palmeira et al., 2008). The Body Esteem subscale comprises nine items (e.g., "Because of my weight I don't like myself") and assesses how respondents feel about themselves and their body with respect to their weight, i.e., the influence of weight on body self-perceptions. The Social Life subscale comprises six items (e.g., "Because of my weight I have trouble making friends") and assesses individuals' perception of how they are treated within their social environment with regard to their weight. Therefore, it assesses individuals' perception of their social relations. Standardized scores range from 0 to 100, with higher scores representing better body esteem and social life. For the Portuguese version, the factorial validity and reliability are acceptable. In this study, the Cronbach's alphas were .89 (body esteem) and .83 (social life).

Strengths and Difficulties Questionnaire (SDQ). The externalizing and internalizing symptoms of children/adolescents were assessed with the self-report version of the Difficulties

subscale of the Portuguese version of the SDQ (Fleitlich, Loureiro, Fonseca, & Gaspar, 2005; Goodman, 2001). Following recent recommendations (Goodman, Lamping, & Ploubidis, 2010), the 20 items of this subscale were clustered into externalizing (e.g., "I fight a lot. I can make other people do what I want") and internalizing (e.g., "I am nervous in new situations. I easily lose confidence") symptoms. Children/adolescents answered the items on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*certainly true*). Higher values indicated higher levels of externalizing and internalizing symptoms. This instrument was chosen over other commonly used measures for several reasons: 1) it has a self-report version (used in this study); 2) it has better coverage of dimensions such as inattention and peer relationships; 3) it has a shorter format; 4) it provides a balanced coverage of youths' behaviors, emotions, and relationships; 5) it is suitable for research as well as clinical practice; and 6) it has adequate validity and reliability (Goodman, 1997). Moreover, the Portuguese version of the SDQ is widely used in research with varying sample ages and conditions. In this study, the Cronbach's alphas were .69 (externalizing symptoms) and .67 (internalizing symptoms).

Sociodemographic and clinical data. The sociodemographic and clinical data were reported by the mothers and included children's/adolescents' age, gender, health problems, weight and height and mothers' age, marital status and education level.

Data Analysis

The Statistical Package for the Social Sciences (IBM SPSS, version 22.0; IBM SPSS, Armonk, NY) was used to perform the data analysis. Descriptive statistics were computed for all sociodemographic and study variables. Pearson's bivariate correlation coefficients were then computed to determine the correlations between variables. Correlation coefficients ≥ .10 were classified as "small", those ≥ .30 were classified as "medium", and those ≥ .50 were classified as "large" (Cohen, 1988).

Structural equation modeling using maximum likelihood estimation was conducted in AMOS© 20 to test the proposed sequential multiple mediation model. The significance of the indirect effects was estimated using bootstrap resampling procedures with 2000 samples and a 95% bias-corrected confidence interval (BC 95% CI). An indirect effect was significant if zero did not appear within the lower and upper CIs. The overall fit of the path model was evaluated with the main goodness-of-fit indices, including the chi-square (χ^2), the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA) on a 90% confidence interval, and the standardized root-mean-square residual (SRMR). The criteria for a good model fit were a non-significant χ^2, CFI ≥ .95, RMSEA ≤ .06, and SRMR ≤ .08 (Browne & Cudeck, 1993; Hu & Bentler, 1999). Multi-group analyses were performed to test the structural invariance of the path model

across gender and age groups. The baseline model for each group was initially examined separately. A multi-group analysis was used to compare the unconstrained model (configural invariance) with two nested constrained models (metric invariance and scalar invariance; Byrne, 2010). The model was considered invariant when the chi-square difference ($\Delta\chi^2$) was non-significant and the difference between CFI was less than .10 (Cheung & Rensvold, 2002).

Results

Participants' Characteristics

Table 1 presents the sociodemographic and clinical characteristics of the children/adolescents and their mothers.

Table 1 | Sociodemographic and Clinical Characteristics of Children/Adolescents and Their Mothers

	Mean (*SD*); observed range *N* = 182
Children/adolescents' age (years)	13.01 (2.60); 7-18
Mothers' age (years)	41.39 (4.88); 30-59
Children/adolescents' zBMI	1.85 (0.44); 0.56-2.76
	***n* (%)**
Child/adolescents' age category	
7-12 years	79 (43.4)
13-18 years	103 (56.6)
Child/adolescents' gender	
Male	85 (46.7)
Female	97 (53.3)
Children/adolescents' comorbid health problems	
Heart problems	6 (3.3)
Breathing problems	17 (9.3)
Metabolic problems	2 (1.1)
Neurodevelopmental problems	4 (2.2)
More than one problem	5 (2.7)
Other	7 (3.8)
None	141 (77.5)
Mothers' marital status	
Not living with a partner	33 (18.1)
Living with a partner	147 (80.8)
Missing data	2 (1.1)
Mothers' education level	
≤ High school	150 (82.4)
≥ College or graduate degree	29 (15.9)
Missing data	3 (1.6)

Correlations and Descriptive Statistics among Study Variables

As Table 2 shows, small to medium correlations were found among some study variables. Specifically, FC was significantly and positively correlated with body esteem and social life. Body

esteem was significantly and positively correlated with social life and significantly and negatively correlated with externalizing and internalizing symptoms. Social life was also negatively correlated with externalizing and internalizing symptoms. Additionally, body esteem was significantly and negatively correlated with children's/adolescents' age (r = -.30, p < .01) and gender (r = -.16, p < .05). Externalizing symptoms were also significantly and negatively correlated with children's/adolescents' gender (r = -.17, p < .05).

Table 2 | Means, Standard Deviations, and Correlations Between Age and Gender

							Correlations				
Variables	**Children** ***n* = 79** *M (SD)*		**Adolescents** ***n* = 103** *M (SD)*		**Total** ***n* = 182** *M (SD)*		1	2	3	4	5
	Boys	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**					
1. Family Cohesion	4.92 (0.74)	4.73 (0.72)	4.67 (0.70)	4.66 (0.70)	4.77 (0.72)	4.69 (0.71)	-				
2. Body Esteem	83.49 (15.05)	81.30 (15.70)	74.79 (19.28)	63.99 (24.33)	78.37 (18.08)	71.84 (22.49)	.18*	-			
3. Social Life	85.24 (19.40)	90.20 (12.74)	87.67 (16.28)	85.38 (17.29)	86.67 (17.56)	87.56 (15.50)	.15*	.52**	-		
4. Externalizing symptoms	7.31 (2.70)	5.27 (3.80)	6.58 (3.23)	6.17 (2.83)	6.88 (3.03)	5.76 (3.32)	-.13	-.18*	-.21**	-	
5. Internalizing symptoms	5.89 (3.13)	5.61 (2.89)	5.28 (3.27)	6.57 (3.33)	5.53 (3.21)	6.13 (3.15)	-.04	-.40**	-.51**	.36*	-

Note. *p < .05; **p < .01.

The indirect effect of FC on children's/adolescents' internalizing/ externalizing symptoms through body esteem and social life.

Initially, we tested a model that included all of the paths between variables. This model exhibited an inadequate fit [$\chi^2(1)$ = 17.28, p < .001; CFI = .89; SRMR = .06; RMSEA = .30, p < .001; 90% CI = .19/.43]. Therefore, following the recommendations of Kline (2011), we trimmed the model by eliminating the non-significant paths, which resulted in the elimination of the externalizing symptoms variable. The final model had a very good fit with the data [$\chi^2(2)$ = 1.61, p = .447; CFI = 1.00; SRMR = .02; RMSEA = .00, p = .589; 90% CI = .00/.14) and explained 29% of the variance in internalizing symptoms. FC had a significant indirect effect on social life through

body esteem (β = .09, BC 95% CI = .02/.19) and a significant indirect effect on internalizing symptoms through body esteem and social life (β = -.07, BC 95% CI = -.15/-.01). Body esteem also had a significant indirect effect on internalizing symptoms through social life (β = -.21, BC 95% CI = -.33/-.12).

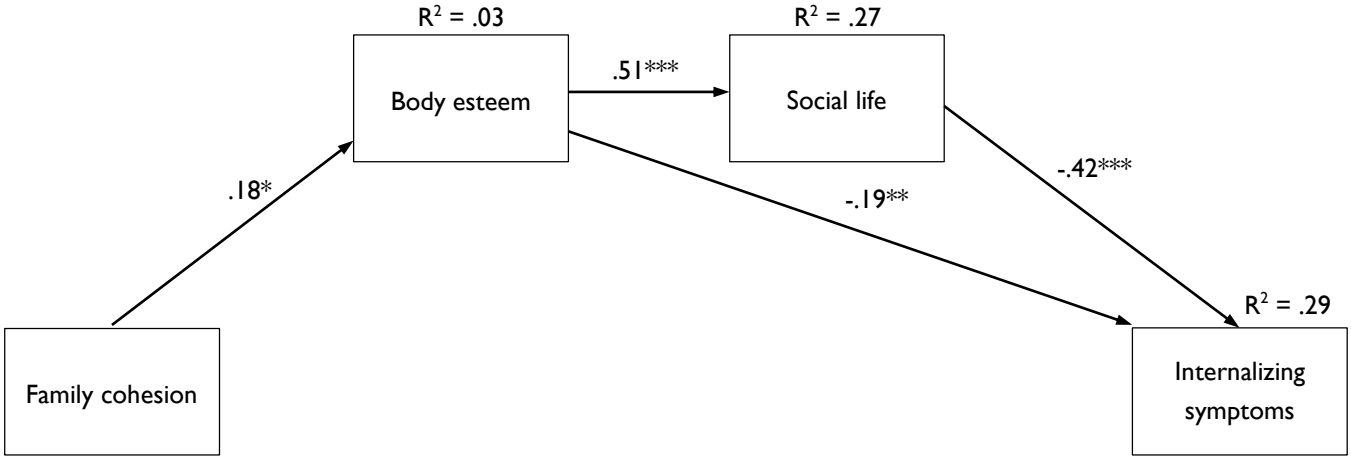

Figure 1 | Path model testing the indirect effects of FC on children's/adolescents' internalizing and externalizing symptoms

Notes. For simplicity, the measurement error terms are not shown. The numbers indicate standardized regression coefficients. *p < .05; **p < .01; ***p < .001.

Multi-Group Analyses

Regarding gender comparison, the baseline model demonstrated a good fit with the data both for boys [$\chi^2(2)$ = 1.62, p = .445; CFI = 1.00; SRMR = .03; RMSEA = .00, p = .516, 90% CI = .00/.20] and girls [$\chi^2(2)$ = 0.93, p = .628; CFI = 1.00; SRMR = .03; RMSEA = .00, p = .692, 90% CI = .00/.16]. Subsequently, the multi-group analyses indicated that the model was invariant across genders based on the difference between the unconstrained model and the two constrained models (Table 3).

With regard to age groups, the baseline model for each group demonstrated a good fit with the data [children: $\chi^2(2)$ = 0.53, p = .766; CFI = 1.00; SRMR = .02; RMSEA = .00, p = .803, 90% CI = .00/.15; adolescents: $\chi^2(2)$ = 1.09, p = .581; CFI = 1.00; SRMR = .02; RMSEA = .00, p = .654, 90% CI = .00/.16]. The chi-square differences among the three tested models were not significant when additional constraints were added. The difference between the models for metric invariance and scalar invariance suggests invariance between age groups (Table 3).

Table 3 | Multi-group Analyses: Measurement Invariance

Gender								
Description	χ^2	df	*p*	Δ χ^2 (*p*)	CFI	Δ CFI	TLI	RMSEA
Configural invariance	2.548	4	.636		1.000		1.000	.000
Metric invariance	9.741	8	.284	6.862 (.143)	.986	-.014	.978	.035
Scalar invariance	9.795	9	.367	0.054 (.862)	.993	.007	.991	.022
Age								
Description	χ^2	df	*p*	Δ χ^2 (*p*)	CFI	Δ CFI	TLI	RMSEA
Configural invariance	1.617	4	.806		1.000		1.000	.000
Metric invariance	8.240	8	.410	6.623 (.157)	.998	-.002	.997	.013
Scalar invariance	8.435	9	.491	0.195 (.659)	1.000	.002	1.000	.000

Note. CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation.

Discussion

This study provides innovative data that suggest that FC may contribute to lower levels of internalizing symptoms among children/adolescents with overweight/obesity through the promotion of higher body esteem and a better perception of social life. To the best of our knowledge, these known relationships have not previously been tested together.

This study suggests that belonging to a cohesive family might be an important factor in reducing internalizing symptoms in children/adolescents with overweight/obesity. This result is consistent with previous findings that have suggested that FC is an important protective factor against psychopathology (Drotar, 1997). Moreover, higher levels of FC have been previously correlated with lower levels of anxiety and depression in children/adolescents (Soliday, Kool, & Lande, 2001). This correlation is particularly important to consider given findings that a more resilient family may protect a child against disruptions caused by the presence of a chronic health condition (Hamlett et al., 1992). This study proposes that the relationship between FC and internalizing symptoms is not direct but rather occurs indirectly through body esteem and social life, suggesting that FC could be positively associated with the body image that

children/adolescents have in terms of their weight. A more cohesive family may facilitate more positive interactions among its members and greater frankness to openly express insecurities, fears, or even body-related shame. Cohesive families may also spend more quality time together, which can encourage their members to more easily express their feelings (Overstreet et al., 1995), including body image concerns. If children/adolescents are encouraged to openly express their feelings, then they will likely have an enhanced body esteem.

FC was related to the perception that children/adolescents had regarding their social life indirectly through body esteem, suggesting that higher levels of FC may be linked with higher levels of social life because of greater body esteem. If children/adolescents establish a more positive relationship with their bodies, then they will likely feel more comfortable in social interactions and interact with others more. Higher levels of body esteem (i.e., feeling more confident in their body with respect to their weight) may be associated with a more positive perception of how they will be treated by others (i.e., social life). A more favorable perception of social life may consequently decrease their internalizing symptoms.

The relationship between social life and internalizing symptoms might occur because of the tendency to view oneself unfavorably compared with others; such comparisons are typically associated with psychological difficulties (Beck, Rush, Shaw, & Emery, 1979; Gilbert & Trower, 1990). Youths' perception of how they are treated by others and their dissatisfaction with social relationships may produce more internalizing symptoms such as sadness, shame, inadequacy or even loneliness.

The findings also suggest that the indirect effect between FC and internalizing symptoms occurs regardless of age and gender. This effect may result from the nature of overweight/obesity. Indeed, body image and social concerns are highly important for children/adolescents seeking treatment, thus increasing the probability that these concerns will arise, regardless of age and gender.

FC was correlated neither directly nor indirectly with externalizing symptoms. This result is consistent with the results reported by Lucia and Breslau (2006), who found a link between FC and internalizing and attentional symptoms but did not find the same link when using externalizing symptoms as an outcome. Additional studies are required to clarify whether this association exists or other mechanisms might explain it. A possible reason for the absence of the indirect effect may be the nature of the symptoms. In fact, externalizing symptoms, as assessed by the SDQ (i.e., behavior problems and hyperactivity/inattention), are likely to be unrelated to the negative perception that youth may have of their body image or even their social relations. The relationship that children/adolescents have with their body and others may be more directly linked with internalizing symptoms (e.g., depression, anxiety, or shame in social situations) rather than externalizing symptoms.

Pediatric obesity studies are increasing in Portugal, but investigations regarding the relationship between family and children's/adolescents' psychosocial adaptation are still scarce. Because it is important to take into consideration countries' cultural specificities, it is important to understand the role of these variables in the context of Portugal. Particularly given the high prevalence of overweight/obesity among Portuguese children/adolescents (OECD/EU, 2016), understanding the relationships between family variables and the adaptation of these youths is of utmost importance.

The strengths of this study are the following: 1) it includes not only children/adolescents with overweight/obesity but also their mothers; 2) it uses self-report measures to assess children's/adolescents' subjective perspective, which should be obtained whenever possible (Matza, Swensen, Flood, Secnik, & Leidy, 2004); 3) it focuses on gender and developmental differences by considering children and adolescents separately; and 4) despite its cross-sectional nature, the study combines important family and child variables in a sequential model, which helps improve the understanding of the relationships between the variables.

The following limitations of the study should be noted: 1) because this study is cross-sectional, it does not enable causal relationships between variables to be established; future research could expand on the relationships between those variables using longitudinal data; 2) this study uses a convenience sample, with participants recruited only in the central region of Portugal; and 3) the sample comprised only children/adolescents attending nutrition appointments, so the findings cannot be generalized to the entire population of children/adolescents with overweight/obesity.

Implications for Practice

This study has theoretical and practical relevance. It suggests the importance of working with the family to improve the psychosocial adjustment of youth. This improvement is of utmost importance, given previous findings that depressive and other internalizing symptoms in childhood are significantly associated with decreased attendance at weight management treatment (Jensen, Aylward, & Steele, 2012).

Although the importance of the family for pediatric obesity care is recognized in existing literature (Altman & Wilfley, 2015), the focus of interventions remains on the child/adolescent with obesity (Karp & Gesell, 2015; Skelton, Buehler, Irby, & Grzywacz, 2012). This study reinforces the importance of including family members (particularly mothers) in such interventions. The importance of family-focused treatment for weight loss is well documented in the literature (Altman & Wilfley, 2015; World Health Organization, 2016). Specifically, parental feeding practices and styles have been identified as important for weight-loss treatment

(Birch & Davison, 2001; Jelalian & Hart, 2009). Moreover, family involvement is considered important to facilitate physical activity (Altman & Wilfley, 2015; Frelut & Flodmark, 2002; Guerra, Da Silveira, & Salvador, 2016). Nonetheless, the inclusion of family and a focus on the relationships between family members (e.g., working with the family to establish more positive relationships between family members) may be important not only for weight loss (Ganley, 1986; Nowicka & Flodmark, 2011; Nowicka et al., 2009) but also, as suggested by the findings of this study, for better psychosocial adaptation (e.g., psychosocial adjustment or self-esteem; Nowicka, Pietrobelli, & Flodmark, 2007). Future studies should invest in assessing the importance of family variables in the psychosocial adaptation of children/adolescents with overweight/obesity.

Moreover, this study highlights the importance of body esteem and social life for understanding the relationship between FC and the psychosocial adjustment of children/adolescents, thus underscoring the necessity for clinicians to collaborate with psychologists. It is of utmost importance that psychologists help enhance the body esteem of children/adolescents with overweight/obesity. Children/adolescents suffering from this chronic condition should be aware of the presence of their overweight/obesity in order to better adhere to treatment. However, psychologists and other healthcare professionals should strike a balance between facilitating better body awareness and instilling confidence among these youths, given that this study found an association between body esteem and social life and, subsequently, internalizing symptoms. By helping children/adolescents have more positive and realistic body perceptions, psychologists may help enhance their perception of how they will be treated by others and thus increase their confidence in their social life. The results of this study also suggest that in clinical practice, health professionals should be aware of the presence of more internalizing symptoms and body esteem insecurities. Children/adolescents with overweight/obesity may suffer from psychosocial difficulties, and health professionals should take this into account whenever they prescribe treatments. Along with treatment for weight loss, these children/adolescents may also benefit from psychological interventions. Thus, multidisciplinary teams are essential when working with these youths, particularly when considering the importance of improving psychosocial adjustment. Moreover, a routine assessment of internalizing symptoms and body esteem may help identify children/adolescents with overweight/obesity who may benefit from greater clinical attention. This may be an important step, particularly because enhancing body esteem might play an important role in individual psychosocial adjustment (Gravina, Palla, Piccione, & Nebbiai, 2015), and psychological adjustment is important in the adherence to prescribed treatment (Guilfoyle, Zeller, & Modi, 2010; La Greca, & Mackey, 2009). Another important variable to take into account among children/adolescents with overweight/obesity is their social life. Studies have found that these children/adolescents may suffer from victimization and social exclusion (Griffiths et al., 2010),

which, as suggested by the results of the current study, may play an important role in children's/adolescents' internalizing symptoms and therefore should be a focus of interventions.

In sum, our results suggest the importance that body esteem and social life may have in the relationship between FC and internalizing symptoms. More studies are needed in this area, specifically to understand how psychologists may work with those families in order to improve the psychosocial adjustment of children/adolescents with overweight/obesity.

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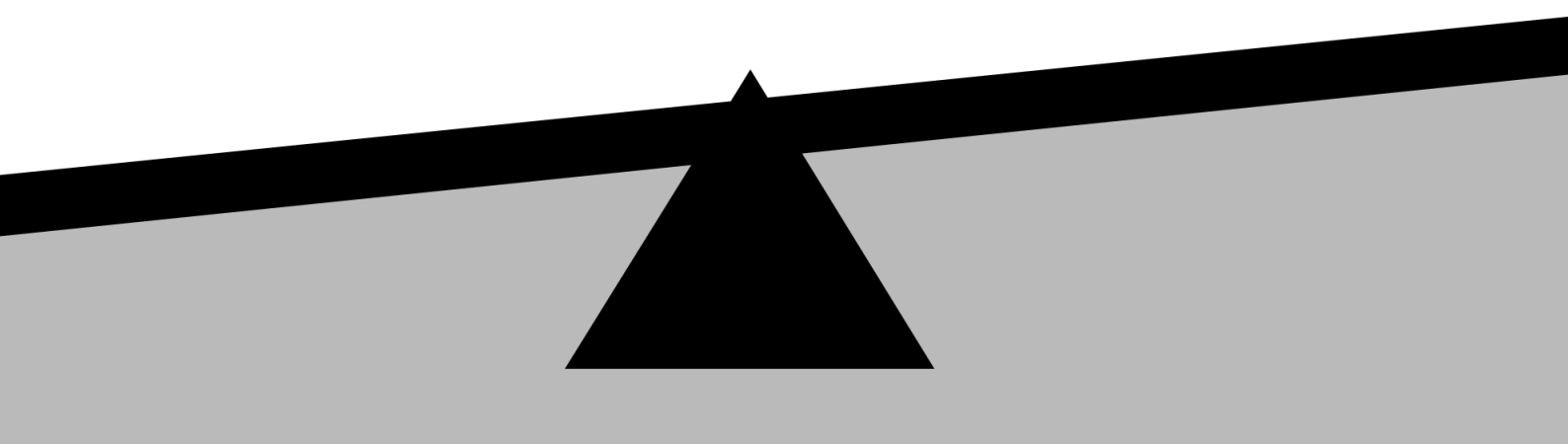
Chapter IV | Discussion



In this final Chapter, a brief summary, along with a discussion, of the main results of this research project is presented. It is not intended to be exhaustive since the results found in the four studies were already presented in the previous Chapter (see Chapter III - Empirical Studies). Instead, this discussion offers an integrative overview of the main results. Subsequently, strengths and limitations of this research project are presented and critically noted. Lastly, a discussion regarding future research, clinical practice and policymaking, in the light of the contribution of the findings of this research project, will be held.

I. Discussion of the main findings

A general aim of this research project was to analyse familial, parental and individual areas of functioning in children/adolescents with overweight/obesity and their parents, and to compare those with the same areas of functioning in children/adolescents with healthy weight and their parents.

Firstly, one study (Article III; Frontini, Haycraft, Canavarro, & Moreira, in press) focused on family functioning and the results evidenced that mothers of children/adolescents with overweight/obesity reported lower levels of FC when compared to mothers of children/adolescents with healthy weight.

Secondly, another study (Article II; Frontini et al., 2016) focused on the parental areas of functioning (e.g., parenting stress, parenting styles) and the results evidenced that:

- Mothers of children and adolescents with obesity presented higher levels of parenting stress than mothers of children and adolescents with healthy weight;
- Mothers of children and adolescents with obesity presented higher levels of use of the authoritarian parenting style and lower levels of use of the authoritative parenting style than mothers of children and adolescents with healthy weight;
- Mothers of adolescents with obesity also reported higher levels of use of the permissive parenting styles than mothers of adolescents with healthy weight.

Finally, all studies focused on individual areas of functioning. The most important findings were as follows:

- Children and adolescents with obesity reported lower levels of QoL compared to children and adolescents with healthy weight;
- Adolescents reported lower levels of QoL compared to children, independently of their weight;

- Children and adolescents with obesity reported higher levels of psychopathological symptoms (internalizing and externalizing symptoms) compared to children and adolescents with healthy weight;
- Parents of children and adolescents with obesity reported lower levels of QoL compared to parents of children and adolescents with healthy weight;
- Parents of children and adolescents with obesity reported higher levels of depressive symptoms compared to parents of children and adolescents with healthy weight;
- Parents of children and adolescents with obesity reported higher levels of anxiety symptoms compared to parents of children and adolescents with overweight and healthy weight.

In conclusion, these findings suggest that children/adolescents with obesity, as well as their parents, report worse psychosocial adaptation outcomes when compared to children/adolescents with healthy weight and their respective parents.

Another general aim of the current research project was to identify potential mechanisms that may account for the associations between family and parental characteristics and children's/adolescents' outcomes (e.g., weight; internalizing and externalizing symptoms; QoL). A series of findings may be resumed as followed:

- Higher levels of parents' anxiety symptoms were associated with lower QoL in adolescents with obesity over 13 years old, through higher levels of adolescents' psychological problems;
- Higher levels of parenting stress were shown to be associated with higher levels of the permissive parenting style, which, in turn, was associated with lower levels of children's/adolescents' QoL;
- Mothers' QoL and children's/adolescents' externalizing symptoms sequentially mediated the relationship between FC and weight status. Higher levels of FC were associated with higher levels of mothers' QoL which was linked with lower levels of children's/adolescents' externalizing symptoms and, in turn, with a decreased likelihood of the children/adolescents being reported as overweight or obese.
- The relationship between FC and internalizing symptoms was not direct but rather occurred indirectly through body esteem and social life (in children/adolescents with overweight/obesity). Higher levels of FC were associated with higher levels of children's/adolescents' body esteem and higher levels of social life and, in turn, with lower levels of children's/adolescents' internalizing symptoms.

These results outline the importance of parental adaptation for the adaptation of their youths.

1.1. Parenting a youth with overweight/obesity: Familial and parenting outcomes

In our research project (specifically in Article III; Frontini et al., in press), and consistent with previous studies (Mendelson, White, & Schliecker, 1995; Zeller et al., 2007), mothers of children/adolescents with overweight/obesity presented lower levels of FC when compared to mothers of children/adolescents of healthy weight. No significant effects were found for age group, or for the interaction between weight condition and age group.

On one hand, it is possible that the presence of a CHC, such as overweight/obesity on a family member may cause higher parental stress, probably making them portray their families as less cohesive (Drotar, 1997). On the other hand, when a child/adolescent has overweight/obesity, he/she may face prejudice against fatness, which may enter the home environment, affecting the relationships among family members (Mendelson et al., 1995). Another possible explanation for the presence of lower levels of FC on those families may be that those lower levels might be linked to unhealthier behaviours. In fact, cohesive families may promote healthier behaviours in a direct way, with children/adolescents inclined to follow their parents' suggestions (Franko et al., 2008). Literature reinforces that the presence of higher levels of FC on healthy-weight families may reflect the fact that those family members share more quality time together, with activities such as shared mealtimes (Franko et al., 2008), which has been related to healthier eating (Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003; White, Haycraft, & Meyer, 2014).

Thus, we believe that the support between family members, the time spent together, and the emotional connection between each other (all characteristics of cohesive families) may promote ideal conditions for a more positive family life. In the context of such CHC as overweight/obesity, the members of a more cohesive family may be more prone to share responsibilities (e.g., preparation of healthy meals), which ultimately may contribute to a better QoL and fewer psychopathological symptoms. For instance, literature found that more cohesive families may spend more time together in the morning at meal time (Franko et al., 2008), which may enhance the consumption of breakfast, which is considered one of the most important meals of the day (Szajewska & Ruszczyński, 2010).

The study of this familial variable is of utmost importance, given that studies found that FC has an important protective factor on children's/adolescents' psychological adjustment (Drotar, 1997), impacting also children's/adolescents' healthful eating habits (Franko, Thompson,

Bauserman, Affenito, & Striegel-Moore, 2008; Welsh, French, & Wall, 2011), which, subsequently, could have an important role on children's/adolescents' weight status.

In Article II (Frontini et al., 2016), mothers of children/adolescents with obesity presented higher levels of parenting stress compared to mothers of children/adolescents of healthy weight. This result is consistent with previous studies that found that caregivers of children/adolescents with obesity present higher parenting stress (Moens, Braet, Bosmans, & Rosseel, 2009; Zeller, Saelens, Roehrig, Kirk, & Daniels, 2004). This is typically found in parents caring for children/adolescents with CHCs (Chiou & Hsieh, 2008; Quittner, Espelage, Opipari, Carter, & Eid, 1998; Streisand, Kazak, & Kenneth, 2003). Thus, this result may be due to the challenges of having a child/adolescent with obesity. In fact, those children/adolescents may face physical and psychological consequences, possibly experienced as a source of parenting stress, along with the prescription treatment that may entail additional stress in family lives (Barlow & Dietz, 1998), which may result in additional tasks and worries added to regular parenting responsibilities (Guilfoyle et al., 2010), such as clinic appointments or the struggle with monitoring the daily adherence to prescribed treatment regimens (e.g., diet and physical activity). Adding a specific diet and introducing physical activity in families that, usually, may not have healthy habits may be difficult for the whole family to maintain. Moreover, many parents of children/adolescents with obesity struggle with excessive weight themselves, which may be another source of parenting stress (Guilfoyle et al., 2010; Modi, Guilfoyle, & Zeller, 2009). Another possible explanation for higher levels of parenting stress in parents of children/adolescents with obesity is related to the fact that those children/adolescents usually face more psychosocial difficulties, namely higher levels of internalizing and externalizing symptoms or lower levels of QoL, as we also found in our studies (e.g., Frontini, Gouveia, Moreira, & Canavarro, 2016; Frontini, Moreira, & Canavarro, 2016), and/or physical difficulties (e.g., gastrointestinal, musculoskeletal and orthopaedic complications; cardiovascular problems; Daniels, 2006; Lobstein & Jackson-Leach, 2006; OECD/EU, 2016). For example, when a child/adolescent face, along with the presence of overweight/obesity, other challenges (e.g., presence of hyperactivity, behaviour problems, or even a cardiovascular comorbidity), this may add more parenting stress. Thus, caring for a child/adolescent with obesity with psychosocial complications may be particularly challenging for parents, adding more tasks and worries to their parental normative responsibilities and, thus, creating more parenting stress.

Another parenting variable of interest in this research project was parenting styles (Article II; Frontini et al., 2016). Mothers of children/adolescents with obesity presented higher levels of use of the authoritarian and permissive parenting styles, which has been consistently found in past literature (Matos et al., 2013; Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006). These two parenting styles are associated with higher risk of children/adolescents becoming

overweight/obese (Rhee et al., 2006). This might be due to the relation between parenting styles and eating and physical activities. For example, the use of an authoritarian parenting style by parents may help transform prohibited foods (particularly foods high in fat and sugar) into more desirable ones and, consequently, more consumed by their children/adolescents (Birch, Fisher, & Davison, 2003; Fisher & Birch, 2000). On one hand, if parents decide to totally restrict certain types of food (e.g., cake, chocolates, chips, etc.), it is possible that those children/adolescents will seek them outside the home. On the other hand, a parent using a more authoritarian parenting style may impose a structure at the table (such as forcing the child to clean the plate) which, ultimately, may result in the child learning to eat based on external cues rather than internal cues (Rhee et al., 2006). Moreover, it is acknowledged that this parenting style has been associated with lower intake of healthy foods, such as fruits and vegetables (Cullen et al., 2000), which may also be related to weight gain. Literature also acknowledges that the authoritarian parenting style may alter the way the child learns how to choose the most appropriate foods, possibly because those parents use high parental demand and control and low responsiveness, which does not allow the child to develop his/her individuality (Latzer & Stein, 2013). Another possible concern regarding the use of the authoritarian parenting style by mothers of children/adolescents with obesity is related to physical activity. As explained in the introduction, physical activity is related to weight loss. Parents using a more authoritarian parenting style may demand their children exercise (regardless of their children's interests and desires), which may have a negative effect, making children/adolescents reluctant to exercise and, consequently, may cause difficulty with weight loss and energy expenditure (Rhee et al., 2006).

Regarding the permissive parenting style, literature suggests that parents who use it more are more likely to allow their children to consume foods they most like and enjoy, regardless of the fact that they are unhealthy. In fact, by setting fewer limits towards their youths' habits and the quality and quantity of the food eaten, parents are unable to guide their children towards self-regulated eating (Lengua, Honorado, & Bush, 2007). This may be an explanation for the result found. In a home environment without limitations, parents do not provide the guidance needed to develop effective self-regulation towards healthy eating behaviours (Rhee et al., 2006). Literature also shows that parents using more the permissive parenting style may have children/adolescents with lower levels of self-control, which may be important in their relationship with food (Lamborn, Mounts, Steinberg, & Dornbusch, 1991).

Mothers of children/adolescents with healthy weight reported a greater use of the authoritative parenting style, which is an important finding (also in line with previous research; Jelalian & Hart, 2009; Pinquart, 2014). This result is consistent with literature showing that the combination between sensitivity and expectations for self-control are of utmost importance to help the child/adolescent have a healthy weight (Rhee et al., 2006).

1.2. Having overweight/obesity: Individual adaptation outcomes

Comparison analyses suggested that children/adolescents with overweight/obesity present worst adaptation outcomes, including poor QoL and higher levels of internalizing and externalizing symptoms, when compared to children/adolescents of healthy weight. These results may be due to challenges and difficulties related to the presence of this condition. For example, those children/adolescents may be more dissatisfied with their body image (Jelalian & Hart, 2009). In fact, it is possible that not feeling well regarding their bodies, their weight, or the way they look may lead to lower levels of QoL and higher levels of psychopathological symptoms (Larkin & Rice, 2005). Another factor that may lead to worse adaptation outcomes may be related to social exclusion or even victimization by others (Griffiths et al., 2010; Hayden-Wade et al., 2005; Jelalian & Hart, 2009; Latner, Wilson, Jackson, & Stunkard, 2009; Puhl & Latner, 2007). Literature reports that children/adolescents with overweight/obesity present higher rates of stigmatization, intolerance, and prejudice, not only from their healthy-weight peers but also from educators and even parents (Latner & Stunkard, 2003; Puhl & Latner, 2007). These children/adolescents usually report social exclusion and are rejected by their healthier peers (Jelalian & Hart, 2009; Zeller, Reiter-Purtill, & Ramey, 2008), which may have an important role in the way they assess the quality of their lives. Additionally, a possible explanation for those results is related to the physical consequences directly related to the presence of overweight/obesity. In fact, as explained before, overweight/obesity is usually linked to fatigue, muscle problems, or the presence of other comorbid CHCs, such as diabetes or cardiovascular diseases (Kistler et al., 2010; Lobstein, Baur, & Uauy, 2004; OECD/EU, 2016). The presence of adjustment difficulties may also be due to the presence of family difficulties, such as higher levels of family conflict or lower levels of FC, which is also one of the main findings of our studies (Article III and IV). Taking into consideration the aforementioned data, it is not surprising that children/adolescents with overweight/obesity may present, as highlighted in literature, not only lower levels of QoL (Jelalian & Hart, 2009; Jensen & Steele, 2012; Ottova, Erhart, Rajmil, Dettenborn-Betz, & Ravens-Sieberer, 2012; Riazi, Shakoor, Dundas, Eiser, & McKenzie, 2010; Swallen, Reither, Haas, & Meier, 2005; Wille et al., 2010; Zeller, Roehrig, Modi, Daniels, & Inge, 2006) but also difficulties with psychological function (Puder & Munsch, 2010; Zeller & Modi, 2008; Zeller et al., 2004).

1.3. Having a child with overweight/obesity: The individual adaptation of parents

Caring for a child with a CHC may be challenging. With this research project, we found that parents of children/adolescents with obesity reported lower levels of QoL compared to

parents of children/adolescents of healthy-weight, which is in line with previous studies (Guilfoyle et al., 2010; Modi et al., 2009; Moens et al., 2009). We also found that parents of children/adolescents with obesity reported higher levels of depressive symptoms compared to children/adolescents of healthy weight and higher levels of anxiety symptoms compared to parents of children/adolescents with overweight and healthy weight. Parenting children/adolescents with overweight/obesity could, at least, partly explain those results. In fact, treatment seeking youths with overweight/obesity may be required to change their family lifestyles. Therefore, and since parents are usually the main responsible for their children's health (Holmbeck, Zebracki, & McGoron, 2009), diet patterns, and feeding practice habits (Haycraft, Farrow, & Blissett, 2013), parents of children/adolescents with overweight/obesity may be struggling with worries regarding their children's health status or changing eating/activity habits or food provision, which may impact the way they perceive their QoL. Visits to the consultation appointments that those parents may face, along with changes in dietary/physical habits that those families may implement and the imposed prescribed diets, may also play an important role in the presence of higher levels of anxiety (Zeller et al., 2007). During sample recruitment, mothers usually mentioned that one of their sources of major distress was the change in dietary habits imposed by the nutritionists/physicians and the fact that they were cooking different meals for different family members. Cooking different meals or planning outdoor activities are some examples of differences in daily lives that may affect parents of children/adolescents with overweight/obesity seeking treatment.

Some studies also found that parents of children/adolescents with overweight/obesity reported higher BMI than parents of children/adolescents of healthy weight (Zeller & Daniels, 2004), which may also help explain those lower levels of QoL. The majority of parents of children/adolescents with overweight/obesity struggled themselves with overweight/obesity, as previously mentioned. For instance, in one of our studies (Article I; Frontini, Gouveia, Moreira, & Canavarro, 2016), 26.2% of parents of children/adolescents with obesity had overweight, and 41.1% had obesity. In another study (Article II; Frontini, Moreira, & Canavarro, 2016), 73.3% of mothers of children/adolescents with obesity were overweight or obese, with a mean BMI of 29.29 (SD = 5.92). The presence of overweight/obesity along with the physical and psychological consequences of this health condition (e.g., lower self-esteem, stigmatization, dissatisfaction with body image), may be related to the way those parents perceived and evaluated their own lives and could significantly impact their psychosocial adaptation, leading to greater dissatisfaction with their body image, stigmatization by others, and high levels of shame, which may often impact their mental health and QoL (Latner, Durso, & Mond, 2013; Teixeira & Silva, 2009). Thus, overweight/obesity also tends to be associated with a number of physical problems (e.g., fatigue respiratory and muscle problems), which may help explain the lower levels of QoL reported by

these parents, along with higher levels of anxiety and depression symptoms. Those results reinforce the multigenerational nature of obesity (Modi et al., 2009) by suggesting that not only children/adolescents but also their parents struggle in the presence of this CHC. Parents of children/adolescents with overweight/obesity may also be facing lower levels of QoL and higher levels of depression and anxiety symptoms due to the fact that frequently children/adolescents with this CHC may face physical and psychological consequences, along with the presence of overweight/obesity. Having a child facing, for example, depressive symptoms or a cardiovascular problem, may lead to more anxiety symptoms or lower levels of perceived QoL.

1.4. Testing possible mechanisms explaining parent-child associations in paediatric obesity

A second general aim of this research project was to explore possible mechanisms that may account for the associations between family and parental characteristics and children's/adolescents' outcomes. This is particularly important, given the known interrelationship between children's and parents' adjustment (Drotar, 1997; Kazak et al., 2009; Schor & American Academy of Pediatrics, 2003). Nonetheless, there is a lack of understanding regarding the specific mechanisms through which family characteristics may be associated with children's psychosocial adjustment. It is possible that some factors may play different roles in different studies. It is, for instance, the case of FC, which has been investigated in other studies, as a resistance factor (thus a moderator) (Li & Warner, 2015; Yoo et al., 2014) or parental adjustment that, in some studies, was explored as a possible mediator (Mehta, Siega-Riz, Herring, Adair, & Bentley, 2011) instead of an independent variable.

1.4.1. The association between parents' anxiety symptoms and adolescents' QoL through psychopathological symptoms

An interesting finding of this research study was that higher levels of parental anxiety symptoms were associated with lower levels of QoL in adolescents with obesity with over 13 years old, through their psychopathological symptoms. A possible explanation may be that poorer parental adjustment may create a more conflictual family environment as well as a less cohesive environment at home (interestingly, in Article III we found that mothers of children/adolescents with overweight/obesity reported lower levels of FC when compared to mothers of children/adolescents of healthy weight; Frontini et al., in press). This, in turn, may lead to more adaptation problems in adolescents and, sequentially, lower levels of QoL. The presence of more anxiety symptoms may also be related to the adoption of less healthy eating and physical habits and the lack of time spent on family meals (Zeller & Modi, 2008), which may,

consequently, be related to higher weight (Jelalian & Hart, 2009; Patrick & Nicklas, 2005). Less cohesive and more worried families may have less time to sit down and share family meals which is related to healthier food consumption (Patrick & Nicklas, 2005).

This result is also consistent with studies, suggesting there is a link between parental adjustment and youth adjustment (Deater-Deckard, 1998; Kazak, Rourke, & Navsaria, 2009; Schor & American Academy of Pediatrics, 2003). Literature also reports that maternal stress may be an important correlate in paediatric obesity and an important predictor of poor psychological adjustment in children/adolescents (Zeller et al., 2004). Although those are preliminary findings, they seem to suggest that there is an obesogenic environment; that is, this result is in line with previous research, suggesting that those children/adolescents usually grow up in family environments that promote and maintain weight gain (Lochrie et al., 2013; Zeller et al., 2007).

Note, in this study (Article I; Frontini et al., 2016), the relationship between variables occurred only in adolescents (the moderating role of age in this relationship is explored in Section 1.5. of this Chapter).

1.4.2. The association between parenting stress and children's/adolescents' QoL through the permissive parenting style

It is important to further understand the relationship between parental behaviour and children's/adolescents' psychosocial adjustment. In this research project, higher levels of parenting stress were found to be associated with lower levels of children's/adolescents' QoL through higher levels of the permissive parenting style (Article III; Frontini et al., in press). This is interesting, given that the permissive parenting style is one of the parenting styles that literature and research show to be more commonly used by parents of children/adolescents with overweight/obesity (e.g., Golan, 2006; Jelalian & Hart, 2009; Matos et al., 2013; Rhee et al., 2006). As highlighted in previous research, positive parenting approaches (e.g., authoritative parenting style) can protect against paediatric obesity (Rhee et al., 2006) and can be a good predictor of healthy children's BMI, healthier eating, healthier physical activity, non-sedentary behaviours, and the consumption of fruits and vegetables (Kremers, Brug, De Vries, & Engels, 2003; Schmitz et al., 2002). Taking into account our results, the permissive parenting style appears to be responsible for a significant percentage of the variance of the QoL of children/adolescents with obesity. This result is in line with previous research that found that parenting stress may compromise the well-being of children/adolescents with a CHC, including obesity (Cushner-Weinstein et al., 2008; Guilfoyle et al., 2010; Mullins et al., 2007; Ohleyer et al., 2007; Zeller & Modi, 2006; Zeller et al., 2006). Although increasing research suggests that parenting behaviour might mediate the relationship between parenting stress and child

adjustment, to the best of our knowledge, this mediation hypothesis was not tested (Anthony et al., 2005).

Literature has found a negative association between parent well-being and stress and negative parenting (Crnic, Gaze, & Hoffman, 2005; Rodgers, 1993). For example, previous studies found that maternal psychopathology was found to possibly disrupt parenting (Burke, 2003). Moreover, parenting stress may interfere with parenting practices that help regulate children's/adolescents' behaviour and emotions (Masten & Coatsworth, 1998). It is possible that mothers suffering from parenting stress could have more difficulties managing normal parenting tasks. Those tasks may also be related to feeding practices. Parents reporting more parenting stress may have difficulties during family meal times and may have less time (or disposition) to share meal time, leisure time, or may be less prone to use better adaptive parental strategies (thus, it is in line with our result that the permissive parenting style is a mediator between parenting stress and QoL). Mothers with higher levels of parenting stress may be more focused on coping with their stress and more focused on themselves and their problems, unable to effectively monitor or control their son's activities.

Another interesting finding was that the association between parenting stress and children's/adolescents' QoL was no longer significant when the permissive parenting style was introduced in the model. This is line with the suggestion of Deater-Deckard and Scarr (1996), which stated that parenting stress may be indirectly related to child outcomes through parenting behaviours. This result suggests that parenting styles (specifically the permissive parenting style) play an important role in the relationship between the two variables, which is in line with previous research showing that parenting and poor caregiver functioning is important for youths' development and may be associated with worse QoL (Janicke et al., 2007; Kotchick & Forehand, 2002). The permissive parenting style (as it has been previously discussed) is characterized by a lack of warmth, monitoring, control, and discipline of their children. Mothers who use a more permissive parenting style might have more difficulties monitoring the food their children/adolescents consume or the amount of TV they watch and applying appropriate boundaries. Thus, they may restrict the time children/adolescents may be outside the house, or with which friends they may hang out, which, ultimately, may have an important association with children's/adolescents's QoL, specially restrictions related to friends, which are extremely important for adolescents. The effects of this parenting style on their children may be applied to all types of different parental interactions and has been related to other negative behaviours. Therefore, it is possible that the use of this parenting style may also have an important role in the global adaptation of the child and, thus, in his QoL. This is particularly important, given that a worse adaptation in the children/adolescent is likely to have an impact on his weight (Puder & Munsch, 2010). Thus, if research suggests that parental variables may be related to poorer

adjustment of children/adolescents with overweight/obesity, then it may be important to focus on parents and parenting when working with this population in clinical settings.

1.4.3. The association between family cohesion and children's/adolescents' weight, through maternal QoL and children's/adolescents' externalizing symptoms.

In another study (Article III; Frontini et al., in press), we found that higher levels of FC were associated with children's/adolescents' weight, through higher levels of maternal QoL and lower levels of children's/adolescents' externalizing symptoms. Previous studies suggested that the link between FC and healthy eating and activity behaviours could be direct (Franko et al., 2008) or mediated by the psychological health of the child (Lucia & Breslau, 2006). As previously discussed, family is an important system in the lives of children/adolescents. Moreover, family environment, as an important and wider system, may have an important role on the individual adaptation of the family members (e.g., maternal QoL). Consequently, as highlighted so far, maternal adaptation may have an important role in children's/adolescents' psychosocial adaptation, specifically because the interrelationship between parents' and children's outcomes has been acknowledged in past research (Kazak, Rourke, & Navsaria, 2009). The psychosocial adaptation of those children/adolescents may, in turn, have an important role on their weight.

A possible explanation for this result may be that members of a more cohesive family may engage in healthier eating (Franko et al., 2008), because they share more family time together (e.g., family meals). Those sharing moments may also be related to mothers' adaptation. In fact, a mother who perceives lower levels of QoL may be less prone to share meals, time, and healthy activities with their children, which, in turn, may be related to their psychopathological symptoms. By being part of a more cohesive family, mothers and children/adolescents with overweight/obesity may be encouraged to openly express feelings (Overstreet et al., 1995) along with worries and emotions. Members of a more cohesive family may feel more support from the other members, which may contribute to the perception of better QoL, which may be linked to fewer externalizing symptoms in family members. In contrast, by being part of a less cohesive family, mothers may feel a lack of support and commitment from the other family members (Moos & Moos, 1986), which in turn may be related to an increase of maladjustment, especially because FC has been considered an important factor for parental adaptation (Field & Duchoslav, 2009). By receiving more support, mothers may feel better adjusted, which may play an important role in the way mothers and children could positively interact. This is reinforced by the negative correlation found in this study between mothers' QoL and children's/adolescents' externalizing symptoms.

Externalizing symptoms were found to be a mediator, which is in line with previous studies on other CHCs that suggest that a cohesive family can protect children against poor outcomes (Soliday, Kool, & Lande, 2001). Moreover, literature suggests that externalizing symptoms may be related with external eating which is eating, in the absence of hunger cues. In turn, external eating has been related to higher energy intake and weight in children/adolescents (Braet et al., 1997; Webber, Hill, Saxton, Jaarsveld, & Wardle, 2009). In fact, a study found that there is a positive association between externalizing behaviours and external eating in children with obesity (Braet & Strien, 1997), which could help explain the mediational role that externalizing symptoms play in the relationship between FC and weight status. Other authors also suggested that externally regulated eating behaviour is a personality disposition (Schachter & Rodin, 1974). Thus, externalizing symptoms may be more common in children/adolescents with more externalizing traits, which could be related to weight status via more external eating. Another possible explanation may be that children/adolescents with externalizing symptoms (such as hyperactivity) may have increased reward sensitivity or a dysfunctional capacity for self-regulation. Moreover, it is possible that children/adolescents with higher levels of externalizing symptoms use food to regulate or express their emotions (Murphy, Bui, & Grier, 2013). By doing so, they may increase their weight.

1.4.4. The indirect relationship between family cohesion and internalizing symptoms through body esteem and social life

Another innovative result of this research study is that FC appears to contribute to lower levels of internalizing symptoms in children/adolescents with overweight/obesity, through the promotion of higher body esteem and, consequently, a better perception of social life. Thus, complementary to the previous result, this finding suggests that belonging to a cohesive family may be an important factor in reducing internalizing symptoms in children/adolescents with overweight/obesity. These findings suggest that when family members support each other, the interactions between family members may be more positive, proposing that it may safeguard children/adolescents with overweight/obesity against psychological maladjustment. As previously explained, former studies suggested that FC is an important protective factor against psychopathology, protecting children/adolescents from poor outcomes (Drotar, 1997; Soliday et al., 2001).

Furthermore, literature found that higher levels of FC are correlated with lower levels of anxiety and depression in children/adolescents (Soliday et al., 2001). This is not surprising, given that a more resilient family has been found to protect a child against disruptions caused by the presence of a CHC (Hamlett et al., 1992).

The results of this study suggest that the relationship between FC and internalizing symptoms is not direct but rather occurs indirectly through body esteem and social life. It also suggests that FC may be positively associated with children's/adolescents' body esteem. By being part of a more cohesive family, members may engage in more positive interactions, being more prone to openly express insecurities, fears, or even shame related to their bodies (Overstreet et al., 1995), especially since cohesive families are usually more supportive, appropriate, and healthy (Field & Duchoslav, 2009; Soliday et al., 2001). By being encouraged to openly express their feelings, children/adolescents will more likely have enhanced body esteem. Moreover, FC was related to the perception that those children/adolescents have regarding their social life indirectly through body esteem. This result suggests that higher levels of FC may be linked to higher levels of social life because of greater body esteem. It is possible that by establishing a more positive relationship with their bodies, children/adolescents may feel more comfortable in social interactions and interact with others to a greater extent. Thus, by feeling more confident in their bodies with respect to their weight, children/adolescents with overweight/obesity may have a better perception of how they will be treated by others (i.e., social life). Accordingly, this may help decrease their internalizing symptoms, especially since positive social relationships have been acknowledged as important adaptive resources that may help individuals maintain adaptive function (Coyne & Downey, 1991; Schwarzer & Leppin, 1991). The relationship between the perception of social life and internalizing symptoms may also occur because of the tendency to view oneself unfavourably compared to others, which is typically associated with psychological difficulties (Beck, Rush, Shaw, & Emery, 1979; Gilbert & Trower, 1990). The way children/adolescents perceive they will be treated by others, as well as their dissatisfaction with social relationships, may produce more internalizing symptoms, that is, more feelings of sadness or even shame. This may help explain the reason why FC was not correlated directly nor indirectly with externalizing symptoms. In fact, externalizing symptoms, as assessed by the SDQ, are related to behaviour problems, hyperactivity and inattention, which are likely to be less related to the negative perception that children/adolescents may have of their body image or even their social relations. It is more likely that the relationship that children/adolescents have with their bodies and others may be more directly linked to feelings of depression, anxiety, or shame in social situations, which are more internalizing in nature. A previous study (Lucia & Breslau, 2006), in line with this result, found a link between FC and internalizing symptoms and not with externalizing symptoms.

1.5. Does age matter? A developmental perspective

In this research project, we incorporated a developmental perspective. Thus, we searched for developmental differences between children (7 to 12 years old) and adolescents (13 to 18 years old) and used age as a possible moderator in some analyses.

In the first study (Article I) (Frontini et al., 2016), an age effect was found with adolescents reporting lower levels of QoL when compared to children, regardless of their weight. This may be due to normative physical and psychosocial changes that usually occur during adolescence. It is during adolescence that youths achieve puberty, which is accompanied by a series of body changes, from the appearance of menstruation to the typical modifications of body shape and size (Ricciardelli & McCabe, 2011; Wertheim & Paxton, 2011). Adolescents have greater concerns regarding opinions and acceptance of their peers while searching for greater autonomy from their parents (Deater-Deckard, 1998; Erikson, 1982; Field & Duchoslav, 2009; Ricciardelli & McCabe, 2011), which may help explain the lower levels reported (Currie et al., 2012). Another possible explanation may be related to the way adolescents eat. In fact, research has shown that adolescents tend to consume more high-calorie foods, which may be related to their worst QoL (Thompson et al., 2004).

In another of our studies (Article II; Frontini, Moreira, & Canavarro, 2016), we found that the difference of the permissive parenting style was only present in the group of mothers of adolescents with obesity, with mothers of adolescents with obesity using more a permissive parenting style than mothers of adolescents of healthy weight. Younger children are in need of more caregiver demands and supervision (Pereira et al., 2009), which is important, given that children are more dependent upon their parents. In contrast, adolescence is a developmental period marked by a demand for autonomy (Erikson, 1982). Thus, it is probable that adolescents suffering from obesity search for more autonomy from their family. Nevertheless, this search for independence may be concomitant to two other aspects: the struggle to be accepted by their peer groups and the struggle to be accepted, regardless of their weight. In fact, literature states that adolescents with obesity suffer from shame, dissatisfaction with body image (but also stigmatization), victimization from peers, and social exclusion (Griffiths et al., 2010). It is possible that mothers of adolescents with obesity have a greater willingness for their children to be accepted by peers, because they want their children to have a normal adolescence, despite their appearance. Consequently, it is possible that they use a more permissive parenting style with less monitoring behaviours towards their children, giving them more freedom and choice opportunity. Another possible explanation is the general family disorganization that may be present in those families. In fact, mothers may have difficulties establishing stable rules, and families may have a lack of structure, which is typical of families with children/adolescents with obesity (Zeller et al., 2007).

2. Strengths and limitations of the study

The present research work has a number of theoretical and methodological strengths that supports the pertinent contribution for understanding the adaptation to paediatric overweight/obesity in children/adolescents and their parents.

1) First of all, and as highlighted previously, this research study and the aims of the study were **supported by solid theoretical frameworks**: the transactional approach to parent-child adaptation; the Social-Ecological Model of Human Development (Bronfenbrenner, 1979); the Social-Ecological Model of Human Development adapted to paediatric psychology (Kazak, 2009); and the Disability-Stress-Coping Model (Wallander & Varni, 1992, 1998).
2) Use of a **multidimensional approach** to adaptation by assessing positive (e.g., QoL) and negative (e.g., psychopathological symptoms) outcomes.
3) In this research study, **self-report measures** were preferred instead of proxy reports, which gives the possibility to access to the subjective and personal point of view of the child/adolescent about their own problems and life. Most studies within paediatric populations so far privileged proxy reports. However, some authors have shown and recommended that researchers and clinicians should allow individuals to report on their own well-being (Matza, Swensen, Flood, Secnik, & Leidy, 2004; Shikako-Thomas et al., 2009). In fact, the use of self-report measures allows children and adolescents to report about their subjective experiences, specially taking into account subjective measures such as QoL and psychopathological symptoms (Buttitta et al., 2014). Therefore, although children have traditionally been considered as unreliable informants, there is a growing evidence that they are able to self-report (Riley, 2004). Despite this recognition, there is a significant lack of research in assessing the adaptation of children/adolescents with overweight/obesity by self-reports (see Chapter I, Section 4.2. Importance of self-reports).
4) This research project has not only **individual outcomes** but also **parental** and **familial variables**, all variables that are important in the scientific domain of paediatric obesity but whose mechanisms, along with the pathways accounting for these relationships, are scarcely studied.
5) In all four studies, the sample consisted of **dyads** in order to highlight the association between parents and child variables and the importance of parental factors on children's/adolescents' outcomes. Therefore, it was possible to assess family members, which permitted a better insight regarding the complexity of family systems.
6) For this research project a **good sample size** was recruited, with the presence of a **control group** and two different clinical samples: children/adolescents with

overweight and children/adolescents with obesity, both seeking treatment at the time of recruitment. The control group was specifically collected for comparative analyses, with equivalent sociodemographic characteristics.

7) Although most studies analyse children and adolescents as a single group, in this research project, there was a focus on **developmental differences**, by considering children and adolescents separately. Given that the developmental tasks from children and adolescents are different, the use of age for analyses was an important consideration (see Chapter I, Section 4.1. Importance of a developmental approach). Moreover, there was a careful selection of **developmentally appropriate instruments**. In fact, for paediatric outcomes assessment, we chose questionnaires that were developed specifically for children/adolescents, with items that were related to their developmental contexts and with wording, language and format adequate to their cognitive skills and age.
8) Lastly, we used **advanced statistical techniques** in addition to more common analysis in the paediatric psychology field.

Nonetheless, the current research study also presents **limitations** that should be noted.

1) First of all, the **cross-sectional design** of the study, which does not allow solid and causal inferences to be made, is an important limitation of the study. Future research should adopt a longitudinal design in order to assess the direction of the associations between variables which is particularly important in the case of a CHC. In fact, the adjustment to a CHC is a dynamic process and should be better understood with longitudinal designs. Therefore, because of the bidirectional association between the study variables and the cross sectional nature of this study, causal inferences are not possible.
2) The sample collected was one of **convenience**. In fact, participants of this study were only recruited in the central region of Portugal. Thus, it does not allow a generalization of results.
3) The clinical sample (i.e., children/adolescents with overweight/obesity) were already **attending nutrition appointments** with the purpose of losing weight. Therefore, generalization of results to the entire population of children/adolescents with overweight/obesity is not possible.
4) In this research study, **two different sample collection procedures** were used regarding height and weight. The height and weight of children/adolescents with overweight and obesity were measured by the nutritionist/physician, whereas height and weight of children/adolescents with healthy weight were self-reported. Therefore,

in some cases, it may not be possible to get accurate answers regarding those measures given that studies show that children/adolescents might inaccurately self-report weight and height (Beck et al., 2012; Brener, McManus, Galuska, Lowry, & Wechsler, 2003). Moreover, some studies show that parents may have difficulties understanding the nutritional status of their children, assessing them as slimmer than they really are (Campbell, Williams, Hampton, & Wake, 2006; Eckstein et al., 2006; He & Evans, 2007)

5) In this research project, children/adolescents with overweight/obesity were followed at **different timings**. For instance, some children/adolescents were being followed by the nutritionist/physician for several months/years, while others were having their first nutrition appointment. In addition, although parents were asked to report how long their child was attending those appointments, many did not recall when consultations started. Therefore, the high number of missing data on this variable determined that this information could not be used. Nonetheless, all children/adolescents were overweight or obese at the moment of recruitment.
6) Although in this research project we were interested in assessing **fathers** and mothers, during sample recruitment, the number of fathers we had access to, began to decline, leaving a large disparity between the two parents. It is acknowledged that mothers tend to be more often responsible for their children than fathers (Haycraft & Blissett, 2011). Therefore, if mothers tend to assume the role of primary caregivers, when the child has a CHC, it is more likely that they will be the responsible to accompany their child to hospital appointments. Nonetheless, future research should try to enlarge the recruitment, adding not only fathers but also other caregivers during sample recruitment. Taking fathers into account in research is important especially given that studies have found that involving fathers in caregiving has been related to improved well-being, less externalising symptoms and a range of other positive outcomes (Sarkadi, Kristiansson, Oberklaid, & Bremberg, 2008).
7) Due to the lower number of children/adolescents with overweight/obesity in schools, it was not possible to create a group of children/adolescents with overweight/obesity **not seeking treatment** to compare on the analyses.
8) Moreover, we believe that there is still a wake-up call needed in this area. In fact, it was difficult to have a robust sample of children/adolescents with overweight to compare to children/adolescents with obesity. We observed that the majority of children/adolescents seeking treatment were obese and not overweight. This may indicate that parents tend to bring their children to clinical appointment in a late state rather than earlier.

9) A quick note regarding the rate of participation is worthwhile. We did not **record the number of participants** refusing to participate nor the reasons for their refusal. Nonetheless, few parents refused to participate, with an estimated rate of participation being higher than 90%. The few parents that did not participate claimed time constraints. Regarding the envelopes that were given to parents to fill in at home, again we were enable to establish the number of participants that re-sent the envelope, nor the reasons why the others did not. Furthermore, it is also important to note that some cases were excluded from our dataset due to missing data. Data was excluded whenever it was not possible to input missing values (i.e., when missings were higher that 10%, making it impossible to use imputation techniques).

3. Implications for future research, clinical practice, and health policymaking

The results from this study have theoretical and practical relevance and might have implications on research and clinical practice for researchers and health professionals working with children/adolescents with overweight/obesity. They provide better understanding of the psychosocial outcomes related to paediatric obesity and suggest that it may not be enough only to work with children/adolescents to promote weight reduction or to improve the psychosocial adjustment of children/adolescents but also to take family members into consideration. Including family members should be an important goal in future interventions and clinical practice. Moreover, programmes targeting overweight/obese youths often focus on weight reduction with little focus on psychosocial influence (Waters et al., 2011). Our studies reinforce the need to take psychosocial adjustment into consideration. It is important to reinforce that the role of the psychologist in this area may be crucial to help children/adolescents and their families engage in treatment. The social and emotional function of the children/adolescents and their parents is as important as the motivation to implement lifestyle changes (APA, 2014). It is important to address this problem also through motivation strategies (Karnik & Kanekar, 2012).

The results from our studies also reinforce the importance that a social and public health movement may have in this area. Changes in paediatric obesity may be as effective as it was in the case of tobacco control (Klein & Dietz, 2010; WHO, 2016). Although some policy changes are well recommended in research, others have been less studied. For instance, the importance of reducing sugar-sweetened beverages, fast food consumption, and screen time and the importance of increasing the consumption of fruits and vegetables has been acknowledged, and there is evidence that appropriately designed taxes on sugar-sweetened beverages and other sweetened foods would result in proportional reductions in consumption (World Health Organization, 2016a). The economic implications of those tax policies have been studied and acknowledged, but less attention was focused on what could be made regarding the psychosocial

consequences in terms of policymaking, even though the psychosocial consequences are responsible for greater immediate costs of this CHC (Dietz, 1998). Overweight/obesity should be viewed not only as a medical issue but also as a public health matter and, thus, as a matter of responsibility of public entities and government (Brownell, Schwartz, Puhl, Henderson, & Harris, 2009). Since governments have a vital role in creating the context for healthy choices and the creation of infrastructures for leisure time and physical activity (EU, 2014), they could also work towards policies and the creation of guidelines to help towards psychosocial adjustment. We endorse the establishment of protocols between governments and research centres in order to create evidence-based guidelines that could be implemented in schools and healthcare centres. With some policies implemented, families may be helped in terms of their psychosocial adjustment related to the presence of overweight/obesity.

In Portugal, some public health policies were implemented in order to deal with overweight/obesity. For instance, in 2005, the National Program To Fight Obesity was created in order to deal with this CHC, identified as a public health problem by the National Health Plan 2004-2010 (DGS, 2005). Later, the Platform Against Obesity appeared (DGS, n.d.). However, and despite the recognition of the implications this CHC may have in psychosocial terms, little has been done in order to implement strategies against negative psychosocial aspects related to paediatric overweight/obesity (e.g., internalizing and externalizing symptoms). Prevention strategies as well as evaluation tools may be spread and implemented earlier in children's/adolescents' lives, which may help prevent this epidemic, considered already a major public health problem worldwide (Buttitta et al., 2014). These protocols may be successfully implemented, since one of the great proposals for 2020 is the reduction of risk factors related to non-communicable diseases, specifically childhood obesity (DGS, 2015).

Teachers and healthcare professionals may be provided with training to detect children/adolescents who may be in need of help, especially since school is, in fact, recognized as a privileged place for promoting health. These protocols may also be helpful in terms of research – helping to create the conditions to implement longitudinal research projects that may follow the psychosocial adjustment of those families that may extend our knowledge in the field of paediatric obesity in Portugal. With some of these policies implemented, we believe that in the near future there will be a significant reduction in the number of children/adolescents with overweight/obesity suffering from psychosocial adjustment. We are conscious that to create and implement such policies may require significant monetary burden but, in the long run, this may help generate savings in health services (Pereira, 2007). Having trained health professionals will have a major impact on the associated chronic diseases related to the presence of overweight/obesity, helping reduce personal and economic costs (DGS, 2014, 2016).

3.1. Implications for research

Our studies reinforce the importance of including family members in research. The knowledge of the impact of family members on children's/adolescents' weight is vast, but studies on the role of family in children's/adolescents' with overweight/obesity psychosocial adjustment is scarcer. Literature acknowledges that the entire family should be involved in programmes and interventions in paediatric obesity (Stein, Weinberger-Litman, & Latzer, 2014). However, understanding the mechanisms through which parenting and familial variables may be associated with the psychosocial (and the weight) of children/adolescents is still important. Studies focusing on mechanisms may be extremely highlighting and may lead to more comprehensive results. The specific mechanisms through which family factors are associated with paediatric overweight/obesity should continue to be a study focus and remain researched thoroughly (Moens et al., 2009). Moreover, research must take into account the reciprocal relationship between family variables and children's/adolescent's chronic illnesses (Field & Duchoslav, 2009; Zeller & Daniels, 2004).

The results from our studies reinforce the importance that future research should continue studying those variables and try to understand how psychologists may work with those families in order to improve the psychosocial adaptation of children/adolescents with overweight/obesity and the adjustment of their parents. Thus, research in prevention and intervention programmes may be more comprehensive in understanding behavioural and environmental factors that contribute to the development of paediatric obesity (Zeller & Daniels, 2004) whenever possible.

Moreover, in our studies, we used self-reports, even when assessing children's/adolescents' QoL and psychosocial adjustment. Our studies are in line with empirical evidence and recommendations that researchers should hear "the voices of the children" (Varni, Burwinkle, & Lane, 2005). More information regarding this topic can be seen in Chapter I (Section 4.2. Importance of self-reports).

Taking into consideration some limitations of our studies, we also acknowledged the importance of using a longitudinal design in order to provide causal evidence in the field of psychosocial adjustment. As previously addressed, the adjustment to a CHC is a dynamic process, especially in paediatric psychology, where children/adolescents are in an important developmental process. Moreover, although mothers are usually responsible for their children's healthcare (Haycraft & Blissett, 2011), future research should add other caregivers during sample recruitment.

3.2. Implications for clinical practice and policymaking in healthcare

As highlighted so far, paediatric obesity prevalence is rising all over the globe, including in Portugal (Chapter I, Section 1.3. The epidemiology of obesity in Portugal). Literature has emphasized the physical and psychosocial consequences that this CHC has on children/adolescents but also on their family members (Chapter I, Section 1.4. Consequences and clinical manifestations), which ultimately has severe economic consequences (Chapter I, Section 1.5. Paediatric obesity: Economical implications). In order to improve the health of these children/adolescents and in order to control the individual and general healthcare costs, it is extremely important to consider prevention approaches (Klein & Dietz, 2010). Psychologists may have a very important role in preventing overweight/obesity and its consequences. Although biology may have an important role, the epidemic of obesity has an origin in broader social environment and human behaviour (Johnson, 2012), which is of the psychological domain. In fact, psychologists are specialists, not only in human behaviour but also in understanding the basis of initiating and maintaining behaviour change (Johnson, 2012). It is of utmost importance to promote the psychosocial wellbeing of individuals with overweight and obesity (Kalra, De Sousa, Sonavane, & Shah, 2012).

Thus, in order to help shape effective prevention programmes targeting paediatric obesity, it is important to take the novel results of research into consideration, as well as evidence-based psychological assessments (APA, 2014). Studies like the ones presented in this doctoral thesis may help highlight important sectors that need to be addressed in order to enable a better psychosocial adjustment. Not only health professionals but also schools and home-based settings may help create and implement prevention and intervention programmes aimed at reversing unhealthy tendencies in students with overweight/obesity (Lobstein et al., 2004; Ward-Benoche, Gance-Cleveland, Harris, & Dean, 2008), which will effectively prevent adult obesity (Kalra et al., 2012). Combining family and school may help level up the effectiveness of the intervention (Mak, Bonsmann, Caldeira, & Wollgast, 2016).

Our results reinforce the importance of including family members (or at least a main caregiver) in interventions and clinical practice in order to improve the QoL and psychosocial adjustment of children/adolescents with overweight/obesity. Adopting a family-centred approach is imperative. In fact, and in accordance with previous studies (Drotar, 1997; Kazak et al., 2009), our findings reinforce the interrelation of family and children's/adolescents' adjustment. Although family has been recognized as an important key component of therapeutic success (Altman & Wilfley, 2015; Barlow & Expert Committee, 2007; Dordevic, Bonham, Ware, Brennan, & Truby, 2015; Epstein, Paluch, Roemmich, & Beecher, 2007; World Health Organization, 2016), the majority of intervention programmes still attribute the responsibility of obesity change to the

child/adolescent (Golan & Weizman, 2001; Karp & Gesell, 2015; Skelton, Buehler, Irby, & Grzywacz, 2012).

Family is a very important system for children/adolescents, especially because it is their first social context (Lakic, 2012). Thus, working with parenting styles is of utmost importance, providing an important context for children's/adolescent's development (Ventura & Birch, 2008) and, as suggested by the results of one of our studies, having an important role in adolescents QoL and psychosocial adjustment. In clinical settings, an inquiry regarding the parenting styles used by those parents, along with a discussion (or reference to a psychologist or mental healthcare) about the benefits of using an authoritative parenting style is another important step to introduce in clinical practice. Parental education towards the adoption of a more appropriate parenting style appears to be fundamental towards a better psychosocial adjustment of children/adolescents. Working towards a better adoption of more authoritative parenting styles may also be important in prevention programmes (Rhee et al., 2006). Because parents are mainly responsible for taking their children/adolescents to clinical settings and for starting and continuing the prescribed treatment, namely diets and the introduction of healthy physical activities (Schor & American Academy of Pediatrics, 2003), family-oriented approaches to paediatric care (and thus paediatric obesity) are of utmost importance (Barlow & Expert Committee, 2007; Epstein et al., 2007). Thus, rather than having interventions exclusively focused on children's/adolescents' weight, including family members and promoting strategies to improve family communication patterns, mutual support, and their psychosocial adaptation is of utmost importance.

Moreover, the results of our studies highlight that parents of children/adolescents with overweight/obesity experience higher levels of parenting stress and higher levels of depression and anxiety symptoms, along with lower levels of QoL. Some of those psychosocial maladjustments were, in turn, found related to the psychosocial adjustment of their children/adolescents. Literature also highlighted that higher levels of parenting stress may compromise treatment outcomes (Quittner et al., 1998). Thus, apart from the fact that it is important to have family members considered in intervention programmes, those results suggest that it might be important to offer mothers and fathers (and likely other caregivers) the opportunity to receive psychological support. Individual interventions for those parents may be essential to provide strategies aimed at reducing not only parenting stress but also the psychopathological symptoms and psychosocial maladjustment and suffering of those individuals. Those results suggest that in clinical practice, health professionals should be aware that caregivers of children/adolescents with obesity may suffer from psychosocial difficulties and should take this into account whenever they prescribe treatments, or intervene whenever necessary. In clinical settings, a routine assessment of parenting stress, parents QoL, anxiety, and

depression symptoms may help identify parents of children/adolescents who may benefit from greater clinical attention. It is an important step, especially because literature suggests that psychological adjustment is important in the adherence to prescribed treatment (Guilfoyle et al., 2010; La Greca & Mackey, 2009). It is, in fact, of utmost importance that clinical and health economic policies take into account the fact that children/adolescents with overweight/obesity and their parents may be in psychosocial suffering, especially taking into account that, for example, untreated depression through adolescence may have several future consequences (Pinto-Foltz, Hines-Martin, & Logsdon, 2010).

The results of our study also highlight the importance that family-centred interventions may have in helping parents cope with the demands of caring for a child/adolescent with overweight/obesity. Enhancing FC, for instance, and the support between family members may be an important first step towards a better psychosocial adjustment of children/adolescents with overweight/obesity and their parents. Moreover, according to previous literature, family involvement may also be important to facilitate physical activity (Altman & Wilfley, 2015; Frelut & Flodmark, 2002; Guerra, Da Silveira, & Salvador, 2016). Thus, focusing on raising FC levels may be particularly useful, not only towards the reduction of youths' adjustment but also, consequently, towards weight reduction. Paediatric obesity interventions for weight reduction should focus not only on the alteration of diet patterns but also on the fomentation of positive and cohesive relationships between family members.

Another important practical implication of these findings is the importance of assessing other dimensions of social and emotional function of children/adolescents seeking treatment, as other research has continuously supported it (Jelalian & Hart, 2009). Assessing and intervening in the psychosocial adjustment of children/adolescents with overweight/obesity is of utmost importance, given the findings of our studies in this Portuguese sample. For instance, it is important that health professionals work towards a better psychosocial adjustment, focusing on enhancing body esteem, psychopathological symptoms, and social and familial factors that may have an important role in weight gain but also on the individual's psychosocial adjustment (Gravina, Palla, Piccione, & Nebbiai, 2015). The psychosocial adjustment of children/adolescents is crucial for good treatment adherence (La Greca & Mackey, 2009) and, thus, for obtaining good therapeutic results, such as healthy weight loss (Lochrie et al., 2013). Alongside the periodical and more typical examination of children's/adolescents' weight and height, health professionals should include a routine assessment of other possible psychosocial problems. For instance, they may use screening assessment tools, such as the instruments used in those studies, for example, the KIDSCREEN or the SDQ. Using QoL assessment in paediatric clinical practice as part of a routine may be extremely beneficial, facilitating patient-physician communication, improving the satisfaction with medical care, and detecting psychosocial difficulties (Varni et al., 2005), which,

as highlighted by the results of our studies and the literature review made, occurs frequently. This practice is poorly disseminated in healthcare services in Portugal and should be considered on a daily basis. Taking into consideration that parents of children/adolescents with overweight/obesity may also be in psychosocial suffering, this routine assessment of QoL and psychopathological symptoms may be extended to parents or other primary caregivers (e.g., using the EUROHIS-QOL 8-index to assess caregivers' QoL). Our studies also reinforce that it is possible to use self-reports when administering questionnaires assessing QoL and psychosocial adjustment.

During sample collection, we observed that children/adolescents and also their parents were motivated by the questionnaires to talk with the researchers about their own experience with overweight/obesity, suggesting that those questionnaires may be a complementary and important tool to use in clinical settings. Specifically, it may suggest that answering those questionnaires may improve the insight of the respondents as well as the reflection and self-awareness towards this CHC, helping those families mobilize important resources for adherence to therapy. Taking into consideration that children's/adolescents' adaptation to a CHC may change during their development, it should also be important to consider the assessment of those adjustment variables over time.

In sum, the results of these four studies reinforce the importance of using a multidisciplinary team, by focusing on the importance of introducing psychologists in the field in order to work with these children/adolescents and their parents for better psychosocial adaptation. It is important to use a multidisciplinary approach with a multifactorial component of psychological, social, environmental, and biological factors related to paediatric obesity to ensure comprehensive care and the use of the best practices (Gravina, Palla, Piccione, & Nebbiai, 2015; Kalra et al., 2012; Lobstein et al., 2004), with the use of a wide range of instruments (EU, 2014). There should be an equal consideration of social, emotional, and physical aspects of children's health (Danielsdóttir, Burgard, & Oliver-Pyatt, 2012).

Recently, there has been some significant awareness of healthcare and multiple-policy sectors at a preventive level, but policy changes on a social scale are still needed (Klein & Dietz, 2010). Nonetheless, we understand the possible economic burden that may arise in order to create a multidisciplinary team, especially in a moment of economical crises, such as the one that Portugal currently faces (Frasquilho et al., 2016). New strategies using internet-based intervention websites and e-Health applications may be an interesting and effective alternative, especially since we are living in an age of digital media opportunities (Mackert, Kahlor, Tyler, & Gustafson, 2009). It will possibly increase the access to important information. The Platform Against Obesity (DGS, n.d.) already has interesting features that should be complemented with more psychosocial information. Platforms such as this one may also help reach more people and

shoot down economic barriers (Cushing & Steele, 2010), facilitating message targeting and permitting tailoring the information to the users' backgrounds (Mackert et al., 2009).

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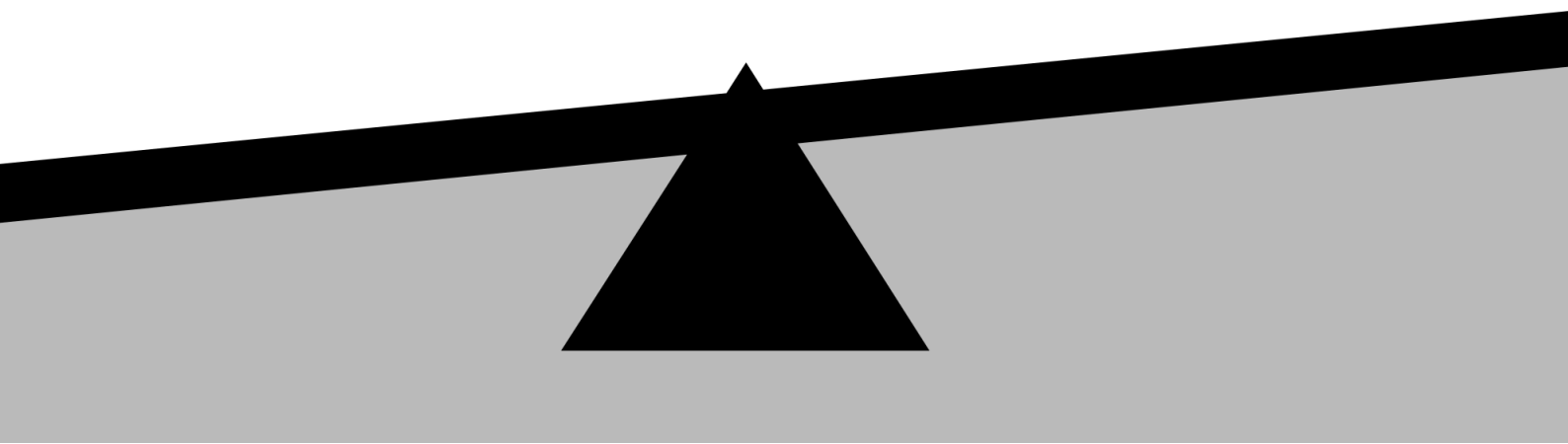

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