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ORIGINAL REPORT

USING CONTENT ANALYSIS TO LINK TEXTS ON ASSESSMENT AND INTERVENTION TO THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH – VERSION FOR CHILDREN AND YOUTH (ICF-CY)

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Objective: To explore how content analysis can be used together with linking rules to link texts on assessment and intervention to the International Classification of Functioning, Disability and Health – version for children and youth (ICF-CY).

Methods: Individual habilitation plans containing texts on assessment and intervention for children with disabilities and their families were linked to the ICF-CY using content analysis. Texts were first divided into meaning units in order to extract meaningful concepts. Meaningful concepts that were difficult to link to ICF-CY codes were grouped, and coding schemes with critical attributes were developed. Meaningful concepts that could not be linked to the ICF-CY were assigned to the categories "not-definable" and "not-covered", using coding schemes with mutually exclusive categories.

Results: The size of the meaning units selected resulted in different numbers and contents of meaningful concepts. Coding schemes with critical attributes of ICF-CY codes facilitated the linking of meaningful concepts to the most appropriate ICF-CY codes. Coding schemes with mutually exclusive categories facilitated the classification of meaningful concepts that could or could not be linked to the ICF-CY.

Conclusion: Content analysis techniques can be applied together with linking rules in order to link texts on assessment and intervention to the ICF-CY.

Key words: documentation; assessment; intervention; ICF-CY; children; disabilities.

INTRODUCTION

The International Classification of Functioning, Disability and Health (ICF) was developed by the World Health Organization to provide a framework for the description of health and health-related states (1). The ICF comprises two parts: Part one – Functioning and Disability (including the components Body Functions, Body Structures, and Activities and Participation) and Part Two – Contextual Factors (including the components Environmental Factors and Personal Factors), which aim to describe an individual's functioning. The child and youth version of the classification, the ICF-CY (2), is a derived version that expands the coverage of the ICF with specific content and additional detail to cover functioning in childhood and youth.

Linking information to the ICF/ICF-CY may contribute to research on functioning and disability in the health, educational and welfare sectors. Several studies in which texts have been linked to the ICF/ICF-CY describe the content of documented assessments (3,4) and report on clients' and professionals' perspectives on interventions (5–9). In these studies the ICF linking rules (10, 11) were used. Moreover, additional analytical steps were undertaken in order to tackle challenges in linking, such as identifying meaningful concepts with common topics (7) or creating additional coding rules for ambiguous information (8).

Linking free texts to the ICF/ICF-CY infers interpretation, and this raises several challenges. According to the ICF linking rules (10, 11) meaningful concepts must be extracted from a text prior to assigning codes. In free texts there may be several ways of extracting meaningful concepts. Identifying meaningful concepts is important when linking interventions to the ICF/ICF-CY. According to the linking rules, the aim of an intervention should be linked to the ICF (11). However, the goals of intervention and intervention methods may not always be logically coherent. For example, a study in which physiotherapy goals were linked to the ICF reported that interventions were provided for areas that were not reported as being related to the problems identified (4). With regard to complexity in documented assessments and interventions, a method of identifying meaningful concepts is required.

The ICF and ICF-CY have complex structures (12–14) in which several codes in the components may share a common topic. For example, in the ICF-CY (15) meaningful concepts describing the processing of information about time may be referred to both Chapter 1, Mental functions, in the component

Body functions, and Chapter 2, General tasks and demands, in the component Activities/Participation. A method is required to identify conceptually different meaningful concepts that may be related to the same topic but linked to different ICF-CY codes.

For the ICF and ICF-CY to be used in assessment and intervention it is important to be able to identify information that can and cannot be linked to the ICF/ICF-CY. According to the linking rules (10, 11), the categories "not-definable" and "not-covered" must be assigned to information that cannot be linked to ICF/ICF-CY codes or assigned to the categories Health Condition and Personal Factors. However, this may be difficult, as the ICF/ICF-CY model and manual describe aspects of functioning and environment that are not part of the classifications, e.g. personal factors and family as a context for a child's participation. The way in which information is documented may also affect the possibility of making links. A method is required that can identify meaningful concepts that can and cannot be linked to the ICF-CY.

There is a need for complementary approaches when linking free texts to the ICF and ICF-CY. Qualitative analysis suggests tools for interpretation of texts (16). One method of qualitative analysis, content analysis, can be used for the systematic analysis of texts. In this study, the rules of content analysis (17–22) have been used together with linking rules (10, 11) in order to link assessment and intervention texts to the ICF-CY.

The current study is part of a research project in which assessment and intervention texts from individual habilitation plans were linked to the ICF-CY[1]. As a part of the linking process, the researchers (NKI, MA, MP) participated in regular meetings, at which differences in the results of independent linking were discussed. The main differences in the results between researchers concerned 3 areas: (*i*) the number of meaningful concepts identified; (*ii*) the linking of meaningful concepts to codes in the ICF-CY; and (*iii*) the formation of judgements as to whether information could be linked to the ICF-CY. This led to the need to use content analysis as an additional tool in linking, which was done in order to make the process of linking of texts on assessment and intervention consistent and trustworthy.

The aim of this article is to explore how content analysis can be used to identify meaningful concepts in texts on assessment and intervention when linking content to the ICF-CY. The research questions are:

• How can content analysis be used to identify meaningful concepts in texts on assessment and intervention?
• How can content analysis be used to identify conceptually different meaningful concepts in order to link these to the most appropriate ICF-CY codes?
• How can content analysis be used to identify meaningful concepts that can be linked to the ICF-CY and those that can be assigned to the categories "not-covered" and "not-definable"?

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METHODS

Data material and participants

Data material consisted of 146 individual habilitation plans collected from 73 children in 6 child and youth habilitation centres in Sweden. According to Swedish legislation, assessments and interventions must be documented in an individual habilitation plan (23) after meetings involving individuals and their advocates. In the present study, the individual habilitation plans had different structure and headings, but they generally contained assessment (e.g. of present situation, problem/needs), goals and interventions, as well as evaluation, and had a length of 102–950 words. Evaluation parts differed among county councils and therefore were not included in this study. Professionals involved in the documentation of individual habilitation plans were nurses, occupational therapists, physicians, psychologists, physical therapists, recreational counselling specialists, social workers, special educators, and speech and language therapists.

Identifying meaningful concepts using content analysis

Applying techniques of content analysis. In this study qualitative content analysis was used with a "problem-driven" approach (18), in which the aim of linking was determined from the beginning, and ICF-CY codes and additional categories were used as a predefined framework. In this qualitative approach issues surrounding the linking process, especially the identification of meaningful concepts, were in focus. Techniques in content analysis were used together with linking rules (10, 11). According to techniques of content analysis, the meaning unit forms the context of a meaningful concept, and the size of a meaning unit has consequences for credibility in the analysis (20). Therefore, meaning units were identified in order to identify meaningful concepts. Illustrating similarities and differences in the categories is suggested (19) in order to handle multiple meanings in texts in content analysis. Coding schemes with critical attributes of codes were therefore developed. In content analysis, the importance of defining data to the fullest extent is emphasized, and checking for mutually exclusive categories is suggested as a way of ensuring an exhaustive list of categories (19). Coding schemes with mutually exclusive categories were therefore constructed.

Procedure to identify meaningful concepts. In the first step, the text of a habilitation plan was studied as a whole and divided into meaning units. These included words and phrases that were related to each other by content, followed and preceded by a shift of meaning in a text (19, 20). Within a meaning unit, meaningful concepts were identified. The text was divided into small and large meaning units and the results were compared for 10% of material. In further analysis a broader context for meaningful concepts was considered, i.e. large meaning units.

In the second step, the meaningful concepts that were difficult to link to the ICF-CY were divided into topic groups for which coding schemes were constructed. Every topic group included 5–7 meaningful concepts that highlighted different aspects of a topic. Codes from the ICF-CY were selected to describe the meaningful concepts in the topic groups. Definitions and inclusion criteria of the selected codes were studied and formulated into critical attributes (i.e. the part of the definition that constitutes the difference) of codes in the ICF-CY. Coding schemes were then created for every topic group, containing a short description of critical attributes of ICF-CY codes and examples of meaningful concepts linked to the codes.

In the third step, meaningful concepts that could not be linked to the ICF-CY were analysed. The identified meaningful concepts that could be assigned to the categories "not-covered" and "not-definable" were analysed and grouped. The meaningful concepts for the category "not-covered" were analysed in relation to definitions of codes in the ICF-CY and in relation to the ICF-CY manual. The meaningful concepts for the category "not-definable" were analysed with regard to definitions of codes in the ICF-CY and type of text formulations. Finally, meaningful concepts assigned to the categories "not-covered" and "not definable" were compared with meaningful concepts assigned to precise ICF-CY codes to create coding schemes with examples of mutually exclusive categories.

To ensure trustworthiness, 10% of the material was linked independently by NK and MP and differences in linking were compared and discussed. In addition, in the initial stage of the project, NKI, MP and MA participated in regular meetings at which the results of independent linking and techniques in content analysis were discussed. The techniques of content analysis used in the study were also verified in research seminars with other researchers.

RESULTS

How can content analysis be used to identify meaningful concepts in texts on assessment and intervention?

Meaningful concepts were identified in two ways: first, by accounting for the larger context in the analysis (large meaning units); and, secondly, by narrowing the context of the meaningful concepts (small meaning units). The use of a broader or narrower context generated a different amount of meaningful concepts. In comparison, using 10% of the material 251 large meaning units were identified when units were based on a broad context, and 302 small meaning units were identified when using a narrow context. In small meaning units 39 additional meaningful concepts (mean = 3) were identified and 5 meaningful concepts were linked to other ICF-CY codes, compared with the results from the meaning units in the broad context.

Table I gives an example of dividing text into small and large meaning units and its consequences for the number and content of identified meaningful concepts. The example concerns the description of outbursts of aggression in relation to stress. In a large meaning unit, one meaningful concept, "difficulty handling stress", is identified and linked to d2401 (handling stress). In small meaning units, aggression outbursts and stress are analysed as two separate meaningful concepts and linked to codes b152 (emotional functions) and e (stress as environmental factor – component level).

Fig. 1 shows another example of dividing text into meaning units and meaningful concepts in the analysis of information about assessment, goal-setting and intervention. Meaning units in Fig. 1 correspond to assessment, goal-setting and intervention as separate steps in the problem-solving process. An alternative is to divide the text into larger meaning units,
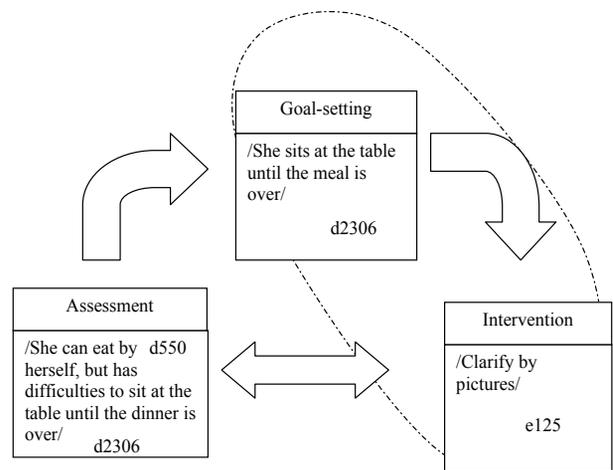
Table I. *Example of dividing text into meaning units and meaningful concepts*

Large meaning units		Small meaning units	
Meaning unit	Meaningful concepts and ICF-CY codes	Meaning unit	Meaningful concepts and ICF-CY codes
/At home aggression outbursts occur and it is stress that can start them off./	(1) difficulty adapting to stress situations (d2401)	/At home aggression outbursts occur //and it is stress that can start them off./	(1) outbursts of aggression (b152) (2) stress influences (e)

Meaning units are marked with /slash signs/.
ICF-CY: International Classification of Functioning, Disability and Health, version for children and youth.

Fig. 1. An example of dividing text into meaning units and meaningful concepts.

where the goal-setting and intervention are seen as one meaning unit and the identified meaningful concept covers both goal and type of intervention.

To summarize, depending on how the context is defined, the number of meaning units and the number and content of the meaningful concepts identified may vary. Continuing the linking process, the broader context was accounted for when extracting meaningful concepts. A total of 1260 (mean = 22.2) meaning units and 1713 (mean = 30.3) meaningful concepts were identified; 943 meaningful concepts were easily linked to the ICF-CY, while 770 meaningful concepts needed further analysis with the help of coding schemes.

How can content analysis be used to identify conceptually different meaningful concepts?

Meaningful concepts, identified as difficult to link ($n = 454$) generated 14 topic groups: (1) *communication* ($n = 44$); (2) *toileting* ($n = 28$); (3) *sleeping* ($n = 30$); (4) *mobility* ($n = 90$); (5) *interaction* ($n = 38$); (6) *school* ($n = 42$); (7) *expressing emotions and regulating behaviour* ($n = 18$); (8) *play* ($n = 30$); (9) *learning* ($n = 12$); (10) *eating* ($n = 42$); (11) *performing daily activities in relation to time demands* ($n = 28$); (12) *focusing attention* ($n = 12$); (13) *activity level* ($n = 21$); and (14) *growth and development* ($n = 19$). Table II contains an example of 1 of the 14 coding schemes for the topic group *performing daily activities in relation to time demands*. Several codes in the components Body Functions and Activity/Participation describe this topic group. In the component Body Functions 3 codes were selected: b1802 (experience of time), b1140 (orientation to time), and b1642 (time management). In Activities/Participation, 3 codes were selected: d2302 (completing daily routine), d2305 (managing one's time), and d2306 (adapting to time demands). Table II contains critical attributes of the codes followed by examples of meaning units, identified meaningful concepts and ICF-CY codes. At the component level, the critical attribute of codes in Body Functions is *cognitive processes involved in performing an activity*, while the critical attribute of codes in Activities/Participation is *performing activities*

Table II. *Coding scheme with critical attributes of the codes for the topic group "performing daily activities in relation to time demands"*

Meaning units	Meaningful concepts	ICF-CY codes
Component Body Functions: Cognitive processes involved in performing an activity		
Experience of length and passage of time		b1802
… Goal: he can distinguish between what is long and what is short time, e.g. drink a glass of water or take a shower …	Distinguish time period	Experience of time
Orientation/awareness of day, date, month, etc.		b1140
… He is well aware of days of week…	Knows days of week	Time orientation
Cognitive processes related to planning (ordering in sequences, allocating time)		b1642
… He has difficulty knowing if there is enough time to perform an activity within a set time-period, e.g. still catch a bus…	Not aware of time needed	Time management
Activities and Participation: Performing activities that require perception and management of time		
Completing daily routines in relation to time demands – general		d230
… y is in need of structure in the day. He needs to know when he has to do things. Free activities are difficult for him as he goes around without a goal …	Difficulty performing everyday activities	Carrying out daily routines
Managing time in daily activities	Difficulty planning time required	d2305
He sits too long in front of the TV and is late to school.		Managing one's time
Performing activities in relation to required time and sequence		d2306
He has difficulty knowing what he has to do and in what order, and needs to be reminded of that.	Difficulty doing things in order	Adapting to time demands

Bold and italic text: critical attributes of codes in components.
ICF-CY: International Classification of Functioning, Disability and Health, version for children and youth.

that require perception and management of time. The critical attributes of each code in the respective components provide further guidance to identifying meaningful concepts, e.g. *experience of length and passage of time* is a critical attribute of code b1802, which gives guidance in identifying meaningful concepts containing such information.

How can content analysis be used to identify meaningful concepts that can be linked to the ICF-CY and those that can be assigned to the categories "not-covered" and "not-definable"?

Following the use of coding schemes for topic groups several meaningful concepts ($n = 316$) should still be linked to the ICF-CY. Meaningful concepts for the two categories "not-covered" and "not-definable" contained several topics. Meaningful concepts that were assigned to the category "not-covered" ($n = 142$), formed 3 additional topic groups: (1) *family as a context for a child's participation* ($n = 60$), (2) *child's subjective experiences* ($n = 68$), and (3) *non-physical environment* ($n = 14$).

As an example of meaningful concepts "not-covered", Table III shows a coding scheme for 1 of the 3 topic groups, i.e. *family as a context for a child's participation*. The coding scheme contains examples of two meaningful concepts that could be linked to the ICF-CY and two meaningful concepts that were assigned to the category "not-covered". In the ICF-CY manual, the importance of the family for child's development and functioning is stressed, but only code e310 can be used to link such meaningful concepts (2). However, code e310 does not refer to persons, but only to personal support provided by these. Thus, meaningful concepts that contained explicit descriptions of how a family supported a child were linked to the ICF-CY code e310. Other concepts were assigned to the category "not-covered".

Meaningful concepts for the category "not-definable" ($n = 174$), formed two additional topic groups: (1) *child's functioning and development* ($n = 40$) and (2) *interventions and support* ($n = 134$). For meaningful concepts assigned to the category "not-definable" a coding scheme for one of the two

Table III. *Coding scheme with mutually exclusive categories for the topic group "family as a context for a child's participation"*

"Not-covered"		**e310 Immediate family**	
Meaning units	Meaningful concepts	Meaning units	Meaningful concepts
The family and mother are tired and worn out because of everyday stress. There is a lot of repair work (e155) in the house and job interviews with personal assistants.	Family worn out	It has been a difficult time for the family as [they do not know if he is going to continue have so many spasms (b735)] or if it will be better. They feel themselves inadequate as parents if they cannot help him in an adequate way.	Parents' worries about the family's capability to support the child.
Mother is unemployed and has been searching for a job since September.	Mother's situation	Father has holiday and can provide support to the child at home.	x is going to be at home (nd) at for least 1 week this summer as long as father is on holiday until week 28.

Bold text: titles for mutually exclusive categories.
nd: "not-definable".

Table IV. *Coding scheme with mutually exclusive categories for the topic group "child's functioning and development"*

"Not-definable"		**Linked to the ICF-CY (different codes)**	
Meaning units	Meaningful concepts	Meaning units	Meaningful concepts
No consequences for functioning y wants to have something in his hands all the time. He still likes to pick at things.	Wants to have something in his hands	*Consequences for child's functioning* y wants to have something in his hands that occupies him when he is waiting for an activity to start.	Has to do something to occupy himself when he is waiting (d2303)
General development Goal: his positive development continues	Positive development	*Specific area of development* x continues developing positively concerning social interaction	Developing social interaction (d7).
Specific but broad area of development x has language difficulties	Language difficulties	*Specific area of development* x has pronunciation difficulties	Difficulties with pronunciation (b320)

Bold text: title for mutually exclusive.

topic groups was created. Table IV shows a coding scheme for meaningful concepts with the common topic *child's functioning and development*. The coding scheme contains examples of 3 meaning units and meaningful concepts that could be linked to the ICF-CY, and 3 meaning units and meaningful concepts that were assigned to the category "not-definable". The difference between the meaningful concepts in the 2 columns is the amount and clarity of information in the text. The meaningful concepts in the left-hand column do not contain enough information to be linked to the ICF-CY.

DISCUSSION

The results of this study show that: (*i*) when dividing text into meaning units the size of the unit may influence the number and content of meaningful concepts identified; (*ii*) grouping meaningful concepts into topic groups and developing coding schemes with critical attributes facilitates the identification of related but different meaningful concepts; (*iii*) coding schemes with mutually exclusive categories facilitate the differentiation of meaningful concepts that can be linked to the ICF-CY and meaningful concepts that can be assigned to the categories "not-covered" and "not-definable".

In this study the steps in the process of linking were verified by other researchers to ensure trustworthiness. Further research is required into whether content analysis techniques result in fair inter-rater reliability among researchers.

Importance of context for identifying meaningful concepts

The decision rules applied for dividing texts into meaning units may influence the number and content of meaningful concepts. Other studies have reported the use of additional steps in analysis prior to assigning ICF codes to texts (3, 4, 7–9). However, the size of meaning units was not discussed in these studies. According to content analysis it is an important step in data analysis to decide on the level of contextualization, as it guides the interpretation of text. The size of meaning units is related to the level of detail of contextualization and is crucial to credibility in the analysis (20). Large meaning units may generate broader overall information about an individual's functioning and participation. At the same time, they make the

linking procedure ambiguous and may lead to difficulties with inter-rater reliability (20, 21). Small meaning units allow for more detailed analysis of the text, but may result in fragmented linking (20, 21), where the results lack information about the functional context. There is a need to consider contextual information in relation to the aim when linking texts to the ICF/ICF-CY. The requirements of context specificity are likely to vary depending on the type of text being analysed.

In this study, which focused on the documentation of assessment and intervention, the results of linking differed when assessment, goal-setting and intervention were regarded as separate meaning units in a problem-solving intervention process, compared with when goal-setting and intervention were regarded as a single meaning unit, i.e. considering intervention as a single whole product. According to the linking rules, the aim of an intervention should be linked to the ICF (11). This implicitly indicates that, by knowing the aim, the content of the whole intervention can be inferred. The relationship between goals of intervention and intervention methods has been highlighted in a study of the goals of physiotherapy (4). It is probable that as detailed information as possible will be required when intervention information is linked to the ICF-CY. Further research is required into methods of linking the documentation of assessment and intervention.

Using coding schemes with critical attributes of ICF-CY codes to identify conceptually different meaningful concepts

The complexity of the ICF/ICF-CY model when used in clinical research and practice has been discussed in several studies (12–14). The current ICF/ICF-CY manual does not contain much information on how different components and chapters are related in specific functional areas. Clinical use of the ICF and ICF-CY indicates that impairments, limitations and restrictions tend to appear in topic-specific clusters related to functional areas (12). The results of the study show that, by using coding schemes with critical attributes of ICF-CY codes, identification of conceptually different but related meaningful concepts is facilitated. Studies in which texts were linked to the ICF-CY, report the need for revision of the categories (6) and creation of additional rules in order to link ambiguous information to the ICF-CY (8). In this study coding schemes with critical attributes of ICF-CY codes have been developed to facilitate the

identification of conceptually different, but related, meaningful concepts. A coding scheme can be revised after some proportion of data has been analysed and initial inter-rater reliability has been controlled (22). Definitions of codes in the ICF-CY, the conceptual foundations of the classification described in the manual, as well as discipline-specific research, can be used to develop topic-specific coding schemes.

Coding schemes with mutually exclusive categories to identify meaningful concepts not linked to the ICF-CY

Concerning areas of functioning and health not covered by the ICF/ICF-CY or not definable in terms of classification, the ICF and ICF-CY coding guidelines (1, 2) state that only relevant, specific and explicit information is to be linked to the classifications. It is therefore important to distinguish between meaningful concepts that can be linked to the ICF/ICF-CY, and meaningful concepts that cannot be linked. The results of the study indicate that coding schemes with mutually exclusive categories can be created that allow meaningful concepts that can be linked to the ICF-CY be separated from those concepts that are currently categorized as "not-covered" and "not-definable".

In conclusion, using the ICF or ICF-CY as a common language when linking free texts to the ICF-CY makes it possible to compare and evaluate interventions and thus increase transparency in the documentation of assessment and intervention. Comparing the perspectives of professionals and clients may contribute to tuning interventions to the clients' needs. However, challenges exist due to the fact that free texts infer interpretation. Techniques in qualitative content analysis related to determining the length of meaning units, the creation of topic-specific coding schemes based on critical attributes, and using coding schemes with mutually exclusive categories, can be used together with linking rules to tackle challenges when linking free texts to the ICF/ICF-CY.

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