Psychometric Properties of a Newly Developed Dutch Well-Being Questionnaire for Young Children

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Abstract

Prosthesis use can significantly influence children's engagement in physical activity and their well-being. As there is currently not yet an instrument to assess well-being in young children who use a prosthesis, this study aims to take a first step by providing a valuable overview of well-being, quality of life, and prosthesis use in children and developing a questionnaire about well-being for young children in a healthy population. In the current study, quantitative and qualitative research are combined in an exploratory sequential design. The participants, 79 primary school children (retest: 41), completed an online self-administered questionnaire in Qualtrics with an initial amount of 16 questions about their well-being. A principal component analysis (oblimin rotation) combined with a parallel analysis suggested a three-component model with 12 remaining items, with a total explained variance of 54.96%. The components are interpreted as emotional distress, social participation, and enjoyment. Internal reliability and test-retest reliability could not be established for every component. The current study provided valuable preliminary information and a foundation for further development of a well-being questionnaire for young children with and without a prosthesis. Future research should focus on revising items, expanding sample sizes and performing confirmatory analysis in both healthy and clinical samples.

Keywords: questionnaire development, principal components analysis, well-being, young children, prosthesis use

Introduction

A lower-leg amputation has a lot of influence on an individual's daily living activities (Burger & Marincek, 1997). Prosthetists are continuously trying to improve the way prosthetics work to improve amputees' typical level of functioning. The amount of knowledge about how prosthesis use can influence an individual's life is growing, but limited studies have been conducted on this topic for children. Currently, some questionnaires exist that are suitable for measuring quality of life or well-being in children. However, the literature lacks a questionnaire that can measure this in school-aged children (6-12 years old) who need a prosthesis. As this target population is relatively small, the focus will first be on validating the questionnaire in healthy school-aged children. Since the objective is to use the questionnaire for young children, and existing questionnaires are often validated for slightly older children, a new questionnaire will be developed. An earlier study by Bell (2007) gave recommendations for the development of items for younger children, such as clear and short items. Therefore, the current study's main focus points are taking a first step in identifying important determinants for the well-being of children who use a prosthesis and aiming to initially develop an instrument that measures well-being in a broader population of young children in general.

Literature Review

Quality of Life and Well-being

It is important to first understand the concepts quality of life and well-being. Across the literature, there is a lack of consensus on the definitions of these concepts, and they are often used interchangeably. The World Health Organization Quality of Life Group (WHOQOL) defined quality of life as "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (Harper & Power, 1998). In general, quality of life is

seen as a subjective evaluation of the satisfaction of well-being across multiple domains (AL-Hamed, 2021). According to Wallander and Koot (2016), it is a multidimensional construct of which the measurement should include at least physical, social, and psychological aspects to sufficiently cover health-related quality of life. Additionally, there are multiple domains that are commonly included as well, such as body image, self-esteem, or other domains that are related to specific health-related issues and are therefore only used in specific target groups (Wallander & Koot, 2016).

As with quality of life, there is no clear and widely accepted definition of well-being. It is often described as a multidimensional structure consisting of emotional, psychological, and social parts (Jarden & Roache, 2023). One of the most used definitions for well-being is: "well-being can be understood as how people feel and how they function both on a personal and social level, and how they evaluate their lives as a whole" (Michaelson et al., 2012). In the current study, this definition of well-being will be used, and the focus will mostly be on personal and social determinants. However, as the amount of research on children regarding these concepts is limited, and the concepts are closely related, the current study will use information from earlier studies that focus on both quality of life and well-being. In the following paragraphs, multiple factors that may be determinants of well-being in children will be introduced.

Social Determinants. To get a better understanding of children's conceptualization of their well-being, research has been done in which children are asked what they see as important factors of happiness (Moore & Lynch, 2017). After being asked what they do that makes them happy, their answers consistently pointed to participation in play. In turn, an inability to join play had a negative impact on their well-being.

Furthermore, according to a recent study, well-being is negatively impacted by loneliness in young people (Goodfellow et al., 2022). Related to this, they describe that the

perceived quality of social relationships is a relevant determinant of well-being. Next to that, Mínguez (2019) explored social relationships and their relation to the well-being of children. In this study, they found that parental engagement, time with friends, free time, and a good relationship with teachers and the school were factors that played a significant part in children's well-being. In summary, these sources highlight the importance of social participation and social relationships for children's well-being.

Personal Determinants. Personal determinants of well-being include several different factors that are related to multiple positive and negative psychological factors, such as positive mood, happiness, anger, and distress (Pollard & Lee, 2003). It is therefore important to include items addressing these different personal determinants. In the following paragraphs, several personal determinants of well-being will be discussed.

The first personal determinant of well-being is physical activity. Being physically active can provide several mental and physical health benefits, according to the World Health Organization (WHO), (World Health Organization, 2020). Participating in regular physical activity is for instance associated with higher levels of well-being (World Health Organization, 2020). Therefore, they set up guidelines for physical activity. For children, these guidelines state that they should partake in an average of sixty minutes of at least moderate physical activity per day (World Health Organization, 2020). On three of those days, the activity should be more intense and focused on muscle- and bone-strengthening activities.

For children who use a prosthesis, there are additional determinants of well-being that might be of importance. Research into life after amputation shows that there are several personal factors that influence quality of life or well-being, such as someone's ability to perform activities of daily living, specifics regarding the level or cause of amputation, and

prosthesis use (Maciver et al., 2023). Therefore, some of these determinants will also be touched upon.

It is known that overall, someone's body image can influence their well-being (Swami et al., 2017). Body image can be defined as the way someone views and evaluates their body, and it is linked to the feeling of self-disgust (Burden et al., 2018). Similar to the relation between body image and well-being, there is a link between body image and satisfaction with life in lower limb amputees. Breakey (1997) concluded that the more negative the amputee's body image is, the less content they are with their life. Research by Burden et al. (2018) also shows that the use of a prosthesis is linked to lower levels of feelings of self-disgust. With these findings in mind, the impact that prosthesis use has on self-disgust may indirectly influence satisfaction with life as well.

The benefits of engaging in physical activity for disabled children include both physical and psychological advantages, such as improvements in fitness, general health, self-image, and quality of life (Ahmed et al., 2017). Bragaru et al. (2011) found that when individuals with a lower-limb amputation participated in sports or physical activities, they scored higher on quality of life than amputees who were not physically active.

However, for individuals with a lower-leg amputation, there are often difficulties with regard to physical activity and sports participation. Lower limb amputation significantly influences individuals' ability to participate in sports (Bragaru et al., 2011). Due to issues with accessibility or physical limitations, the amount of sports participation or regular physical activity often decreases. Additional research also suggests that sports participation levels of children with an amputation are usually lower compared to children without such a disability (Ahmed et al., 2017).

Furthermore, amputation goes hand in hand with a change in how people spend their free time (Burger & Marincek (1997). It was found that lack of accessibility and social

constraints were, among other reasons, the most important hindrances to leisure participation (Couture et al., 2009). Generally, these constraints were related to the use of a prosthesis or wheelchair.

In summary, the determinants of well-being in a general population of children are similar to those for children with a prosthesis. However, specific health- or disease-related conditions, including disabilities such as an amputation, often introduce additional determinants that are important for assessing an individual's well-being.

Existing Questionnaires

Having established an overview of the most important determinants of well-being with the literature review above, it is possible to explore how they can be measured, and whether there are existing questionnaires that are suitable for measuring this in a general population of Dutch school-aged children. As the current study additionally aims to take a first step in establishing a basis for the development of a questionnaire for young children who use a prosthetic, additional more specific instruments will also be considered. In the following section, the most relevant existing measuring tools will be discussed.

Multiple social and personal determinants of well-being are included in several instruments, such as the World Health Organization Quality of Life assessments, WHOQOL-100 and WHOQOL-BREF (Power & Kuyken, 1998; Harper & Power, 1998). Additionally, there are health-specific questionnaires such as the Pediatric Quality of Life Inventory (PedsQL) (Varni et al., 1999) or KIDSCREEN (Ravens-Sieberer et al., 2008).

Both of the general quality of life measures (WHOQOL-100 and WHOQOL-BREF) are designed by the World Health Organization (Power & Kuyken, 1998; Harper & Power, 1998). Social determinants that the WHOQOL instruments include are personal relationships and social support. Additionally, these questionnaires include questions from a psychological domain and about physical health, which can be considered personal determinants. An

advantage of these instruments is that a Dutch version of both is available for adults. However, the questions are quite complex and should be adjusted for young children to be able to understand them.

The PedsQL (Varni et al., 1999) also includes multiple questions that fall under those social and personal determinants and addresses four domains, namely physical, emotional, social, and school. Different age group versions are available, starting from the age of five for self-report. However, the items from the PedsQL are difficult and often negatively worded, which is something that should be avoided in self-report questionnaires for children (Bell, 2007).

The Dutch 52-, 27- and 10-item KIDSCREEN questionnaires (Ravens-Sieberer et al., 2008) are all suitable for self-report measures with children aged 8-18 years old. The KIDSCREEN items closely resemble the kind of questions that the current study aims to include, only that this study aims to develop questions for younger children. Furthermore, for future use in children who use a prosthesis, additional questions about physical activity or prosthesis use would be relevant. The 52-item KIDSCREEN measure includes ten dimensions of health-related quality of life, specifically physical well-being, psychological well-being, moods and emotions, self-perception, autonomy, parent relation and home life, social support and peers, school environment, social acceptance (bullying), and financial resources. The constructs in the KIDSCREEN questionnaire that are the most relevant to the personal and social determinants of well-being from the current study are psychological well-being, self-perception, social support and peers, and social acceptance and bullying.

Alternatively to general measures, several specific tools are available to measure quality of life in different disability- or disease-related conditions. Examples include the DISABKIDS (Baars et al., 2005), or the Prosthesis Evaluation Questionnaire (PEQ), designed by Legro et al. (1998). The DISABKIDS is a questionnaire with seven

condition-specific modules (Baars et al., 2005). None of these seven modules are however related to amputation or prosthesis use. The PEQ, on the contrary, is specifically designed to assess prosthesis-related quality of life (Legro et al., 1998). It includes four scales in total, starting with two scales on the physical domain with items assessing prosthesis function, and items assessing mobility. Furthermore, a psychosocial scale and a global well-being scale are included. However, the PEQ has not been validated for children, thus modifications to the questions would be necessary. Since the current study takes a first step in the development of a well-being questionnaire, it will initially be tested in a general population of young children. Therefore no specific questions about prosthesis use will be included yet.

Questionnaire for Children

As discussed, several different questionnaires are designed to measure health-related quality of life, well-being, or prosthesis evaluation. However, some of the existing questionnaires are not available in Dutch or are not validated for measuring in school-aged children. Moreover, none of the questionnaires discussed are specifically designed to measure well-being in young children with a prosthesis.

Over the past years, the amount of research that has been conducted into developing valid questionnaires for children has increased. According to Bell (2007), it is important that questions are short and clear, and that there is no room for ambiguity. In detail, it is recommended that complex or negatively worded questions should be avoided in children's self-report questionnaires. Additionally, if a retrospective question design is used, the reference period should be concrete and preferably short. Furthermore, they mention that ideally, scales would be completely labeled verbally or with visual images (Bell, 2007).

Ultimately, the aim is to design a questionnaire that measures well-being in children with a prosthetic limb. With the recommendations for designing a questionnaire for young children in mind, this study takes a first step in this direction, by initially aiming to develop a

valid and reliable Dutch questionnaire that measures well-being, and testing it in a broader population of young children.

Method

This study used a mixed-methods design, specifically an exploratory sequential design, in which quantitative and qualitative research are combined. The research can be divided into two phases. Phase I was a qualitative phase, in which information was gathered for the development of a new questionnaire through reviewing literature and existing questionnaires. After reviewing the literature and existing questionnaires, a questionnaire was developed. Subsequently, the second phase of this study consisted of a quantitative research phase in which the reliability and validity of the questionnaire were assessed. The central variable in the current study was well-being in children.

Phase I. Qualitative Phase

Questionnaire Design

To start, a literature review was conducted to obtain information about existing theories that related to the focus of this research. The information that was gathered during the literature review phase was used to define the constructs to be included and the variables to be measured. Thereafter, questionnaires that measured similar constructs as this study's construct of interest were sought. Items from different instruments (e.g. KIDSCREEN (Ravens-Sieberer et al., 2008) and PedsQL (Varni et al., 1999)) and prosthesis evaluation questionnaires (e.g. PEQ (Legro et al., 1998)) were gathered. Selected items from existing English questionnaires were translated into Dutch and adapted to better fit the construct and the target population. Additionally, new items were generated based on the literature review. Both the adapted items and the newly generated items were used to form an item pool for a new questionnaire about well-being. To ensure content validity, the items were reviewed by three experts in the fields of prosthesis development and sports psychology. The experts

reviewed the items based on content and judged their adherence to the recommendations for item development for young children. Based on the multiple rounds of expert feedback, items were either deleted, adapted, or selected for use in the questionnaire.

Questionnaire

The developed questionnaire consisted of 16 items about well-being. All items were scored on a 5-point Likert scale, with the options ‘never’ (1), ‘rarely’ (2), ‘sometimes’ (3), ‘often’ (4), and ‘always’ (5). Reverse-scored items were added to detect possible invalid response patterns. In addition to the developed well-being questionnaire, some demographic questions and items about physical activity were included during the administration to pilot test their feasibility. The current study will not further go into detail about those questions. The complete administered questionnaire can, however, be found in Appendix A.

Phase II. Quantitative Phase

In Phase II, the developed questionnaire was administered to the participants and subsequently, the data was analyzed to establish the validity and reliability of the well-being items.

Procedure

Prior to the data collection, the research was approved by the Ethical Committee of Psychology of the University of Groningen (PSY-2223-S-0463). After the approval, the researcher looked for primary school employees’ contact information via their personal network. Upon acquiring contact information, multiple primary schools were contacted and invited to take part in the study. They were sent an information letter about the research and the procedure. If schools were interested in participating, the school sent an information letter and an informed consent form to the parents of the children. Thereafter, the school was visited to start with administering the questionnaire to children whose parents consented that their child could participate in the study. A short explanation of the research and the

questionnaire was given in the classroom. Subsequently, the participants were presented with the questionnaire, which started with a question regarding informed consent. As it was an online self-administered questionnaire, the participants were presented with the link to Qualtrics (2005) and could fill in the questionnaire on their school laptop or tablet simultaneously. To guarantee confidentiality, no details that could identify the participant were asked. Instead, every participant was given an individual code so that a second administration of the questionnaire could be linked to that participant's first response by the researcher only. While filling in the questionnaire, it was allowed for the children to ask questions when they did not understand a question or were struggling with reading the items. For most participants, the completion of the questionnaire took around five to ten minutes. For every question, giving an answer was required. Finally, to be able to analyze the test-retest reliability, some of the participants were asked to complete the questionnaire again after one to two weeks. The procedure for this retest was the same as during the first time.

Participants

To establish a sufficient sample size, Gorsuch's (1983) recommendation for a minimal subject-to-item ratio of 5:1 for exploratory factor analysis was followed, with the note that a larger sample size is better. The ratio was applied for the 16 items about well-being, suggesting a minimal sample size of 80 participants. A non-probabilistic sampling method was then used to recruit participants for the present study. Participants were 79 Dutch children who were recruited via their primary school. The participants were 38 boys and 41 girls between the ages of 6 and 12 (M age = 9.34, SD = 1.49 years). A subsample of 41 participants filled out the questionnaire a second time after one or two weeks.

Data Analysis

The data was exported from Qualtrics (2005) to SPSS Statistics version 28 (IBM Corp., 2021) for the statistical analysis of the Likert-scale items about well-being. The α-level was

set at .05 for all tests. As it was required for the participants to answer each of the questions before advancing to the next page, there was no missing data for the items. A boxplot was created with sum scores of the well-being items to determine if there were outliers. Two participants were considered to be outliers based on their low sum scores and as the response patterns of both of these participants seemed to be faulty, they were therefore deleted. The analysis was conducted with the remaining 77 participants. Finally, the assumption of normality for factor analysis was checked by inspecting skewness and kurtosis z-scores. According to Kim (2013), if the absolute z-values for the current sample size exceeds 3.29, the null hypothesis should be rejected and it should be concluded that the distribution of the sample is non-normal.

Principal component analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy test was conducted together with Bartlett's test of sphericity to establish whether the data was suitable for factor analysis. For the KMO, guidelines have been set to determine adequate sampling, with values below .49 being unacceptable and values greater than .90 being marvelous (Hutcheson and Sofroniou, 1999). Furthermore, Bartlett's test of sphericity was used to assess whether the correlations between items were large enough to perform a PCA, for which the test should be significant.

Considering that items could possibly be assigned to multiple subfactors, or that these subfactors could possibly better be split or combined, a principal component analysis (PCA) was performed to identify underlying components from the data, assessing construct validity. Additionally, there was not sufficient data for performing a confirmatory factor analysis. Since all items were designed with the aim of measuring various components of well-being, oblique rotation (direct oblimin) was used to allow correlations between the components (Gorsuch, 1983). The components were extracted based on eigenvalues greater than one. Items with low communalities (< .20) were deleted, since low-communality items likely have

fewer similarities with other items (Child, 2006). Additionally, multiple PCAs were conducted based on the exclusion of items that seemed to not be applicable to this study's sample. The item exclusions were based on the consideration that since some items were designed for possible future use in children with an amputation, they were not relevant to the general population of children in this study. Pattern loadings > .30 were considered significant (Kline, 1994).

Parallel analysis. To check whether the principal component analysis retained the correct amount of components from the data (Costello & Osborne, 2005), a parallel analysis (Patil et al., 2017) was performed. When the eigenvalue from the parallel analysis exceeded the eigenvalue from the current data, the factor was retained. A new PCA was performed with the amount of components that should be retained based on the parallel analysis.

Internal consistency. In order to evaluate the reliability of the extracted components and the total scale, multiple reliability analyses were carried out. First of all, Cronbach's alpha was calculated to assess the internal consistency of the complete scale, containing 12 items. Thereafter, the internal consistency of the items in each of the three subscales was evaluated. This was done by calculating McDonald's omega, which is a more appropriate measure than Cronbach's alpha due to its robustness (Hayes & Coutts, 2020). A value of .70 or higher was interpreted as acceptable for both Cronbach's alpha and McDonald's omega (Nunnally, 1978). This is in accordance with the COTAN guidelines, where values above .70 are interpreted as sufficient for decisions on the individual level that are relatively less important (Egberink, 2009).

Additionally, the inter-item correlations in the subscales were examined. An average inter-item correlation between .15 and .50 was considered acceptable to support the internal consistency of the scale (Clark & Watson, 1995). Finally, the relationships between the three subscales were analyzed with Pearson's correlation coefficient after computing mean item

scores. The correlation coefficients were interpreted as a weak (.10 – .30), moderate (.30 – .50), or strong (> .50) relationship (Statistics, 2020).

Test-retest reliability. Using the subsample, consisting of 41 children between the ages of 8 and 12 (*M* age = 9.69, *SD* = 1.13 years), the relative test-retest reliability was assessed. The intraclass correlation coefficients (ICC) for each component were calculated with a 95% confidence interval for relative reliability. ICC values were interpreted following the COTAN guidelines (.70-.80 sufficient, >.80 good) (Egberink, 2009).

Results

Phase I: Qualitative Phase

In the qualitative phase, an extensive literature review was performed, and existing questionnaires were reviewed. Through the literature review, the main construct, well-being, was defined as a multidimensional structure about how people feel and function on a personal and social level (Jarden & Roache, 2023; Michaelson et al., 2012). Subsequently, the most important determinants of well-being were identified, specifically social and personal determinants. Multiple items were derived from existing questionnaires that measured these social and personal determinants of well-being and similar constructs. Examples of these questionnaires are the KIDSCREEN (Ravens-Sieberer et al., 2008), PedsQL (Varni et al., 1999) and WHOQOL-100 (Power & Kuyken, 1998). Following the review of the literature and existing questionnaires, a preliminary set of items was created. The main aim was that these items included the most important social and personal components of well-being. Additionally, the items were carefully considered, so that ultimately, they would also be suitable for children with a prosthesis. Several rounds of feedback by experts were performed during the item development stage. Based on the expert feedback, some items were deleted based on their content or formulation. Other items were refined, for instance made shorter or more concise, or difficult words were adapted to easier language. Finally, the selected items

were added to a new list of definitive items. The final questionnaire consisted of 16 items in total and was subsequently administered to a general population of young children.

Phase 2: Quantitative Phase

The assumption of normality for a factor analysis was checked. The absolute z-score for skewness was 1.821 and the absolute z-score for kurtosis was .726, both not exceeding the value of 3.29 stated by Kim (2013). Some items, however, did exceed this value (see Appendix B). Despite performing data transformations, the values did not improve and therefore, the original data was used.

Principal component analysis and parallel analysis

An initial PCA was performed with all 16 items. Alongside the PCA, a parallel analysis was conducted to establish how many components should be retained. According to the comparison of the eigenvalues extracted from the current study with those of the parallel analysis, four components were initially retained. Based on the result from the parallel analysis, a second PCA was performed in which four factors were extracted. The result of this PCA can be found in Appendix C.

Despite the expectation that items 7 (Vorige week kon ik in de buurt meedoen met buitenspelen.), 8 (Vorige week kon ik in de buurt meedoen met buitenspelen.), and 9 (Vorige week kon ik op school meedoen met gym.) would measure similar constructs, they did not load on the same component, or a conceptually logical component in general. Additionally, regarding item 14 (Vorige week wilde ik er net zo uitzien als mijn vrienden.), during data collection, a comment was made by one child about this item, saying ‘People always say me and her look alike.’, also indicating that the item might not be aligned with its intended purpose in children without a prosthesis.

As the results of the PCA did not seem to make sense conceptually, a re-evaluation of the items indicated that some items might not be suitable for children without a prosthesis.

Multiple PCAs were thereafter conducted based on the exclusion of the items that did not seem to be suitable for children without a prosthesis. Items 7 (Vorige week kon ik in de buurt meedoen met buitenspelen.), 8 (Vorige week kon ik op school meedoen met buitenspelen.), 9 (Vorige week kon ik op school meedoen met gym.) and 14 (Vorige week wilde ik er net zo uitzien als mijn vrienden.) were excluded. There were no items with communalities lower than .20, so no additional items had to be deleted.

The final PCA was then conducted with the remaining 12 items and based on a parallel analysis, three components were retained. The value of the KMO measure of sampling adequacy of the final PCA was .612. According to the Hutcheson and Sofroniou (1999) guidelines, this value is considered to be mediocre. Bartlett's test of sphericity was significant ($\chi^2_{(66)} = 247.493$, $p < .001$), which indicates at least one observed correlation between the data and therefore suitability of the data for a factor analysis. Table 1 shows the items and pattern loadings. The three components explained 54.96% of the total variance. For the individual components, the explained variances are added in Table 1.

Table 1

Pattern loadings

Item	1	2	3
5. Vorige week was ik boos*	**.806**		
16. Vorige week lachten andere kinderen mij uit*	**.801**		
6. Vorige week voelde ik me eenzaam*	**.679**		
15. Vorige week pestten andere kinderen mij*	**.561**		
2. Vorige week was ik verdrietig*	**.514**		.346
10. Vorige week kon ik meedoen met mijn vrienden		**-.844**	
11. Vorige week had ik plezier met vrienden		**-.837**	
12. Vorige week hielpen mijn vrienden en ik elkaar		**-.715**	
4. Vorige week had ik plezier			**.759**
3. Vorige week had ik lol			**.744**
1. Vorige week was ik blij	.337		**.367**
13. Vorige week was ik blij met mezelf		-.447	**.366**
R^2	26.24%	14.60%	14.13%

Note. N = 77. Extraction method: Principal component analysis; Rotation Method: Oblimin (with Kaiser Normalization). Pattern loadings <.30 are not displayed, pattern loadings are displayed in bold for the component to which they are assigned.
Component 1 (*Emotional distress)* = items 2, 5, 6, 15, 16.
Component 2 (*Social participation*) = items 10, 11, 12.
Component 3 (*Enjoyment*) = items 1, 3, 4, 13.
Items with an * have been recoded, (1 = *nooit*, 2 = *bijna nooit*, 3 = *soms*, 4 = *vaak*, 5 = *altijd*).

Internal consistency

The scores for McDonald's omega and average inter-item correlations for the three components are presented in Table 2 along with the descriptive statistics. Component 3 shows a low value for omega. Table 3 consists of an overview of the correlations between the three components. The correlations between the components are low, suggesting that the items do not form one complete well-being indicator scale.

Table 2

Descriptive statistics, McDonald's omega and average inter-item correlations (n = 77)

	M	SD	ω	inter-item correlation
Component 1	4.033	.749	.747	.362
Component 2	4.480	.685	.806	.544
Component 3	4.214	.467	.493	.187

Table 3

Correlations between components

	Component 1	Component 2	Component 3
Component 1	1		
Component 2	.305*	1	
Component 3	.116	.085	1

*$p < .01$

Test-retest reliability

The ICC values, and corresponding confidence intervals for the relative reliability are displayed in Table 4. The ICC value for component 1 indicates good reliability and component 3 seems to be moderately reliable with an ICC value above .50. For component 2 however, the ICC value indicates poor reliability.

Table 4

Intraclass correlation coefficients & 95% confidence intervals (n = 41)

	ICC	95% CI ICC
Component 1	.775	.606 – .875
Component 2	.420	.140 – .640
Component 3	.645	.426 – .793

Note. Two-way random effects model, absolute agreement.

Discussion

Ultimately, the aim is to design a questionnaire that measures well-being in children with a prosthetic limb. This study takes a first step in this direction, by initially aiming to develop a valid and reliable Dutch questionnaire that measures well-being, and testing it in a general population of young children.

Firstly, the current study is considered to have reasonable content validity, through the extensive literature review and multiple rounds of expert evaluations. Through examining existing questionnaires and literature, important topics for the measurement of well-being and quality of life in children were selected. To further enhance validity, the current study followed recommendations from Bell (2007) for item formulation for children, including short and clear items in the questionnaire and avoiding complex or negatively worded items.

Based on the literature review, social and personal determinants of well-being were identified, and existing questionnaires were examined to find items that measured these determinants. Additionally, new items were created to cover determinants that were missing. A preliminary item pool was then created with the new items and items from existing questionnaires, some of which were adapted so that they were suitable for use with young children. With multiple rounds of expert feedback, an item list consisting of 16 items was created.

However, there are some limitations to the process of creating the item list, as no systematic method involving clear criteria for item exclusion and inclusion was used. A more structured approach to item selection and the development of new items could possibly have enhanced the validity and reliability of the questionnaire. Additionally, a phase of pilot testing a larger initial item pool might have provided more insights, possibly leading to a more refined and effective questionnaire.

Principal component analysis

Initially, the questionnaire contained 16 items, with which the first PCA was performed. Based on the eigenvalues greater than one, six components would be retained. As it is known that this default option for retaining a certain number of factors in SPSS is often an inaccurate method (Costello & Osborne, 2005), parallel analysis was used as an alternative method. The parallel analysis for this PCA suggested retaining four factors. As the results of this PCA did not seem to make sense conceptually, the items were re-evaluated and additional PCAs were performed alongside item exclusions to further explore the factor structure of the questionnaire. This resulted in the deletion of four items from the questionnaire. The deleted items were item 7 (Vorige week kon ik in de buurt meedoen met buitenspelen.), item 8 (Vorige week kon ik op school meedoen met buitenspelen.), item 9 (Vorige week kon ik op school meedoen met gym.) and item 14 (Vorige week wilde ik er net zo uitzien als mijn vrienden.). These items were deleted because there were concerns about whether the items measured the intended construct within the sample of children who do not use a prosthetic foot. As all items were initially designed with the idea in mind that the questionnaire would be used for measuring well-being in children with a prosthesis as well, this may have resulted in these questions not being suitable for the general population. After item deletions, the final PCA was performed with 12 items. This PCA suggested retaining

four components. After the parallel analysis, however, three components were extracted and interpreted as emotional distress, social participation, and enjoyment.

The first component, emotional distress, includes five items related to negative moods and feelings of being rejected by other children through bullying. The explained variance of this component is 26.24%. Existing questionnaires include similar scales, such as psychological functioning (PedsQL; Varni et al., 1999) with an explained variance of 14.15%. The second component, social participation, consists of three items that cover social relations with other children, the extent to which they can join in with others, and the level of perceived support. The explained variance of this component is 14.60%. The third component is interpreted as enjoyment and includes four items that describe positive emotions and satisfaction with themselves. The explained variance of the component is 14.13%. Existing longer questionnaires include similar items within factors such as psychological wellbeing and self-perception (KIDSCREEN-52; Ravens‐Sieberer et al., 2013) and perceived physical appearance (PedsQL; Varni et al., 1999).

Two items, item 1 (Vorige week was ik blij.) and item 2 (Vorige week was ik verdrietig.) cross-loaded on the components emotional distress and enjoyment. This cross-loading however, is not completely inexplicable, as the two items tend to measure opposite parts of a similar construct and one of them has been recoded.

Furthermore, one item (13. Vorige week was ik blij met mezelf.) loaded the strongest on social participation (-.447), but also loaded on the enjoyment component (.366). The item was assigned to enjoyment for better face validity. This item is similar to a question categorized under 'self-perception' in the KIDSCREEN-52 questionnaire. In the shorter KIDSCREEN-27 questionnaire, the factor ‘self-perception’ is classified under ‘psychological well-being’ (Ravens‐Sieberer et al., 2013). Therefore, it is more logical to assign the item to the enjoyment component instead of social participation.

The three components, emotional distress, social participation, and enjoyment, are viewed as important domains in well-being measurement, and the total explained variance of the three-component model was 54.96%. This suggests that the three components provide a good summary of the item responses. The items correlate adequately with these components and the components capture the essence of the questionnaire. As a comparison, the KIDSCREEN-27 questionnaire had an explained variance of 56.9% with a five-factor model. Dimensions from this five-factor model that the current questionnaire does not include, are physical well-being, parents and autonomy, and school environment. Physical well-being is often included as a personal determinant of well-being (Pollard & Lee, 2003). For the current study, however, with the aim to measure well-being in children with a prosthetic foot at a later stage, it is more logical to develop specific questions for that target group later. Furthermore, since the aim was to make a questionnaire that could be administered to young children, the goal was to keep the questionnaire as compact as possible. The choice for a short questionnaire is also a possible limitation of the current study, as it could mean that fundamental parts of well-being may be missing.

Reliability analysis

Regarding the internal consistency, components 1 and 2 had values of McDonald's omega above .70, indicating acceptable reliability for those subscales (Nunnally, 1978). Component 3 however, with a value of .493, demonstrated inadequate reliability. A possible reason for the inadequate reliability may be that the items of which the component consists, do not reliably measure the same construct.

Similarly, the mean inter-item correlations did not fully support the internal consistency. The mean inter-item correlations of components 1 and 3 were between the acceptable values of .15 and .50 (Clark & Watson, 1995). The average inter-item correlation of component 2 however, just exceeded that with a value of .544. Typically, high mean

inter-item correlations could indicate that the component includes items that may be redundant or do not differ enough from each other.

Regarding inter-scale correlations, only one statistically significant moderate correlation was found between components 1 and 2. This means that for the inter-scale correlations between components 1 and 3, and components 2 and 3, there was insufficient evidence for concluding that a significant linear relation between them exists. Based on the literature, it was expected that higher scores on items about enjoyment and good social relationships, and lower scores on items about negative mood, would contribute to a higher total score that indicates a higher level of well-being. However, the low and mostly insignificant correlations between the subscales suggest that it is not logical to calculate a total score for well-being.

Finally, the intraclass correlation coefficient for component 1 indicates good reliability, and component 3 was moderately reliable. For component 2 however, the ICC value indicates poor reliability, with a value just below .50. This may indicate that for component 1 and component 3, the participants stay in the same relative position in comparison to others, but for component 2, social participation, this fluctuates. The low ICC for social participation could also be attributable to the small sample size of the current study, or possibly a lack of variety among participants (Koo & Li, 2016).

Limitations and future research

The current research could not yet confirm the validity and reliability of the questionnaire. Several limitations and directions for future research have been identified.

The first limitation of the current research is that there is a relatively small sample size. Even though the KMO value for sampling adequacy was sufficient and Bartlett's test of sphericity was significant, so that a PCA could be performed, the results of the current study

should be interpreted with caution. Due to the small sample size, it was also impossible to split the dataset and perform a confirmatory factor analysis.

Another limitation of the current study is related to the process of questionnaire development. No highly structured process was followed for the development of the items, which may have impacted the validity and reliability of the questionnaire. Furthermore, conducting a pilot test phase before administering the questionnaire could possibly have led to a more refined and effective questionnaire.

Contrary to expectations, it is not possible to derive a total well-being score from the current questionnaire, as the correlations between components are low. In future research, the items in the questionnaire can be revised to enhance the correlations between subscales and allow the calculation of a total score for well-being. Furthermore, additional items could be added to the questionnaire to broaden the questionnaire. This could be additional items for one of the three existing components of the current questionnaire. Alternatively, items could be added that fall under components that this questionnaire does not yet contain, but existing questionnaires do include, such as physical well-being, parents and autonomy, and school environment (Ravens‐Sieberer et al., 2013) or items assessing pain or worry (Varni et al., 1999).

Additionally, the existing questionnaires that were used for the process of developing the current questionnaire, were mainly quality of life questionnaires. To improve the current questionnaire, it could be beneficial to include other measures of children's well-being or health-related quality of life as well during the process of item development. Examples of other instruments that can be used are the Child Wellbeing Index (WHO-5; Topp et al., 2015) or the Child Health Questionnaire (CHQ; Landgraf et al., 1996).

Moreover, the current items were developed for future use with young children with a prosthesis, but tested in a general population of young children. Future research should

therefore focus on testing the items in a larger sample and including children who use a prosthesis. Additionally, the sample should be large enough to also perform a confirmatory analysis. Before testing the questionnaire in a clinical sample, however, it would first be important to revise the items. As the questionnaire is short, it might also be beneficial to add additional items that cover other parts of well-being, while keeping the total length of the questionnaire in mind so that it can be administered to young children as well.

Finally, literature on prosthesis use shows that issues regarding accessibility of different kinds of prosthetics (Hadj-Moussa et al., 2021) are often related to a change or decrease in leisure time activities (Bragaru et al., 2011; Sims et al., 2019). Therefore, specified items could be developed and tested for children with a prosthesis, such as questions regarding accessibility and movement ability.

Implications

Despite this questionnaire's shortcomings, the current study provides valuable preliminary information for the development of a well-being questionnaire for young children. Even though the findings should be interpreted cautiously, they can serve as a basis for the development of a valid and reliable questionnaire that can also be used in a clinical setting. It is however important to note that first, additional steps are necessary to refine and validate the instrument.

Conclusion

The current study was aimed at the development of a well-being questionnaire for children and investigated its psychometric properties. Results from the analysis show that the 12 remaining items can be organized into three components that are interpreted as emotional distress, social participation, and enjoyment. The items on those components were intended to all contribute to measuring well-being. However, the low correlations between the

components indicate that the questionnaire cannot be used for one total well-being score. Furthermore, the questionnaire did not meet the accepted standards for reliability all the time.

While the current study did not yield a completely valid and reliable measure, it produced a valuable overview of well-being and prosthesis use in children and contributed exploratory findings regarding the design of a well-being questionnaire for children. Further research is needed before implementing the questionnaire with children with a prosthesis and could focus on refining the questionnaire with an expanded sample. Finally, to verify the factor structure and assess the model fit, a confirmatory factor analysis should be performed in both a healthy and clinical sample.

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Appendix A

Vragenlijst

Hoi,

We stellen straks een aantal vragen over jou en over sporten. Het invullen duurt ongeveer 7 minuten. Geef het antwoord dat het beste bij je past.

Alle antwoorden zijn goed. Als je vragen hebt of iets niet begrijpt mag je dat altijd zeggen.

Deel 1.

De volgende vragen gaan over sporten en bewegen.

Wat doe jij wel eens? Kies alles wat je wel eens doet.

o traplopen 	o touwtjespringen 
o lopen (naar school) 	o hinkelen 
o fietsen (naar school) 	o trampoline springen 
o rennen 	o helpen met klusjes 
o klimmen 	o in de tuin helpen 
o verstoppertje spelen 	o allemaal niet

o tikkertje 	

< alleen indien antwoord niet “allemaal niet” is >

Doe je dit bij elkaar meer dan 1 uur per dag?

- o Ja
- o Nee
- o Weet ik niet

Sport jij?

- o Ja
- o Nee

< indien nee >

Waarom sport je niet? Je mag meerdere antwoorden kiezen.

- o Ik vind sporten niet leuk
- o Ik heb er geen tijd voor
- o Het is te duur
- o Dat lukt me niet door mijn lichaam
- o Anders, namelijk …
- o Weet ik niet

< indien ja >

Sport je bij een vereniging?

- o Ja
- o Nee

< alleen indien iemand sport bij een vereniging >

Op welke sport zit jij? Kies de 2 die je het vaakst doet. 1 mag natuurlijk ook.

o wandelen 	o gym 
o hardlopen 	o fitness 
o fietsen 	o dansen 

O zwemmen 	O paardrijden 
O voetbal 	O volleybal 
O atletiek 	O anders, namelijk: ……..

< alleen indien iemand sport >

Hoe veel dagen doe je deze sport per week?

	1	2	3	4	5	6	7
… *(sport 1)*	○	○	○	○	○	○	○
… *(sport 2)*	○	○	○	○	○	○	○

< alleen indien iemand sport >

Hoe lang doe je deze sport per keer?

	minder dan 1 uur	1 uur	meer dan 1 uur	weet ik niet
… *(sport 1)*	○	○	○	○
… *(sport 2)*	○	○	○	○

Deel 2.

We zijn benieuwd hoe het met je gaat. Denk aan vorige week.

Vorige week…

	nooit	*bijna nooit*	*soms*	*vaak*	*altijd*
1. was ik blij	O	O	O	O	O
2. was ik verdrietig	O	O	O	O	O
3. had ik lol	O	O	O	O	O

Vorige week…

	nooit	*bijna nooit*	*soms*	*vaak*	*altijd*
4. had ik plezier	O	O	O	O	O
5. was ik boos	O	O	O	O	O
6. voelde ik me eenzaam	O	O	O	O	O

Vorige week…

	nooit	*bijna nooit*	*soms*	*vaak*	*altijd*
7. kon ik in de buurt meedoen met buitenspelen	O	O	O	O	O
8. kon ik op school meedoen met buitenspelen	O	O	O	O	O
9. kon ik op school meedoen met gym	O	O	O	O	O

Vorige week…

	nooit	*bijna nooit*	*soms*	*vaak*	*altijd*
10. kon ik meedoen met mijn vrienden	O	O	O	O	O
11. had ik plezier met vrienden	O	O	O	O	O
12. hielpen mijn vrienden en ik elkaar	O	O	O	O	O

Vorige week…

	nooit	*bijna nooit*	*soms*	*vaak*	*altijd*
13. was ik blij met mezelf	O	O	O	O	O
14. wilde ik er net zo uitzien als mijn vrienden	O	O	O	O	O
15. pestten andere kinderen mij	O	O	O	O	O
16. lachten andere kinderen mij uit	O	O	O	O	O

Appendix B

Table A1

	skewness			kurtosis		
	statistic	SE	z-score	statistic	SE	z-score
item 1	-1.122	.274	4.095	3.777	.541	6.981
item 2	-.695	.274	2.536	.277	.541	.512
item 3	-1.798	.274	6.562	5.384	.541	9.952
item 4	-1.334	.274	4.869	4.294	.541	7.937
item 5	-1.023	.274	3.734	1.131	.541	2.091
item 6	-1.309	.274	4.777	1.031	.541	1.906
item 7	-.795	.274	2.901	-.127	.541	.235
item 8	-2.055	.274	7.500	3.760	.541	6.950
item 9	-2.982	.274	10.883	8.970	.541	16.580
item 10	-2.273	.274	8.295	5.936	.541	10.972
item 11	-2.529	.274	9.229	7.576	.541	14.004
item 12	-1.628	.274	5.942	4.358	.541	8.055
item 13	-1.466	.274	5.350	3.688	.541	6.817
item 14	-1.044	.274	3.810	-.085	.541	.157
item 15	-.752	.274	2.744	-.335	.541	.619
item 16	-1.538	.274	5.613	1.643	.541	3.037
sum - all items	-.499	.274	1.821	-.393	.541	.726
sum - excluding items 7, 8, 9 & 14	-.613	.274	2.237	-.069	.541	.128

Appendix C

Table 1

Pattern loadings

Item				
	1	2	3	4
14. Vorige week wilde ik er net zo uit zien als mijn vrienden*	**.658**	-.317		
2. Vorige week was ik verdrietig*	**.639**			
15. Vorige week pestten andere kinderen mij*	**.567**			-.305
3. Vorige week had ik lol		**.770**		
9. Vorige week ko ik op school meedoen met gym		**.654**		
1. Vorige week was ik blij		**.564**		-.481
4. Vorige week had ik plezier	.448	**.448**		
10. Vorige week kon ik meedoen met mijn vrienden			**-.870**	
11. Vorige week had ik plezier met vrienden			**-.819**	
12. Vorige week hielpen mijn vrienden en ik elkaar			**-.708**	
8. Vorige week kon ik op school meedoen met buitenspelen			**-.566**	

13. Vorige week was ik blij met mezelf		.428	**-.454**	
7. Vorige week kon ik in de buurt meedoen met buitenspelen			**-.396**	
5. Vorige week was ik boos*				**-.831**
6. Vorige week voelde ik me eenzaam*				**-.734**
16. Vorige week lachten andere kinderen mij uit*	.363			**-.659**

Note. N = 77. Extraction method: Principal component analysis; Rotation Method: Oblimin (with Kaiser Normalization). Pattern loadings <.30 are not displayed, highest pattern loadings are displayed in bold. Items with an * have been recoded, (1 = *nooit*, 2 = *bijna nooit*, 3 = *soms*, 4 = *vaak*, 5 = *altijd*).