Psychometric Evaluation of the mCEQ Applied to Cigarettes and Heat-not-Burn Products in the US and Japan

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Introduction

The modified Cigarette Evaluation Questionnaire (mCEQ), Cappelleri et al., 2007, is a measurement instrument that assesses the self-reported reinforcing effects of smoking cigarettes. Conceptually, the mCEQ consists of three multi-item and two single-item domains (Figure 1). The increasing availability of alternative products to cigarettes raises the question whether the mCEQ can also be used to assess the reinforcing effects of other tobacco or nicotine-containing products.

The study aimed at a psychometric evaluation of the mCEQ applied to cigarettes and a heat-not-burn tobacco product, the candidate Modified Risk Tobacco Product (MRTP) Tobacco Heating System (THS). Furthermore, the potential to integrate items from two other instruments was investigated: the Minnesota Withdrawal Scale-Revised (MNWS-R; Hughes and Hatukuma, 1988) and the Questionnaire on Smoking Urges – brief version (QSU-DB; West and Ishler, 2010).

Methods

The mCEQ, QSU-DB and MNWS-R were administered in two-month reduced-exposure studies (Figure 2), one conducted in the US (ZHRM-REXA-07-US - NCT01989956) and one in Japan (ZHRM-REXA-07-JP - NCT01970995; Lüdicke et al., 2017a; Lüdicke et al., 2017b).

The analysis was based on traditional Classical Test Theory (CTT) and Rasch Measurement Theory (RMT) (Table 1 and Figure 3).

Table 1: Overview of the Data Set.

<table>
<thead>
<tr>
<th>Study Site</th>
<th>Data Collection</th>
<th>Study Days</th>
<th>Time-points</th>
<th>N = 39 Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>ZHRM-REXA-07-US</td>
<td>Day 0, 1, 2, 3, 4, 5, 30, 60, 90</td>
<td>24 items</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>ZHRM-REXA-07-JP</td>
<td>Day 0, 1, 2, 3, 4, 5, 30, 60, 90</td>
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Results

The mCEQ is, in principle, applicable to cigarettes as well as to THS. From a CTT perspective, all three multi-item domains could be confirmed. The two multi-item domains of Smoking Satisfaction and Psychological Reward, together consisting of 8 out of the 12 mCEQ items, also met the requirements of RMT after minimal adaptation (excluding one item from Psychological Reward). Despite their brevity, both scales showed few extreme scores (Smoking Satisfaction 10.5%, Psychological Reward 11.2%) implying satisfactory targeting.

The applicability of the mCEQ to cigarette and THS was confirmed for respondents from the US and Japan based on RMT analyses. The analysis of the extended mCEQ did not reveal any potential to improve the mCEQ for the single-item domains and Aversion domain.

A possible limitation lies in the analysis of all responses at different time points as if they were coming from independent respondents. Since the main goal of the study was to assess the general applicability of the mCEQ, the possible dependency was deemed non-critical.

In its current form, it is recommended to administer the full mCEQ to assess the self-reported reinforcing effects of cigarettes and the candidate MRTP THS. The two multi-item domains (Smoking Satisfaction and Psychological Reward) can be interpreted at the scale level, whereas the remaining items (one item deleted from Psychological Reward, two items assessing Aversion, one item on Craving Reduction, and one item on Enjoyment of Respiratory Tract Sensation) should be interpreted as single-item measures.

Moving forward, inclusion of a special instruction to remove the ambiguity of the wording ‘smoking’ and ‘cigarettes’ not applying to the use of other products, is considered, or the wording of items as proposed by Hatsukami et al. (2013) with the Product Evaluation Scale (PES): Was it satisfying? Instead of Was smoking satisfying?

Discussion

References


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Competing Financial Interest

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