

A Weighted Multidimensional Index of Child Well-Being Which Incorporates Children's Individual Perceptions

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Abstract It has been a decade since a landmark piece of work on child well-being measurement based on a summary index was developed in the United States, the Index of Child and Youth Well-Being. Several research studies, both in the U.S. and Europe, followed on from this work. Despite these studies' valuable contribution, scope exists for further improvements at the methodological level. In the present paper we draw the methodological basis for a new, micro-based summary child well-being index in which children's views on their own well-being assume a central role and distinct weights (based on the children's perceptions) to each component that is included in the index are used. Based on 914 pairs of responses of Portuguese children and their carers, the newly proposed index was tested vis-à-vis other methodologies. The econometric estimations show that the significance of all potential well-being determinants (e.g., age, school cycle, mother's and father's level of education) remains the same across the distinct methods of calculation of child well-being indexes. However, the consideration of subjective components (degrees of importance and weights) allowed to evidence that the most relevant determinants of child well-being are the set of variables related to the child's parents, namely education and professional status. In particular, when compared to their counterparts, children whose fathers have higher education degrees reveal an increased overall well-being by around 25 %, whereas children whose fathers are unemployed present a decreased well-being by around 11 %.

Keywords Child well-being · Measurement · Child indicators · Methods

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1 Introduction

Concern with child well-being and its measurement is not new (Ben-Arieh and Goerge 2001). This field of research has, however, experienced several changes and important developments over time, where the measurement of child well-being through summary indexes has become one of the most recent trends (Ben-Arieh 2008). Although some limitations remain—namely measuring children’s perspectives of their own well-being is still not duly considered—, data on children has been growing rapidly (Ben-Arieh 2008; Fernandes et al. 2012). This increase in the data available has led to some difficulties in drawing conclusions about how children are faring, especially when several dimensions of their well-being are considered, and that is basically why researchers have been called upon to build single summary indexes, in order to simplify the interpretation of data which is now abundant (Ben-Arieh 2008; Moore et al. 2007, 2008).

It has been a decade since a landmark piece of work on child well-being measurement based on a summary index was developed in the United States, the Index of Child and Youth Well-Being by Land and colleagues (Land et al. 2001). Several research studies both in the U.S. and Europe followed on from this work, namely those of Land et al. (2007), Bradshaw et al. (2007, 2009), Moore et al. (2007, 2008) and Bastos et al. (2004, 2008, 2009).¹

However, improvements to the methodologies used in these studies are still required, be it because of the use of aggregated data, as is the case of Land et al. (2001, 2007) and Bradshaw et al. (2007, 2009), or because children’s perspectives are generally overlooked, which is, for example, the case of Moore et al. (2007, 2008), who use microdata, but collected from parents and not from children. Another shortcoming, with the exception of very few papers, such as that by Bastos and Machado (2009), has to do with the fact that equal weights are assigned to each indicator used in the construction of the index.²

This paper primarily aims to draw the methodological basis for a new summary child well-being index which takes into account, and tries going beyond, some of the above mentioned limitations of previous studies, and where children’s views on their own well-being assume a central role. Empirical exploratory testing to the proposed index is made, on which some conclusions are drawn.

Two types of questionnaires are needed to collect data for this type of index. One questionnaire focuses on the measurement of objective items, which are considered to characterize child well-being, where the parents of the targeted children are the respondents. The second questionnaire is administered to children themselves who are asked about the importance each item has for them and they are also asked about the relative importance they give to each of the items considered relevant for their well-being. The weights for aggregating the components of children’s well-being into the summary index come from the data collected in this second questionnaire.

This paper is, thus, intended to contribute at the methodological level by proposing a new summary child well-being index and, hence, demonstrate the relevance of taking into

¹ A thorough analysis of the several methodologies is provided in Fernandes et al. (2012).

² It should be noted that none of the abovementioned studies consider interactions between the dimensions of well-being that, according to Bronfenbrenner and Morris (1998), are likely to exist. Bronfenbrenner and Morris’s (1998) ecological model of human development considers that the main effects on children’s outcomes are likely to be the result of interactions between factors. Although comprising a limitation to the existing indexes in this area, developing an interaction model between dimensions of well-being is beyond the (necessarily restricted) scope of the present research work. Nevertheless, some comments on this matter are made in the concluding section.

account children's perspectives on their own well-being in the measurement process. Bearing this goal in mind, the paper is structured as follows: first, the theoretical foundations underlying the choice of which dimensions of children's well-being to include are described (Sect. 2); next, the use of a weighting scheme different from a uniform one is justified and the way to achieve it is explored (Sect. 3); in Sect. 4 empirical testing to the proposed composite index is made, with comparisons of results between different calculation methodologies; finally, Sect. 5 puts forward a summary of our proposal and some concluding remarks are made.

2 Theoretical Basis for Selecting the Dimensions to be Included in the Child Well-Being Index

2.1 The Current Consensus: A Multidimensional Approach

Following the general consensus in current work on child well-being indexes (e.g., Land et al. 2001, 2007; Moore et al. 2007, 2008; Bradshaw et al. 2007; Bastos et al. 2008; Bastos and Machado 2009; Bradshaw and Richardson 2009; for a survey, see Fernandes et al. 2012), a multidimensional approach is also taken here. This being said it is necessary to specify which dimensions are to be considered in order to assess child well-being and on what basis the choice of those dimensions is grounded.

We consider here two types of foundations for the choice of these dimensions:

1. A normative foundation, corresponding to the universal social ideal enshrined in the United Nations' Convention on the Rights of the Child (1989);
2. A positive foundation, corresponding to a model of child psychological development proposed by Bronfenbrenner and Morris (1998).

2.1.1 A Normative Foundation: The United Nations' Convention on the Rights of the Child

The United Nations' Convention on the Rights of the Child (CRC, 1989) is a normative framework establishing children's rights with relatively widespread social consensus in current days. The rights advocated by this convention can be considered as those that many contemporary societies believe are required to ensure the well-being of children. Thus, this convention provides a normative grounding which is unlikely to raise much criticism when looking to assess child well-being.

The CRC basically addresses human rights placing the child at the centre of its concerns, and follows an holistic approach, which means that ensuring the realization of children's rights requires taking into consideration all the relevant areas of their lives (United Nations 1989; Pais 1999).

The CRC advocates four general principles (United Nations 1989; Pais 1999). The first (Article 2) states non-discrimination, irrespective of race, colour, gender, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status. This implies that data on child well-being should be disaggregated by gender, age, ethnic, economic and geographic group (Pais 1999).

The second principle (Article 3) determines that the child's best interest should be a major concern, contributing to the perception of the child as a citizen in his or her own right and to the notion that the child should be placed "at the centre of the equation" (Pais

1999, pp. 11). This implies that the child should be the unit of analysis when assessing his/her well-being.

The third principle (Article 6) states children's inherent right to life and determines the obligation to ensure, to the maximum extent possible, the child's survival and development. To achieve that, the several sectors relevant to children's lives must be considered (Pais 1999). This reflects the holistic approach of the CRC (Pais 1999), which points out to the complexity of children's lives and, hence, to the need for multidimensionality.

Finally, the fourth principle (Article 12) determines respect for the views of the child. Children have the right to express themselves freely and their views should be taken into consideration in matters that affect them (Pais 1999; Bradshaw et al. 2006, 2007; Ben-Arieh 2008). As mentioned earlier, the main purpose of this paper is to take this principle into consideration.

The CRC also elaborates on thematic areas such as children's civil rights and freedoms, family environment and alternative care, basic health and welfare, education, leisure and culture activities (Pais 1999).

Hence, the CRC is anchored in an understanding of children's well-being as the realization of children's rights. It takes children as the unit of analysis and calls for more data on their well-being, while also highlighting a breadth of topics and issues that need to be covered when assessing children's well-being. Finally, it stresses the dual status children should have in society: they are dependent on their families, and other entities such as schools and communities, but they are also members of society in their own right (Ben-Arieh 2000, 2008; Hoelscher 2004; Bradshaw et al. 2006, 2007).

2.1.2 A Positive Foundation: The Ecological Model of Human Development

It is today recognized that children's psychological development and the context in which it takes place influences their well-being. The ecological model of human development (Bronfenbrenner 1977, 1979, 1994; Bronfenbrenner and Morris 1998) is a useful framework to understand this influence.

The ecological model environment "is conceived as a set of nested structures, each inside the other like a set of Russian dolls" (Bronfenbrenner 1994: 39) – see Fig. 1. Children's psychological development occurs within four concentric circles of environmental influence with which they interact (Bronfenbrenner 1994; Bronfenbrenner and Morris 1998; Bradshaw et al. 2006, 2007; Ben-Arieh 2008). The immediate environment of interaction, the microsystem, is the level of most direct influence on children. It includes settings such as family, friends, neighbours, school, health care, etc. The mesosystem includes the connections between the microsystems, such as between family and school. The exosystem comprises linkages between settings where at least one does not directly include the child but exerts indirect influence on him/her. Examples are parent's work place or parent's social networks. Finally, the macrosystem comprises the most distant factors, the wider societal context, the "societal blueprint for a particular culture or sub-culture" (Bronfenbrenner 1994: 40).

These systems are dynamic and interdependent, exerting influence on each other and undergoing change over time (Lippman 2004; Bradshaw et al. 2006, 2007; Ben-Arieh 2008).

This model can provide the basis to define which dimensions should be considered as relevant in shaping children's well-being. For this reason, several recent studies on this topic (e.g., Bradshaw et al. 2006, 2007; Moore and Vandivere 2007; Ben-Arieh 2008) have made reference to this model and it also serves as the starting point in our study.

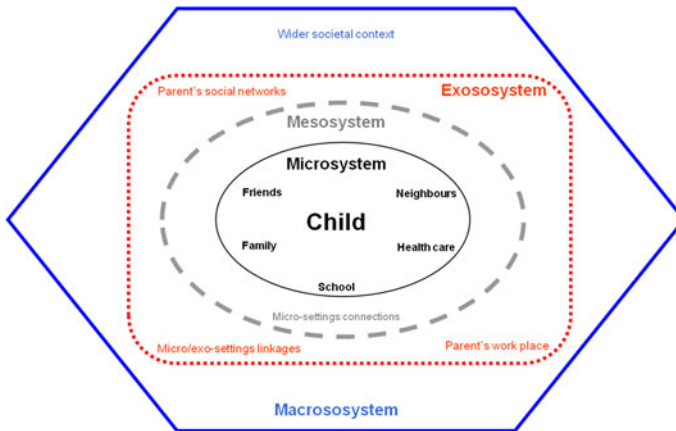


Fig. 1 Systems of the ecological model of human development

2.2 Choosing the Dimensions of Child Well-Being

Following Bronfenbrenner and Morris' (1998) considerations, the microsystem is the level with the strongest impact on children, since it is where children spend their time and interact the most among themselves and with other people (Bradshaw et al. 2006). This being said, to have the full picture of the settings which most greatly and directly influence child well-being, it is helpful to take a closer look at what characterizes the microsystem level.

According to Bronfenbrenner and Morris (1998), human development happens through processes of interaction between a human being and the persons, objects, and symbols in their immediate external environment. These interactions in the immediate environment are designated as proximal processes. The power and direction of the proximal processes vary systematically as a function of the characteristics of the developing person, of the environment, of the nature of the developmental outcomes, and occur over time (Bronfenbrenner and Morris 1998). These are the main components of the model at the microsystem level. In what follows, special attention will be given to the first three: proximal processes, person's characteristics, and environment.

The main individuals with whom young children interact are, in general, their parents (or the people that are in charge of them). As children get older, other people such as caregivers, relatives, siblings, peers, teachers, close friends and so on, come into play, to exert influence on their development as well (Bronfenbrenner and Morris 1998). Interaction with objects and symbols—such as playing with toys, working on hobbies, or reading—also plays an important role in developmental outcomes (Bronfenbrenner and Morris 1998). According to Bronfenbrenner and Morris (1998), several studies have shown³ that these proximal processes appear as the most important force influencing development outcomes, but, at the same time, their impact on child development varies according to what the authors call “person” (person's characteristics) and “context” (environmental context) factors. So the impacts on child psychological development of personal characteristics and context, through proximal processes, should not be conceived simply as additive.

³ Full references are given in Bronfenbrenner and Morris (1998).

Proximal processes and their relationship with personal characteristics and context happen at the microsystem level which includes several settings. According to Bronfenbrenner and Morris (1998), the family setting is the most relevant, followed by a whole range of others, namely: friend/peer groups, neighbourhoods, health care, and school (see also Bradshaw et al. 2007; Ben-Arieh 2008). Children influence and are influenced most directly by these settings. We will consider here that these settings are the basis from which to select the relevant dimensions of child well-being.

Based on the settings mentioned above, we argue that family, neighbourhood, school and health possibly encompass the largest part of children's lives, since, for example, it would not be inaccurate to assume that children's interactions with friends happen most often at school or in their neighbourhood. Within each of these settings we can find proximal processes and/or context variables that exert influence on children's lives. Both can be seen as comprising different dimensions of child well-being for each of the settings considered. Additionally, since children's personal characteristics have influence on their own well-being, factors such as their physical and psychological traits have to be taken into account. It should be noted, though, that some of these features per se—particularly the physical ones—may not directly imply constraints to the child's development and well-being; what they represent is disparity in the biological resources available for a child to engage in activities (Bronfenbrenner and Morris 1998). Put another way, they represent risk factors (Bronfenbrenner and Morris 1998). This goes for any of the physical psychological/behavioural factors, that is, they all represent risk factors to well-being. Additionally, we have to be aware that personal characteristics play a dual role in children's lives, in the sense that if, on the one hand, they influence child development, on the other, they can also be regarded as dependent variables (Bronfenbrenner and Morris 1998). This means that personal characteristics can represent risk factors and actually determine well-being at the same time, which is why they should be considered in the assessment of child well-being.

Based on the abovementioned aspects of Bronfenbrenner and Morris's model (1998), we can define three types of variables that exert influence on children's development and well-being (cf. Table 1):

- “context variables”;
- “interaction variables”, including “interaction with people” and “interaction with objects”;
- “personal characteristics variables” (or “psychobiological” factors).

The main settings in which children interact can incorporate one or more types of variables, that is, interaction and/or context variables. With regard to children's psychobiological characteristics, they will be treated as an independent group of variables.

Table 1 Main settings and types of variables included

Types of variables	Main settings				
	Family	Neighbourhood	School	Health	Personal characteristics
Context	X	X			
Interaction	X	X	X	X	
Psychobiological factors					X

Using the types of variables just mentioned and organizing them within the main settings, we can structure the child's environment as follows:

- family setting:
 - interaction variables: family relations, especially, child-parent relations, parents engagement in children's health, in children's school; also interaction with objects, such as reading, working on hobbies, access to computers, free time spent with media can be considered here;
 - context variables: different contextual topics can be covered, such as family and children's income, deprivation, and housing;
- school setting:
 - interaction variables: examples are student–teacher relations, student-peer relations, friends at school, educational achievement, educational engagement;
- neighbourhood setting:
 - interaction variables: such as family and child relations with neighbours, friends within the neighbourhood, engagement in activities within the neighbourhood;
 - context variables: neighbourhoods' socioeconomic characteristics, such as physical conditions, available services, including public transport, and infrastructures such as playgrounds can have impact on children's well-being;
- health setting:
 - interaction variables: visits to the doctor, nutrition, and also, among young teenagers, cigarette smoking, alcohol drinking, drug use, teenage pregnancy, among others, have impact on children's and young people's lives;
 - personal characteristics (psychobiological): factors such as permanent illness, physical handicaps, distractibility, aggressiveness, apathy, unresponsiveness, curiosity, or tendency to engage in activities are determinant of children's well-being.

From this categorization, which allows us to sort variables by their main features, and taking into account insights from a literature survey on child well-being indicators (Fernandes et al. 2012), we arrive at eight broad dimensions of child well-being, where three of them include context variables only, four include only interaction (with people or objects) factors and one considers personal characteristics factors only:

- Contextual dimensions:
 - Material well-being: related to family and child's material resources, such as income and deprivation;
 - Housing context: related to housing physical conditions;
 - Neighbourhood environment: related to neighbourhood socioeconomic features;
- Interaction dimensions:
 - Health: includes children's general health behaviours;
 - School/education: includes factors related to educational engagement/participation;
 - Leisure and recreation: covers other children's activities such as hobbies and extra-curricular activities;
 - Social relations: focuses mainly on children's relations with other people, such as family, friends and peers from school and/or neighbourhood.

Table 2 Settings, types of variables and dimensions

Types of variables	Settings				
	Family	Neighbourhood	School	Health	Personal characteristics
Context	Material well-being	–	–	–	–
	Housing context	–	–	–	–
	–	Neighbourhood environment	–	–	–
Interaction	Leisure and recreation	–	–	–	–
	Social relations	–	–	–	–
	–	–	School/ education	–	–
	–	–	–	Health (behaviours)	–
Psychobiological factors	–	–	–	–	Physical and psychological traits

- Psychobiological Factors:

- Child's personal characteristics: this dimension is ultimately related to children's physical and psychological traits.

Three remarks should be made about this dimensional breakdown. Firstly, these dimensions result directly from the previous categorization into settings and main types of variables (cf. Table 1). This new breakdown is, however, useful for the purpose of structuring the summary index that we are about to propose, since it enables distinguishing effects on children's well-being resulting from different types of factors, that is, impacts resulting from context factors, from interaction factors and from children's own personal characteristics. It should be noted that some dimensions cut across different settings since they include variables of the same type, namely the leisure and recreation, and the social relations dimensions (Table 2).

Secondly, the dimensions are all obviously interrelated. So it is actually quite difficult to establish a clear distinction and boundary between them and their individual impact on children's well-being. As Bronfenbrenner and Morris (1998) acknowledge, the main effects on children's outcomes are likely to be the result of interactions between factors—proximal processes, context and person—and, also, between settings. Nevertheless, dimensional breakdown is still a helpful exercise since it allows for a comprehensive representation of children's well-being and may point out to which dimensions represent challenges to social policy and deserve more attention (Bradshaw et al. 2007).

Thirdly, there are some family and child features that, although not directly related to well-being, represent additional potential risk factors, for example, family structure, age, ethnicity, and gender (Land et al. 2001, 2007; Aber et al. 2002; Meadows et al. 2005), which are worth analyzing to complement the assessment of children's circumstances, but cannot be included in one single dimension of child well-being.

3 A Child Well-Being Index: A New Methodological Approach

3.1 Implementing the Distinct Dimensions of Child Well-Being

In order to implement the distinct dimensions of child well-being (cf. Table 2) and focus on the measurement of objective items which are generally considered to characterize child well-being, we developed a questionnaire⁴ where the parents of the targeted children are the respondents. This questionnaire is, thus, intended to assess information on 41 indicators (cf. Table 3) that cover the eight dimensions previously identified.

The indicators were chosen taking into account existing literature on child well-being indicators (e.g., Land et al. 2001, 2007; Aber et al. 2002; Hoelscher 2004; Bradshaw et al. 2006, 2007; Moore et al. 2007, 2008; UNICEF 2007; Bastos et al. 2004, 2008; Bastos and Machado 2009; Bradshaw and Richardson 2009), and following also Bronfenbrenner and Morris' (1998) model of human development. Table 3 presents the complete list of indicators, sorted by dimensions, but before proceeding, some considerations on the choice of the indicators are in order.

Concerning the material well-being dimension, it is now more than established that the family's income level strongly influences children's well-being. A vast majority of studies on indicators of child well-being include at least one indicator of this kind (e.g., Land et al. 2001, 2007; Aber et al. 2002; Hoelscher 2004; Bradshaw et al. 2007; Moore et al. 2007, 2008; Bradshaw and Richardson 2009), reason by which it has also been included on our list.⁵ With regard to the deprivation level indicators on Table 3 (having meat/fish or equivalent vegetarian meals, having new shoes/clothes, celebrating special occasions, and having holidays away from home), they provide complementary and more direct information on children's material situation (Bradshaw et al. 2007). Following the work of Gordon et al. (2000), and the recommendations of Hoelscher (2004), we included indicators related to children's needs, namely, having meat/fish or equivalent vegetarian meals and having new shoes/clothes, as well as "soft indicators" (Hoelscher 2004), which encompass celebrating special occasions and having holidays away from home.

The housing context dimension is intended to capture children's living conditions. Research has shown that housing conditions affect children's well-being (see e.g., Aber et al. 2002; Hoelscher 2004; Bradshaw et al. 2007), so indicators related to physical housing problems, such as rotten windows, having a flushing toilet and a shower/bathtub (Bradshaw et al. 2007; Bradshaw and Richardson 2009), as well as indicators related to overcrowding and specifically to the child having or not his/her own private space in the house (Hoelscher 2004; Bastos et al. 2004, 2008; Bradshaw et al. 2007; Bastos and Machado 2009; Bradshaw and Richardson 2009), emerge as relevant.

The neighbourhood dimension can constrain children's well-being for several reasons, such as whether they have public spaces in which to play and/or whether the neighbourhood is safe or not (see e.g., Hoelscher 2004; Bradshaw et al. 2007; Moore et al. 2008); or whether the neighbourhood lacks important public services and amenities, such as public transportation and markets/supermarkets which are relevant to meet children's daily needs (Aber et al. 2002).

Health is obviously of the utmost importance as a dimension of child well-being and its inclusion in a child well-being index is unquestionably found in a vast majority of studies on the matter (e.g., Land et al. 2001, 2007; Bastos et al. 2004, 2008; Bradshaw et al. 2007;

⁴ Questionnaires are available upon request to the corresponding author.

⁵ Income categories in the questionnaire were defined according to the Portuguese National Statistics Institute's (INE 2008) categorization of the annual total net income of households, divided by the twelve months of the year in order to obtain monthly income.

Table 3 Elementary indicators

Dimensions	Indicators
Material well-being	<ul style="list-style-type: none"> • Household income; • Number of times: <ul style="list-style-type: none"> • a week the household provides the child with meat/fish (or vegetarian equivalent) meals; • every year the household: <ul style="list-style-type: none"> • buys new shoes/clothes for the child; • celebrates special occasions (e.g., birthday party); • has a vacation away from home.
Housing context	<ul style="list-style-type: none"> • Total number of rooms in the house; • Child has his/her own bedroom; • Child has his/her own bed; • House has: <ul style="list-style-type: none"> • rotten windows, doors and/or floors; • damp ceilings and/or walls; • a flushing toilet; • a shower/bathtub.
Neighbourhood environment	<ul style="list-style-type: none"> • Access to public transports; • Access to stores/markets/supermarkets; • Public spaces where the child can play (e.g., streets, parks, playgrounds, etc.); • Streets are safe for children to walk around alone; • Number of times the child plays in the street without adult supervision.
Health (behaviours)	<ul style="list-style-type: none"> • Child eats fruit and/or vegetables at least once a day; • Child has three meals a day; • Number of times in a day child brushes teeth; • Number of times in a year child has doctor appointments (excluding when sick).
School/education	<ul style="list-style-type: none"> • Child has repeated a grade; • Child has been suspended/expelled from school; • Child's relationship with teacher(s); • Child has help with homework.
Leisure and recreation	<ul style="list-style-type: none"> • Child has extra-curricular activities (e.g., sports, music, etc.); • Child has leisure activities at home (e.g., reading, watching TV, playing computer games, etc.); • Child has leisure activities outside the house (e.g., going to the movies, to the theatre, to the circus, etc.).
Social relations	<ul style="list-style-type: none"> • Child plays/spends time with parents/caregivers; • Child plays/spends time with brother(s)/sister(s)/other children living in the household; • Child talks about him/herself to parents/caregivers; • Child talks about him/herself to brother(s)/sister(s)/other children living in the household; • Number of close friends the child has; • Average number of days the child spends playing with friends; • Child's relationship with other children, besides friends.
Physical and psychological traits	<ul style="list-style-type: none"> • Child has physical and/or mental limitations/handicaps; • Child is physically underdeveloped; • Child has chronicle/long-term disease (e.g., asthma, diabetes, etc.); • Child has concentration problems; • Child has aggressive behaviours; • Child reveals lack of interest in his/her surroundings.

Moore et al. 2007, 2008; Bastos and Machado 2009; Bradshaw and Richardson 2009). For reasons explained earlier, we opted to only consider health-related behaviours in this dimension, whereas physical and psychological traits are treated as a separate dimension.

Nutrition and having healthy food (Aber et al. 2002; Hoelscher 2004; Bradshaw et al. 2007; Bradshaw and Richardson 2009), visits to the doctor (Aber et al. 2002; Hoelscher 2004) and brushing teeth habits (Bradshaw et al. 2007; Bradshaw and Richardson 2009) are all considered relevant health behaviours that impact on children's well-being.

Children spend a large part of their time at school (Aber et al. 2002; Hoelscher 2004). Their enrolment in education represents an important indicator of participation in society, which has impact on children's well-being not only in the present but also in their future lives (Aber et al. 2002; Hoelscher 2004; Bradshaw et al. 2007). Thus, educational achievement, here measured through "repeating a grade", becomes an important indicator (Moore et al. 2008). Children's behaviours towards school have impact on their educational achievement (Aber et al. 2002; Hoelscher 2004), hence it is important to observe factors such as school suspension/expulsion (Moore et al. 2007). Teacher-student relationships and having support from parents, caregivers or others also impact on school attainment (Aber et al. 2002; Hoelscher 2004; Bastos et al. 2004, 2008; Bastos and Machado 2009).

Leisure and recreation activities are important for children's development (Bronfenbrenner and Morris 1998) and participating in such activities is essential to children's well-being (Hoelscher 2004). These include all kinds of activities developed at home, like watching TV, reading, or playing games, having private lessons, such as sports and music, and also activities developed outside the house, such as going to the movies, theatre or circus (Hoelscher 2004; Bastos et al. 2004, 2008; Bastos and Machado 2009).

The quality and quantity of social relations are central to children's well-being (Hoelscher 2004), including relations with children's significant others, namely their parents, siblings and friends (Aber et al. 2002; Hoelscher 2004; Bastos et al. 2004, 2008; Bradshaw et al. 2007; Moore et al. 2007, 2008; Bastos and Machado 2009; Bradshaw and Richardson 2009).

Children's personal resources, specifically physical and psychological traits, have a direct impact on their development, and therefore on their well-being, and can also influence how children interact with other important dimensions of their lives (Bronfenbrenner and Morris 1998). Thus, overall physical and psychological healths are key components of children's well-being (Moore et al. 2007, 2008). Specifically, physical and/or mental handicaps, underdevelopment and chronic/long-term diseases, as well as behavioural problems like aggressiveness, lack of concentration and lack of interest in the surrounding environment, can be considered relevant indicators for this dimension (Bronfenbrenner and Morris 1998; Moore et al. 2008).

Other information, such as composition of the household, nationality and ethnic origins of the household members, parents' or caregivers' employment situation and education level, is also addressed on the questionnaire. All these represent potential risk factors (see e.g., Land et al. 2001, 2007; Aber et al. 2002; Meadows et al. 2005), meaning that each of these elements in themselves do not directly influence children's well-being but can place them at a higher risk of constraints to their well-being, and are thus worthy of analysis. It should be noted that parents/caregivers' level of education and employment situation are often considered indicators of child well-being (e.g., Land et al. 2001, 2007; Aber et al. 2002; Bradshaw et al. 2007; Bradshaw and Richardson 2009). These can indeed be determinant to the household's income poverty and, therefore, to deprivation levels (Aber et al. 2002; Bradshaw et al. 2007; UNICEF 2007), but we consider them as not exerting direct influence on children's well-being. Hence, they are included in the category of risk factors and should be analyzed separately from the composite child well-being index.⁶

⁶ Moore et al. (2007, 2008) also refer to these components as 'risk factors' and analyze them together with contextual variables instead of within the group of individual well-being variables.

Following the main trend in the literature on poverty and deprivation measurement (e.g., Gordon et al. 2000; Rodrigues and Andrade 2010), in the material well-being dimension, along with the questions on the number of times the household provides the child with meat/fish (or vegetarian equivalent) meals, new shoes/clothes, celebrations on special occasions and vacations away from home, a question is added to obtain information on whether the household would provide more of these items if they had a higher income. The rationale behind this question is to try to assess if the household can afford, or not, those items and to try to isolate situations where the household can actually afford the items but simply chooses not to buy them.

An additional question about the parents'/caregivers' perceptions of their child's overall happiness is also included. Thus, parents/caregivers are asked "On a scale from 1 to 10, where 1 represents "Not happy at all" and 10 represents "Extremely happy", please indicate, in your opinion, how happy is the child?". This question is added in order to compare these perceptions with the results of the overall child well-being index. A similar question will also be considered in the children's questionnaire, they are asked "Thinking about your life and on a scale from 1 to 10, where 1 represents "Not happy at all" and 10 represents "Extremely happy", please indicate how happy are you?".⁷ This will additionally allow us to compare parents' and children's perceptions of their well-being and draw some conclusions about the adequacy of considering parents as respondents when trying to assess subjective factors pertaining to children's lives.

3.2 Aggregating the Dimensions of Child Well-Being

With regard to the aggregation of the child well-being dimensions into a single composite indicator, a major issue needs to be addressed at the outset: the relative importance each dimension should have on overall well-being (and the importance each indicator should have within each dimension), that is, the weighting scheme.

3.2.1 Review of the Current Weighting Scheme Proposals

3.2.1.1 Composite Well-Being Indexes for the Total Population The construction of composite summary indexes implies choosing a method to aggregate the elementary indicators, a matter that generates little agreement among social scientists (Hagerty and Land 2007). For this reason, social indicators are often aggregated considering that each particular indicator has the same importance as the next one, that is, equal weights are assumed, both for the indicators within dimensions and for dimensions in relation to the overall indicator (Hagerty and Land 2007).

Hagerty and Land (2007) have demonstrated that in the absence of estimates of the importance a population places on certain life aspects, the equal weighting system becomes the most appropriate when aggregating information into a single composite index, since it allows for greater agreement among individuals about the importance that each indicator should have. However, the authors have also established that a much higher level of

⁷ Two remarks should be made about the overall happiness question, one about the wording and another about the scaling. First, the word "happiness" was used instead of "satisfaction" because "happiness" seems to be a much easier concept for children to understand as the term "satisfaction" is not very commonly used amongst children and young people (Rees et al. 2010). Second, a ten-point scale was used to assess overall happiness because, following Cummins' (2003) work on life satisfaction scales, these types of scales have demonstrated to be superior in representing people's levels of life satisfaction when compared to smaller scales of five or seven points.

agreement arises when using true weights, derived from surveys done for the purpose of estimating the importance placed by individuals on each indicator. By comparing the attitudes of a group of people with regard to the results of two composite well-being indexes, one using equal weights and the other using weights derived from the group members' opinions, Hagerty and Land (2007: 486) concluded "[a]greement is maximized by using the average weights from a survey of individuals' importance".

In an attempt to measure and compare social exclusion of immigrants and Germans in Germany, Haisken-DeNew and Sinning (2007) also followed an approach different from uniform weights. In line with the life satisfaction literature, the authors propose a set of weights based on an analysis of the extent to which the dimensions of a social inclusion index contribute to the individual's general life satisfaction (Haisken-DeNew and Sinning 2007). The conclusions they reached are quite revealing. Using a weighting scheme based on the individuals' (immigrants vs. Germans) subjective evaluations about the contribution of each inclusion dimension to overall life satisfaction allows for a different picture on how immigrants are fairing in Germany. With this type of weights, "on the whole immigrants are as equally 'deprived' (or not) as Germans" (Haisken-DeNew and Sinning 2007: 18).

Another recent study on material deprivation, conducted by Rodrigues and Andrade (2010), analyzes the impact of considering different weighting systems when assessing material deprivation through a composite indicator. The authors compare the results of material deprivation when using an equal weighting system with the results obtained using a weighting system derived from a survey that reflects the social perception of the importance of the items considered in the material deprivation indicator. The weights of this second approach were derived from the Eurobarometer survey of 2007 on "Poverty and Social Exclusion". The authors concluded that when applying these different weights to the material deprivation indicator the number of deprived households was reduced significantly (Rodrigues and Andrade 2010).⁸

Albeit in the latter case weights are 'aggregated' and not individually considered, the evidence from the abovementioned studies suggests that taking into account the subjective perceptions of individuals (Haisken-DeNew and Sinning 2007) or groups of individuals (Hagerty and Land 2007; Rodrigues and Andrade 2010) on the relative importance of the dimensions (and indicators in each of those dimensions) in their own well-being may lead to substantially different results, compared to the case where an equal weighting system is used to construct a composite index. Thus, people's subjective perceptions about their own lives, together with objective indicators – which have proven to be useful but are often considered narrow-focused (Diener 1994; Diener and Seligman 2004; Land et al. 2007) -, should be part of the construction of indexes measuring people's well-being.

3.2.1.2 Composite Indexes of Child Well-Being Literature on composite measures of child well-being has tended to adopt the uniform weighting scheme. This is the case, for example, of the works of Land et al. (2001, 2007), Bastos et al. (2004, 2008), Bradshaw et al. (2007), Moore et al. (2007, 2008) and Bradshaw and Richardson (2009) (Fernandes et al. 2012). An exception is the research developed by Bastos and Machado (2009). Here the authors opted to place more importance on the indicators in which deprivation was not widespread and, consequently, non-possession of certain items, the authors argue, translates into a strong feeling of deprivation (Bastos and Machado 2009). However, although different from uniform weights, the weighting scheme adopted by Bastos and Machado far

⁸ For other works on alternative weighting schemes see, for example, Decancq and Lugo (2010), Guio et al. (2009), and De Kruijk and Rutten (2007).

from represents the real weights of the items considered in the construction of their composite deprivation index, since they do not take into account children's perceptions of those items' relative importance (Fernandes et al. 2012).

Hence, considering the recommendations and results from the literature on composite indexes and weighting schemes on the one hand, and what has and has not been done by the main research works on composite measures of child well-being on the other, we put forward a new proposal for weighting indicators when constructing composite indexes of child well-being: weights should be derived from inquiries to the children themselves. This opens space for the participation of children in what can be considered a determinant stage in the measurement of their well-being process: the importance they place on each 'objective' elementary indicator.

3.2.2 *Proposing a New Weighting Scheme Based on Micro (Individual Children's) Perceptions*

Subjective well-being has come to be considered a crucial aspect that needs to be taken into account when analyzing child well-being (Aber et al. 2002; Bradshaw et al. 2007; UNICEF 2007; Fernandes et al. 2012). Several studies on child well-being indicators do take subjective well-being into consideration in one way or another: by including a dimension of subjective well-being in the indicator of overall well-being (see, for example, Bradshaw et al. 2006, 2007; UNICEF 2007); or by considering empirical research on subjective well-being when identifying the relevant domains of well-being (see Land et al. 2001, 2007). But what is subjective well-being exactly?

Some authors consider subjective well-being to be "the degree to which an individual judges the overall quality of her or his life as a whole in a favourable way" (Diener 1994: 106). Others define subjective well-being as "both a cognitive evaluation and some degree of positive or negative feelings, i.e., affect" (Andrews and Withey 1976: 18).⁹ The implicit theory in these and similar definitions is that individuals are capable of evaluating life events and circumstances in terms of cognitive considerations and/or in terms of affect (Diener 1994). This definition of subjective well-being is very close to that of another concept: the concept of attitude.

According to Ajzen (2001), an "attitude represents a summary evaluation of a psychological object captured in such attribute dimensions as good-bad, harmful-beneficial, and likable-dislikeable" (Ajzen 2001: 28). Hence, attitudes can be conceived as predispositions to respond to certain objects with certain classes of responses (Fishbein and Ajzen 1974; Greenwald 1989; Cross 2005) or characterized as evaluations of an attitude object "on a pro to con continuum" (Ostrom 1969: 16). Consequently, it is possible to conclude that measuring subjective well-being is basically measuring attitudes (Andrews and McKenel 1980).

In Sect. 2 we defined the dimensions of well-being based on the ecological human development model (Bronfenbrenner and Morris 1998). We did not base our choice of dimensions on empirical research on subjective well-being, nor did we distinguish a dimension of subjective well-being. But, if perceived or subjective well-being is relevant to the overall well-being of individuals, how can we introduce this kind of considerations into our framework? The answer to this question is implicit in our weighting scheme proposal for the summary child well-being index. With regard to this aspect, a quick word on child agency is in order.

Child agency is an important issue that researchers have paid greater attention to (Ben-Arieh 2005; Sutton et al. 2007; Redmond 2008, 2009). There is a growing number of studies (e.g., Ben-Arieh 2000, 2006, 2008; Land et al. 2001, 2007; Aber et al. 2002; Hoelscher 2004;

⁹ For some more definitions see, for example, Diener (1994).

Bradshaw et al. 2006, 2007; Moore et al. 2007, 2008; UNICEF 2007; Bastos et al. 2004, 2008; Bastos and Machado 2009; Bradshaw and Richardson 2009) where the child is the unit of analysis, not considered simply as a passive research object, but rather as an agent whose perceptions and attitudes have to be expressed and taken into account, when his/her well-being is at stake.

A particular way of involving children in the study of their own well-being is to try to capture their views in the measurement of their life circumstances. Using data resulting from surveys where children are asked about several, mostly objective, aspects of their lives has been the solution presented by several studies (e.g., Land et al. 2001, 2007; Bradshaw et al. 2007; Bradshaw and Richardson 2009).

Another course of action, and the one proposed here, involves asking children about subjective aspects of their lives, which has to some extent been done by some of the previously mentioned studies (e.g., Bradshaw et al. 2006, 2007; Bradshaw and Richardson 2009; Bastos et al. 2004, 2008; Bastos and Machado 2009). In our case, however, this information is treated differently: it is used to generate weights for the composite well-being index.

Specifically, within each dimension, children are asked to organize the several items included in the parents' questionnaire (cf. Table 3) according to their importance, that is, to order the items from the most to least important. Ordering dimensions according to their importance must also be requested. This means that besides a parents' questionnaire, a children's questionnaire also had to be built. Following this procedure solves two issues usually raised in the child well-being literature: children are more adequately involved in the measurement of their well-being and, moreover, the weights of the indicators and dimensions considered in the construction of a child well-being index correspond to their 'true' relative importance, since they result from children's perceptions of several aspects of their lives.

Thus, we argue, the weights of the index's indicators and dimensions have to be obtained from questionnaires that focus on children's perceptions of the relative importance of those items for their well-being. These perceptions are no different from attitudes, so the questionnaires are essentially measuring children's attitudes towards these different aspects of their lives. According to previous conclusions about the existing relationship between the concept of attitudes and that of subjective well-being, this means that subjective well-being is in fact being introduced in our framework. Indeed, our proposed child well-being index can be conceived as both an 'objective' and 'subjective' measure of well-being, since it combines objective items with children's subjective perceptions about them.

3.3 The New Composite Well-Being Index: Implementing the Dimensions and Weighting Scheme

Following the rationale and procedures put forward in previous sections, we can now define the well-being indicators for each dimension (material well-being, housing context, neighbourhood environment, health (behaviours), school/education, leisure and recreation, social relations and finally, psychobiological traits). However, before doing so, an additional methodological procedure needs to be introduced.

In the children's questionnaire that we propose here, besides being asked to organize items within dimensions according to their importance, children are also required to classify each item according to a degree of importance on a five point scale that goes from "Not important" to "Extremely important".¹⁰ This procedure allows us to distinguish the

¹⁰ According to Oppenheim (1992), when measuring attitudes it is preferable not to have many neutral items or many extreme items at either end of the scale, which justifies the choice of a five point scale.

different degrees of impact having or not having a certain item may have on children’s well-being, and this according to their own perceptions on the importance of the items. Thus, instead of having to define thresholds of well-being for each item, we have degrees of well-being for each of these items. Most research works have adopted a different methodology. In particular, in research works using microdata, such as in Bastos et al. (2004, 2008) and Moore et al. (2007, 2008), thresholds are defined by the researchers themselves and indicators are taken to be binary, assuming the values 0 or 1.

Bastos and Machado (2009) employ a different methodology. Recognizing that deprivation cannot be conceived as a binary variable (Bastos and Machado 2009), the authors opt for a fuzzy conceptualization of deprivation, considering it as a graded variable. Accordingly, Bastos and Machado (2009) define a membership function that varies between 0 and 1, where 0 means no deprivation, 1 means total deprivation and values between 0 and 1 mean partial deprivation. This approach, the authors argue, avoids establishing a single dichotomous classification (Bastos and Machado 2009). Our approach also has this advantage. Additionally, in our formulation, the degree of well-being is not externally imposed on the individual child; it results instead from the children’s own perceptions. This can be considered another advantage to our methodology, since it allows children to further participate in the measurement of their own well-being.

Hence, children’s subjective evaluations about their own lives are introduced in two different ways: besides being present in the weighing scheme that we propose and describe in previous sections, it is also considered in children’s evaluations about the importance degree each item has for them. This reinforces the claim we made earlier that the proposed index can be considered not only an objective but also a ‘subjective’ measure of well-being.

Summing up, in our proposal, the indicators for each child and each dimension are defined as follows.

3.3.1 Material Well-Being Indicator (MWI)

$$MWI = w_{MW1}f_{MW1} + w_{MW6}[w_{MW2}f_{MW2} + w_{MW3}f_{MW3} + w_{MW4}f_{MW4} + w_{MW5}f_{MW5}]$$

where f_{MWi} is a function of x_{MWi} and g_{MWi} , referring x_{MWi} to the elementary indicators $i = 1, \dots, 5$ of dimension *MW* (material well-being) for the individual child and g_{MWi} to the degree of importance given by the individual child to indicator $i = 1, \dots, 5$; w_{MWi} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 5$. In this particular case, the sum of $(w_{MW2}f_{MW2} + w_{MW3}f_{MW3} + w_{MW4}f_{MW4} + w_{MW5}f_{MW5})$ is attributed a particular weight w_{MW6} by the individual child, since it constitutes a sub-indicator translating the level of deprivation.

3.3.2 Housing Context Indicator (HCI)

$$HCI = w_{HC1}f_{HC1} + w_{HC2}f_{HC2} + w_{HC3}f_{HC3} + w_{HC4}f_{HC4} + w_{HC5}f_{HC5} + w_{HC6}f_{HC6} + w_{HC7}f_{HC7}$$

where f_{HCi} is a function of x_{HCi} and g_{HCi} , referring x_{HCi} to indicators $i = 1, \dots, 7$ of dimension *HC* (housing context) for the individual child and g_{HCi} to the degree of importance given by the individual child to indicator $i = 1, \dots, 7$; w_{HCi} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 7$ of dimension *HC*.

3.3.3 Neighbourhood Context Indicator (NCI)

$$NCI = w_{N1}f_{N1} + w_{N2}f_{N2} + w_{N3}f_{N3} + w_{N4}f_{N4} + w_{N5}f_{N5}$$

where f_{NCi} is a function of x_{NCi} and g_{Ni} , referring x_{NCi} to indicators $i = 1, \dots, 5$ of dimension NC (neighbourhood context) for the individual child and g_{Ni} to the degree of importance given by the individual child to indicator $i = 1, \dots, 5$; w_{NCi} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 5$ of dimension NC .

3.3.4 Health (Behaviours) Indicator (HI)

$$HI = w_{H1}f_{H1} + w_{H2}f_{H2} + w_{H3}f_{H3} + w_{H4}f_{H4}$$

where f_{Hi} is a function of x_{Hi} and g_{Hi} , referring x_{Hi} to indicators $i = 1, \dots, 4$ of dimension H (health) for the individual child and g_{Hi} to the degree of importance given by the individual child to indicator $i = 1, \dots, 4$; w_{Hi} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 4$ of dimension H .

3.3.5 School Indicator (SI)

$$SI = w_{S1}f_{S1} + w_{S2}f_{S2} + w_{S3}f_{S3} + w_{S4}f_{S4}$$

Where f_{Si} is a function of x_{Si} and g_{Si} , referring x_{Si} to indicators $i = 1, \dots, 4$ of dimension S (school) for the individual child and g_{Si} to the importance given by the individual child to indicator $i = 1, \dots, 4$; w_{Si} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 4$ of dimension S .

3.3.6 Leisure and Recreation Indicator (LRI)

$$LRI = w_{LR1}f_{LR1} + w_{LR2}f_{LR2} + w_{LR3}f_{LR3}$$

where f_{Lri} is a function of x_{Lri} and of g_{Lri} , referring x_{Lri} to indicators $i = 1, \dots, 3$ of dimension LR (leisure and recreation) for the individual child and g_{Lri} refers to the degree of importance given by the individual child to indicator $i = 1, \dots, 3$; w_{Lri} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 3$ of dimension LR .

3.3.7 Social Relations Indicator (SRI)

$$SRI = w_{SR1}f_{SR1} + w_{SR2}f_{SR2} + w_{SR3}f_{SR3} + w_{SR4}f_{SR4} + w_{SR5}f_{SR5} + w_{SR6}f_{SR6} + w_{SR7}f_{SR7}$$

where f_{Sri} is a function of x_{Sri} and g_{Sri} , referring x_{Sri} to indicators $i = 1, \dots, 7$ of dimension SR (social relations) for the individual child and g_{Sri} refers to the degree of importance given by the individual child to indicator $i = 1, \dots, 7$; w_{Sri} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 7$ of dimension SR .

3.3.8 Psychobiological Characteristics Indicator (PCI)

$$PCI = w_{PC1}f_{PC1} + w_{PC2}f_{PC2} + w_{PC3}f_{PC3} + w_{PC4}f_{PC4} + w_{PC5}f_{PC5} + w_{PC6}f_{PC6}$$

where f_{Pci} is a function of x_{Pci} and of g_{Pci} , referring x_{Pci} to indicators $i = 1, \dots, 6$ of dimension PC (psychobiological characteristics) and g_{Pci} to the degree of importance given by the individual child to indicator $i = 1, \dots, 6$; w_{Pci} refers to the weight attributed by the individual child to indicators $i = 1, \dots, 6$ of dimension PC .

Thus, the overall child well-being indicator (OCWI) for each child comes as follows:

$$OCWI = W_{MW}MWI + W_{HC}HCI + W_{NC}NCI + W_HHI + W_SSI + W_{LR}LRI + W_{SR}SRI + W_{PC}PCI$$

where W_i refers to the weight attributed by the individual child to each of the dimensions $i = MW, \dots, PC$.

Consequently, we are proposing here an individual (micro) overall well-being indicator, built as detailed above, that is intended to assess the well-being of each individual child.

4 Comparing the Newly Proposed Index With Alternative Scenarios

One way of testing the added value of the proposed composite child well-being index is to estimate the impact of the determinants of child well-being according to different calculation scenarios/methodologies/indexes resorting to econometric techniques. Specifically, we compare the estimation results obtained for our proposed index with the results obtained for three alternative calculation scenarios: no weights and no degree of importance (Scenario 1); no weights but considering the degree of importance (Scenario 2); with weights but considering no degree of importance (Scenario 3). Such exercise is made resorting to a sample of Portuguese children. The next section provides a brief description of this sample.

4.1 A Brief Description of the Sample of Children Used

The target population of our study was the child population attending the third, fourth, fifth and sixth grades of public and private schools from the Northern region of Portugal.^{11,12}

The proportion of children enrolled in private and public schools was then calculated for each school cycle and efforts were made to include at least one school from each of the sub-regions (NUTS III) in the country's North region. Schools were then randomly selected according to these specifications. Children were not individually selected. After direct contacts with schools, we obtained responses from 1,262 children and their respective parents/carers, so the number 1,262 refers to the pair child-parent (which corresponds to a total of 2,524 responded questionnaires). Some responses/questionnaires had to be excluded from the analysis due to unsolvable inconsistencies between the child's and the parent's answers to the questionnaires, so the number of cases was reduced to 1246.¹³

The effective respondent sample comprises (1,246) children between the ages of 8 and 13 years-old. For such a sample, excluding those aged 12 and 13 (who represent, respectively, 11.1 % and 1.3 % of the total), the share across all age groups is between around 18 % (8 year-olds and 11 year-olds) and 26 % (9 year-olds) (cf. Table 4). Distribution across school grade is also relatively homogeneous: 27.8 % are enrolled in the third

¹¹ According to the Portuguese Ministry of Education (www.gepe.min-edu.pt), in 2008/2009 and for the North region of the country, around 183,500 children were registered in the third, fourth, fifth and sixth grades of the education system.

¹² Data was gathered through two questionnaires applied to children themselves and their parents/carers. The questionnaires were sent to the schools that agreed to take part in the study with precise instructions on how to be applied. Children answered the questionnaire in the classroom and the parents' questionnaire was sent home to be completed and then returned. Only one of the parents/carers had to answer the questionnaire that was sent home. The process of data gathering took place between April and June of 2011.

¹³ The exclusion of cases was made based on inconsistencies between the children's and parents' answers concerning the existence of siblings/other children in the household. For all other cases where the inconsistency related to non-absolute answers, these were corrected; for the cases where data was missing on the children's behalf, the parents' answer was considered; and for the cases where data was missing on the parents' behalf, the children's answer was considered.

grade, 28.0 % in the fourth grade, and 21.3 and 22.8 % in the fifth and sixth grades, respectively. In terms of gender (male vs. female) and type of school (private vs. public), 47.2 % of the children surveyed are male and about 26.8 % attend private schools.

The vast majority of the children in the sample (94.3 %) live in households which include individuals of Portuguese nationality only. The remaining children belong to households with double nationality (including Portuguese) and foreign households (2.2 % and 3.5 %, respectively).¹⁴

About one-third (31.9 %) of the children live in households with a net monthly income between 180 and 270 % of the (2012) Portuguese (gross) minimum wage (i.e., between 868€ and 1300€/month). Income-poor children (i.e., no income or net income below 867€) represent 37.8 % of the total. Only 9.8 % of the children surveyed live in households with a relatively high income (more than 2601€/month). With regard to the parents' (or individuals responsible for the child's care) occupation, in almost three quarters of the cases (72.9 %), the mother (female carer) is employed (whereas 21.8 % are unemployed and 5.3 % are not in the labour market). In the case of the father (or male carer), 84.2 % are employed and 9.1 % unemployed.

Parents (especially, fathers) are relatively low educated. Indeed, around 60 % of the children's parents have less than 9 years of schooling. Only 18 % (23.9 %) of the fathers (mothers) surveyed have a higher education degree.

It is also worth summarizing the basic results regarding the degree of happiness (from 1—Not happy at all, to 10—Extremely happy) as reported by the children themselves and by their parents. In terms of the children's answers, almost three quarters (73.6 %) reported being extremely happy (rated at 9 or 10); less than 2 % reported low levels (below 5) of happiness. The parents' answers are less extreme but still quite optimistic, with 68.2 % claiming that their offspring are quite happy (rated at 9 and 10) and less than 1 % thinking their children are not really happy (rated at below 5) (Table 4).

4.2 Computing the Composite Child Well-Being Index

To obtain the overall child well-being index we first compute the indexes of each individual well-being dimensions, as described in Sect. 3.¹⁵

In the computation of the index for each of the well-being dimensions, a simple additive formula was applied but different weights were considered. These weights result from the ranking of items by children. For each dimension, children were asked to organize the

¹⁴ The original parents' questionnaire also included a question about the household's ethnic origins but due to the large amount of missing data, this information was considered unsuitable for analysis.

¹⁵ Regarding the objective individual indicators (reported by parents), two rules of thumb were considered: "having" (for positive indicators, "not having" for negative indicators) is better than "not having" ("having" for negative indicators) and "having more" is better than "having less". So, considering a positive indicator of any one of the dimensions defined, we assume for every individual child that if he/she has a certain item (scoring 1) then that same child is better off than a counterpart that does not have that item (who scores 0). Following the same type of reasoning, if an individual has more of a certain item (scores more than 1), that individual will be better off than another one who has the item but in a lesser quantity. Additionally, we also consider the importance degree the child states each item to have for him/her. Thus, if a child has a certain item, his/her well-being will increase according to the importance he/she attaches to that item. For example, if the child has an item (scores 1 in objective terms) and on a scale from 1 to 5 values that item in 4, then his/her well-being score for that item will be 4; if a child does not attribute any importance to that item (reports 1 in terms of importance degree), then his/her well-being score will be 1. On the other hand, if the child does not have that item, she/he will be attributed a negative score according to the importance degree she associates to the item, plus 1 (so negative scores can go from -4 to -1). Also according to this, if the child does not have the item and does not value that item then his/her well-being score will be 0.

Table 4 Main statistics for the respondent sample

Main variables		Percentage	
Age (years)	8	17.6	
	9	26.3	
	10	24.0	
	11	19.6	
	12	11.1	
	13	1.3	
Gender	Male	47.2	
	Female	52.8	
School grade	3rd	27.8	
	4th	28.0	
	5th	21.3	
	6th	22.8	
Type of school	Private	26.8	
	Public	73.2	
Household nationality	Portuguese	94.3	
	Portuguese and other	2.2	
	Other	3.5	
Household income level	No income	2.8	
	From 1€ to 433€	10.5	
	From 434€ to 867€	24.4	
	From 868€ to 1300€	31.9	
	From 1301€ to 1734€	10.0	
	From 1735€ to 2600€	10.5	
	More than 2600€	9.8	
		Mother	Father
Professional situation	Employed	72.9	84.2
	Unemployed	21.8	9.1
	Retired	1.0	2.1
	Other/not applicable	4.3	4.6
		Mother	Father
Education level	No education	1.5	1.2
	Basic school (1st–9th grade)	56.3	61.4
	High school (10th–12th grade)	18.3	19.4
	Higher education (Bachelor degree, Master, PhD)	23.9	18.0
		Child	Parents
Reported happiness	1	0.4	0.1
	2	0.2	–
	3	0.5	–
	4	0.7	0.7
	5	3.4	2.1
	6	2.4	2.3
	7	5.0	7.4
	8	13.7	19.3
	9	16.5	23.0
	10	57.1	45.2

individual items from first (more important) to last (less important). Following a procedure similar to the one adopted by De Kruijk and Rutten (2007) in the calculation of a composite poverty index for the adult population of the Maldives, the greater weight was attributed to items placed first, the second greater weight to items placed second, and so on.^{16,17}

For all indexes, that is, the overall well-being index (OCWI) and the individual dimensions of well-being indexes (i.e., material well-being (MWI), housing context (HCI), neighbourhood context (NCI), health behaviours (HI), school well-being (SI), leisure and recreation (LRI), social relations (SRI) and psychobiological characteristics (PCI)) the minimum possible score is -4 and the maximum score varies across dimensions, being the highest maximum score the one for the material well-being (MWI) domain (top possible score is 25) and the lowest maximum score the one for the housing context (HCI) and the psychobiological characteristics domains (PCI) (both have a maximum score of 5). The maximum score for the overall child well-being index is around 17. Due to missing data, the pair of children/parent for which it was effectively possible to calculate the overall child well-being index was 914.

4.3 Child Well-Being Indicators: Does the Consideration of Degrees of Importance and Weights Matter?

In order to determine whether considering degrees of importance and weights renders different results from the case where they are not considered or are only partially considered, we estimated an OLS model for the determinants of child well-being considering our proposed index and three alternative scenarios regarding the computation of the index: no weights and no degree of importance (Scenario 1); no weights but considering the degree of importance (Scenario 2); with weights but considering no degree of importance (Scenario 3) (see Table 5).

The models' dependent variable is the overall child well-being and the independent variables considered are: child's age, sex and school cycle (1st cycle vs. 2nd cycle); both parents' professional status (unemployed or not) and both parents' education level (no education, basic school, high school, higher education); household's nationality (Portuguese or other); and type of school frequented by the child (private vs. public).

Since child's age and school grade, as well as the mother's and the father's education level, were highly correlated, we estimated four different models, where age and school grade are not simultaneously considered and the same for the mother's and father's level of education. Table 5 summarizes the impact of each of the independent variables considered on the overall child well-being for each of the calculation scenarios.

¹⁶ We imposed that within dimensions all the weights have to sum one. To compute the overall well-being index, the individual domain indexes were summed using the same procedure, having each of the well-being dimensions been attributed a different weight, which also resulted from children's ranking of dimensions.

¹⁷ Given that the index comprises so many items, it was very likely that any given child might be missing an item, which ended up having impact on the overall sample size. So for analysis purposes and in order to maximize the sample size we imputed missing data. Data was imputed considering the most common responses (modal response) according to selected features of the household and/or the child (income category, sex, age, school year, having siblings, etc.) and this method was adopted for imputation of missing data concerning parents' answers and for children's answers regarding the degrees of importance. In what respects the weights of each indicator and dimension attributed by children, missing data was imputed using the mean weights, also determined according to a set of child features (sex, age and school year). We chose not to impute missing data for income nor for other variables characterizing the household and the child (nationality, mother and father's education level and employment situation, type of school frequented by the child, child's age, gender and school grade, reported happiness degree by parents and by the child).

Table 5 Determinants of the overall child well-being using different index calculation methods [OLS estimates]

Dimensions/variables/ fitness of the model	OCWI (in ln)—proposed index: WITH weights and WITH degree of importance				OCWI (in ln)—scenario 1: NO weights and NO degree of importance			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Child related variables								
Gender (1 = girl; 0 = boy)	-0.005	-0.006	-0.004	-0.005	0.009	0.011	0.009	0.013
Age (ln)	-0.158***		-0.176***		-0.149***		-0.163***	
School cycle (1 = 3rd and 4th grades; 0 = 5th and 6th grades)		0.044***	0.043***		0.041***		0.042***	
Parents related variables								
Mother's education level (ln)	0.223***	0.228***	0.251***	0.252***	0.134***	0.153***	0.145***	0.155***
Father's education level (ln)	-0.067***	-0.067***	-0.061***	-0.062***	-0.033***	-0.033***	-0.030***	-0.032***
Mother professional status (1 = unemployed; 0 = other)	-0.114***	-0.114***	-0.111***	-0.113***	-0.061***	-0.059***	-0.059***	-0.058***
Family related variables								
Nationality (1 = Portuguese nationality only; 0 = other)	0.081***	0.080**	0.087***	0.086***	0.056***	0.067***	0.058***	0.076***
School related variable								
Type (1 = public; 0 = private)	-0.051***	-0.051***	-0.049***	-0.050***	-0.046***	-0.044***	-0.046***	-0.048***
Constant	2.081	1.694	2.100	1.677	2.514	0.674	0.278	0.700
N	808	810	786	788	811	811	820	789
Goodness of fit								
Adjusted R ²	0.249	0.251	0.273	0.272	0.289	0.303	0.297	0.298
F (p value)	39.185 (0.000)	39.653 (0.000)	43.167 (0.000)	43.109 (0.000)	47.989 (0.000)	51.864 (0.000)	48.579 (0.000)	49.294 (0.000)

Table 5 continued

Dimensions/variables/fitness of the model	OCWI (ln)—scenario 2: NO weights and WITH degree of importance					OCWI (ln)—scenario 3: WITH weights and NO degree of importance				
	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 16	Model 16	Model 17	
Child related variables										
Gender (1 = girl; 0 = boy)	0.007	0.011	0.008	0.014	-0.004	-0.004	-0.004	-0.004	-0.003	
Age (ln)	-0.210***	0.060***	-0.226***	0.061***	-0.134***	0.035***	-0.148***	-0.148***	0.034***	
School cycle (1 = 3rd and 4th grades; 0 = 5th and 6th grades)										
Parents related variables										
Mother's education level (ln)	0.159***	0.192***		0.189***	0.182***	0.187***		0.210***	0.212***	
Father's education level (ln)	-0.032**	-0.031**	-0.028*	-0.030*	-0.058***	-0.058***	-0.055***	-0.055***	-0.056***	
Mother professional status (1 = unemployed; 0 = other)										
Father professional status (1 = unemployed; 0 = other)	-0.071***	-0.066***	-0.069***	-0.066***	-0.093***	-0.094***	-0.088***	-0.088***	-0.090***	
Family related variables										
Nationality (1 = Portuguese nationality only; 0 = other)	0.084***	0.108***	0.087***	0.119***	0.055**	0.054**	0.060**	0.060**	0.060**	
School related variable										
Type (1 = public; 0 = private)	-0.058***	-0.054***	-0.057***	-0.060***	-0.048***	-0.048***	-0.044***	-0.044***	-0.046***	
Constant	2.081	2.219	1.647	2.249	1.651	0.604	0.277	0.277	0.613	
N	808	811	820	789	798	808	811	811	786	
Goodness of fit										
Adjusted R ²	0.227	0.245	0.237	0.240	0.296	0.297	0.322	0.322	0.320	
F (p value)	35.012 (0.000)	39.042 (0.000)	35.946 (0.000)	36.983 (0.000)	49.364 (0.000)	49.888 (0.000)	54.219 (0.000)	54.219 (0.000)	54.048 (0.000)	

*** p value significance level <0.01; ** p value significance level <0.05; * p value significance level <0.10

As the results show (see Table 5), regardless the method of calculation used, the determinants of overall well-being are similar. Specifically, age, school cycle, mother's and father's level of education, mother's and father's professional situation, nationality of household members and type of school attended (public or private) emerge as statistically significant for all four scenarios (p value <0.01 or p value <0.05). However, two facts are interesting to highlight. First, as we introduce the subjective components reported by the child into the calculation of the indexes (that is, the degree of importance attributed to items and the weights), the impact of the mother's and father's education level on overall well-being, as well of the mother's and father's professional status, almost doubles (see Table 5), whereas the impact of other variables does not suffer substantial change.¹⁸ Secondly, comparing scenario 1 with our proposed index, the ordering of factors that most contribute to overall well-being suffers some changes: in scenario 1 age is the most important determinant, followed by the parents' education level and then the father's professional situation, but when using our proposed index, the most important determinant of overall well-being is the father's level of education, followed by mother's, and then age comes third, and the father's unemployment fourth (cf. Table 5).

Summing up, although the significance of all factors (age, school cycle, mother's and father's level of education, mother's and father's professional situation, nationality of household members and type of school attended) is similar across methods of calculation, the consideration of subjective components (degree of importance and weights) reveals that the most relevant determinants of child well-being are the set of variables related to the child's parents, in particular, the education level of both parents, followed very closely by the father's employment status.

5 Concluding Remarks

The present paper constitutes an attempt to make a methodological contribution to the overcoming of some limitations of past studies on the measurement of child well-being through summary indexes. It proposes a solution on how to involve children in the measurement of their own well-being, which, in turn, allows obtaining the real weights for the selected indicators and dimensions of well-being, giving relevance to the use of microdata instead of aggregated data.

We grounded our proposal on two distinct foundations (cf. Sect. 2): a normative one, framed by the Convention on the Rights of the Child (CRC 1989), and a positive one, based on Bronfenbrenner and Morris' (1998) ecological model of human development. The choice of well-being dimensions derives from the latter.

Focusing on the microsystem level, dimensions were divided into interaction dimensions (health behaviour, school, leisure and recreation, and social relations), context dimensions (material well-being, housing and neighbourhood), and a personal characteristics dimension. Detailed definitions were provided of the indicators included in each dimension (Sect. 3), as well as the manner in which they were implemented. Structuring these elementary objective

¹⁸ Although for our sample gender does not reveal to be significant, it is interesting to note the change of direction of the impact on overall well-being when weights are introduced in the calculation of the index (compare Scenarios 1 and 2 with Scenario 3 and our proposed index—Table 5). When no weights are considered, female children seem to do better than their male counterparts, but when introducing weights, females do worse than males.

indicators involves the gathering of primary information from children's parents, by means of direct questionnaires.

To settle on a formulation for the proposed child well-being index, the major literature trends were reviewed regarding weighting schemes and individual indicator aggregation methods for composite indexes of well-being. This led us to conclude that the most suitable weighting scheme would have to consider 'real weights' for each of the individual indicators, that is, weights derived from the relative importance given to each of the indicators by each individual child. We thus proposed an additional questionnaire to be administered to children themselves. To the best of our knowledge, this methodology has not yet been tested for composite indicators of child well-being.

Another point was made regarding the definition of well-being thresholds for each indicator. In most cases, the researchers themselves have defined the cut-off points for indicators. Diverging from this methodological option, we have instead chosen to involve children and ask them to evaluate each indicator on a five-point scale (from "Not important" to "Extremely important"). Combining this information with that obtained from the parents' questionnaires enables us to define degrees of well-being for each indicator.

The formulation of our proposed composite index thus results from all of the above considerations. Accordingly, indicators can be weighted and summed for each dimension of well-being and dimensions weighted and summed to obtain the overall well-being index for each individual child.

Comparisons across different calculation methods show that the proposed index does introduce change in the results obtained for child well-being. Specifically, the consideration of the subjective components reported by children (degrees of importance and weights) into the calculation of the index reveals that the set of variables that most determine child well-being are the parent-related variables: both parents level of education and the father's employment situation. This means that it is not indifferent to consider or not consider children's own perspectives on the measurement of their well-being and the proposed methodology can be a reliable solution for the involvement of children in the measurement process.

Bronfenbrenner and Morris' (1998) model of human development identifies the existence of what the authors call "synergistic interdependencies" among certain aspects of children's lives. More precisely, they state that personal characteristics and context, although having a direct impact on development outcomes, also exert an indirect impact through the influence they have on interactions between the individual and other people or objects. This implies that dimensions of well-being are interrelated and, thus, when building a composite index to assess the well-being of children, a simple additive formula can reveal some limitations. This is in fact an acknowledged limitation to our proposed composite indicator. However, as mentioned earlier, the aim of this methodological proposal was to account for three of the main methodological shortcomings in current studies (the short account for children's perceptions on their own well-being, the use of aggregated data, and the use of uniform or other weighting schemes that do not translate the real weights of individual indicators) and demonstrate the relevance of considering children's reports in a measurement exercise.

Some challenging paths for further improving this research would involve the gathering of a wider sample of children (not only from the North region of Portugal but from all Portuguese regions) and the inclusion, as controls, of variables characterizing the school context, namely the size of the school and its location (urban vs. rural regions).

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