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CLINICAL REVIEW

Development of pediatric sleep questionnaires as diagnostic or epidemiological tools: A brief review of Dos and Don'ts

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SUMMARY

Questionnaires are a useful and extensively used tool in clinical sleep medicine and in sleep research. The number of sleep questionnaires targeting the pediatric age range has tremendously increased in recent years, and with such explosion in the number of instruments, their heterogeneity has become all the more apparent. Here, we explore the theoretical and pragmatic processes required for instrument design and development, i.e., how any questionnaire, inventory, log, or diary should be created and evaluated, and also provide illustrative examples to further underline the potential pitfalls that are inherently embedded in every step of tool development.

Introduction

"*Ask and ye shall be answered*"

In 1884, the *quality of sleep*, or the inability to sleep, was perceived as a potential symptom of acute insanity and nervous exhaustion, whereas the *quantity of sleep*, or curtailing hours of sleep was suggested to imperil the integrity of the brain.[1] Ever since those days, attempts to document sleep by non-invasive and inexpensive methods have been intensively pursued. Consequently, questionnaires, scales, diaries, and logs have been and continue to be extensively applied. In the early ages such instruments were primarily developed for research data-collection purposes, but lately some of the available tools have found their way to the clinical setting for diagnostic or outcome assessment purposes. Given their epidemiological or clinical value, customary use of these instruments as part of routine screening processes in clinical practice should enhance awareness of the importance of sleep to both the patient and the professional alike. Of note, it is still somewhat disconcerting how undervalued 'nighttime' behavior is when reflecting upon the abundance of standardized 'daytime' behavior assessment tools and the relative scarcity of such tools for the "dark hours". Similar to daytime diagnostic tools, the core principles on which development of tools aiming to obtain valid information on nighttime behaviors are similarly heavily dependent on the psychometric quality of the "subjective" 'tool' (i.e., instrument, test, interview, measure, scale, diary, log, and questionnaire, hereafter referred to as "tool"). Gathering information on sleep quality or quantity might appear a priori a straightforward simple question-and-answer scenario, and indeed a multitude of custom-developed tools are currently used in the field of pediatric sleep. However, as will become apparent in this technical review, the design of a good tool is a complicated process that requires consideration of 11 major operational steps.

Development and design of tools

The development and design of tools (Figs. 1 and 2) should be defined and described in sufficient detail and sufficient rigor to not

Abbreviations: EFA, exploratory factor analyses; IRT, Item-Response Theory; NPSG, nocturnal polysomnography; PCA, principal component analysis; PSG, polysomnography; ROC, Receiver Operator Curves; SD, standard deviation.

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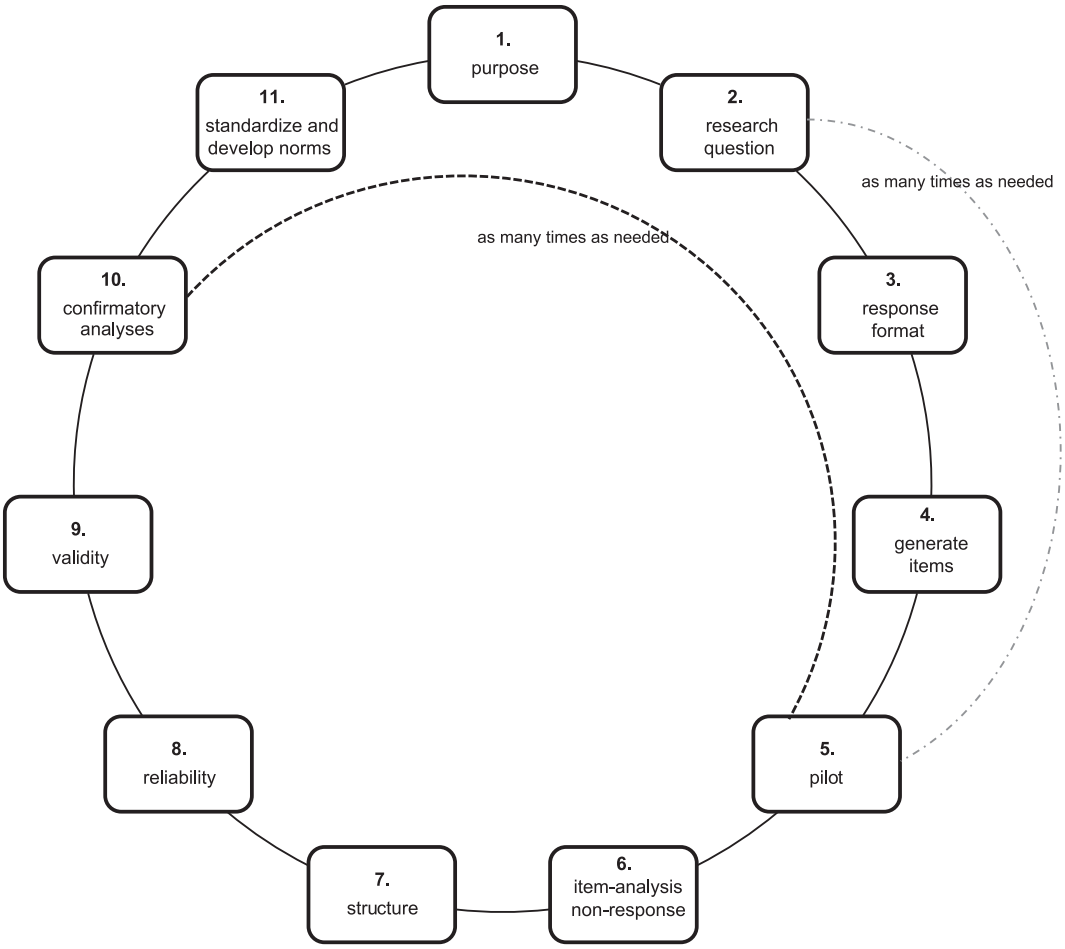

Fig. 1. Steps in tool development.

only facilitate a fully-informed decision about whether to implement the tool in the particular task at hand, but further to enhance and enable accurate interpretation of the results collected using the tool. Therefore, it is imperative that researchers, practitioners and publishers should be as transparent as possible regarding the subjective tool(s) utilized and reported.

Step 1: purpose

The use of a tool to measure knowledge, attitude, attribute, emotion, cognition, intention or behavior is cardinal to the social sciences. Additionally consideration needs to be given as to whether the tool will be used for data-collection, screening, or for diagnostic purposes. The very same considerations are needed in pediatric sleep research and practice because questionnaires, logs, diaries are considered as the source of subjective information, since they capture observations of the individual, and are commonly used to measure perceptions of sleep. To filter out as much as possible such 'subjectiveness' one would need to adhere to the steps outlined in this review. In practice, researchers or practitioners usually generate questions, and responses to these questions are then converted into a numerical format to be statistically analyzed or interpreted. To achieve such prior easy goals, researcher or practitioner either assumes or unequivocally wishes that underlying dimensions contained in the questions, such as language, similar meaning and interpretation of the wording, etc. will be identically perceived by the respondents, and therefore, minimize errors of comprehension and completion. As discussed in more detail below, the how – the which – the number – the type and the layout of questions included in the instrument being developed or evaluated, need to be reliably operationalized, and be relevant and acceptable to the targeted group. Thus, in the process of defining the purpose of the tool, it is critical to define the targeted sample as well, and to delineate the use of the tool as the first step of instrument development (or evaluation).

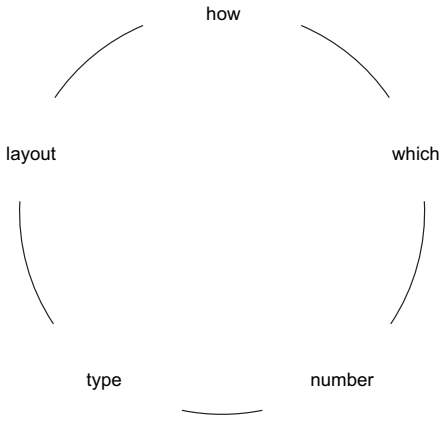

Fig. 2. Design of tool.