REVISITING CAPE-P15 CUT-OFF VALUES TO INCREASE SENSITIVITY FOR DETECTING PSYCHOTIC EXPERIENCES IN PRIMARY CARE

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Abstract

Psychotic experiences (PE) co-occur with depression and anxiety, and indicate severity of general mental distress. Identifying PE in primary care mental health settings may facilitate access to evidence-based interventions. The Community Assessment of Psychic Experiences – Positive 15-items Scale (CAPE-P15) has shown promise in detecting those at ultra-high risk of developing psychosis. Based on a sample of 1,131 individuals with common mental disorder we propose high-sensitivity thresholds of the CAPE-P15 to broaden its application across clinical settings.

Keywords

Psychotic experiences; psychosis; common mental disorders; primary care; CAPE-P15

1. Introduction

Traditionally, the presence of subthreshold psychotic symptoms, also called psychotic experiences (PE), has been thought to indicate increased risk for transition to a psychotic disorder (Fusar-Poli et al. 2012; Yung et al. 2005). However, research in primary care settings has shown that only few people with PE make such a conversion (Hui et al. 2013; Perez et al. 2017). In fact, recent studies suggest that PE may also be a marker for severity of distress in common, non-psychotic mental disorders (Stochl et al. 2014).

The clinical relevance of PE in common mental disorders (CMD), such as depression or anxiety, is manifold and includes poorer treatment response (Hui et al. 2013; Kelleher et al. 2012; Perez et al. 2017; Wigman et al. 2014). People with CMD including PE (CMD-P) are distressed individuals that may be under-served by mental health services. Symptoms of CMD-P may not meet the threshold for ultra-high risk for psychosis (UHR) in specialist care, nor are they well managed by standard interventions for CMD currently offered in primary mental health care settings, where PE are not routinely screened for (Perez et al. 2017). In England, primary mental health care is delivered as part of the Improving Access to Psychological Therapies (IAPT) programme, which aims to increase the provision of evidence- based therapies. Interventions are delivered through telephone, digital and face-to-face therapy in community settings and can be accessed by people aged 17 and older in England who are registered with a general practitioner. People can access the service via general practitioner or self-referral.

Recently, attention has turned to the potential of existing short, self-report questionnaires to detect people with PE in primary care (Perez et al. 2017). One such measure is the Community Assessment of Psychic Experiences - Positive 15-items Scale (CAPE P-15) (Capra et al. 2013). Despite the CAPE-P15's good reliability, its clinical application for screening purposes was limited due to the absence of cut-off scores. To remedy this, Bukenaite et al. (2017) analysed CAPE-P15 and Comprehensive Assessment of At-Risk States (CAARMS) (Yung et al. 2005) responses from people referred to early intervention in psychosis services. The authors identified a mean score cut-off for UHR of 1.47 for both frequency of and distress associated with PE (Bukenaite et al. 2017). However, if the purpose of identifying PE is to promote early recovery in a variety of clinical settings, cut-off values to screen for UHR may be excessively high for individuals with CMD accessing primary care.

To understand PE, depression, and anxiety symptoms as manifestations of a continuum of mental distress (Stochl et al. 2014) indicates that lower CAPE-P15 cut-off scores might also capture those experiencing fewer and/or less intense PE but higher CMD severity and, therefore, prone to poorer outcomes. Increasing the sensitivity of the CAPE-P15 to provide a structured approaching to

identify more people with PE might facilitate prompt access to more specific, evidence-based interventions.

The CAPE-P15, like any other measurement tool, is not fully reliable; its scoring is subject to Standard Error of Measurement (SEM), a standard deviation around *true* scores for each individual. Accordingly, it is possible for true positive cases to score below established cut-off values (Stochl et al. 2012). Herewith, we revisit CAPE-P15 cut-off values by estimating the SEM and scoring confidence interval (CI) limits in a sample of people with CMD treated in primary mental health care services to increase sensitivity for detecting PE in such settings.

2. Methods

2.1 Sample

We carried out our analysis with a sample of 1,131 individuals with CMD that were referred to the Improving Access to Psychological Therapies (IAPT) programme in primary care across three mental health services (trusts) in England: Cambridgeshire and Peterborough NHS Foundation Trust, Norfolk and Suffolk NHS Foundation Trust and Sussex Partnership Foundation Trust. CAPE-P15 data was collected between February and August 2018 from a total caseload of 14,803.

2.2 Setting

The IAPT programme provides access to evidence-based psychological treatments, predominantly within a cognitive-behavioural therapy framework, to over 1,000,000 people with CMD every year (NHS England, 2018). IAPT services routinely record patient-reported measures of depression and anxiety, i.e. the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al. 2001) and the Generalised Anxiety Disorder Assessment (GAD-7; Spitzer et al. 2006). These measures are completed at baseline and at each treatment session, and services use them to calculate recovery rates. Our participating IAPT services also collected the "current" CAPE-P15, which refers to the previous three months (Capra et al. 2017), as part of an NHS Quality Improvement Programme to assess the impact of PE on recovery rates.

2.3 Statistical analysis: Estimation of the CAPE-P15 Standard Error of measurement (SEM)

The CAPE-P15 is comprised of two subscales: frequency of and distress associated with PE. Responses to 15 items regarding frequency and distress range from 1-4. To account for non-response to any items, scores are weighted for the number of valid answers. The weighted score is

the sum score divided by the number of items completed. We employed Classical Test Theory (CTT) and Item Response Theory (IRT) approaches to estimate the CAPE-P15 SEM.

In the CTT, reliability is a constant that can be estimated using statistical methods such as McDonald's hierarchical ω coefficient (Cronbach, 1951), which is especially suitable for scales with bi-factor structures such as the CAPE-P15 (Bukenaite et al. 2017). We used ω estimates to compute the SEM with the formula $SEm = sd\sqrt{1 - reliability}$. New high-sensitivity thresholds were established as $1.47 - 1.96 \times SEm$, i.e. the lower 95% CI limit for which the upper 95% CI limit is equal or above the CAPE-P15 cut-off for UHR. This analysis was performed with the R package *psych* (Revelle, 2018).

In the IRT, the SEM varies depending on severity levels of measured constructs (i.e. PE). Therefore, each CAPE-P15 summary score is associated with its own specific SEM. Given the CAPE-P15 scoring instructions and format (rating scale), we employed the Rating Scale Model to estimate the CAPE-P15 SEM conditional on PE severity. We calculated item fit indices, such as chi-square and mean squares, to evaluate how well the data fits the model. The estimation of high-sensitivity thresholds required two steps. First, we computed 95% CI for each score. We then determined new thresholds for each subscale taking the lowest score for which its upper 95% CI limit was above 1.47. IRT analyses were performed with R package *eRm* (Mair et al. 2018)

This study was approved by and registered with the official NHS Quality Improvement Programmes of all participating mental health NHS trusts, and confirmed as such by the UK Health Research Authority (Health Research Authority, 2019). Data analysis followed the guidelines established by the UK Anonymisation Standard for Publishing Health and Social Care Data (NHS Digital, 2013).

3. Results

3.1. Sample description

The mean age in our sample was 39.7 years (SD=14.9) and 65.8% were female. Most individuals (73.5%) scored below the CAPE-P15 threshold of 1.47 for UHR. Both PHQ-9 and GAD-7 mean scores for the total sample were above the recovery thresholds for each measure (PHQ-9 mean=11.6, SD=6.7 (recovery threshold≤9); and GAD-7 mean=10.5, SD=5.8 (recovery threshold≤7)) when the CAPE-P15 were completed.

3.2. CCT CAPE-P15 high-sensitive cut-off values

Table 1 shows McDonald's hierarchical ω, the associated SEM and CI limits for CAPE-P15 scores. Overall, CAPE-P15 reliability was high. The lower 95% CI limit for frequency and distress subscales were 1.30 and 1.29, respectively. These cut-off values are highly sensitive and would detect almost everybody (97.5%) who might have PE.

Table 1 about here

3.3 IRT CAPE-P15 high-sensitive cut-off values

Each CAPE-P15 frequency and distress item fit to the Rating Scale Model is provided in Table 2. Chi-square was only statistically significant in both subscales for item 6 ("In the past three months, have you felt as if electrical devices such as computers can influence the way you think?"), suggesting that it does not fit the model perfectly; however, it's out-fit and in-fit mean squares were within acceptable limits (between 0.6 and 1.4) (Gustafson, 1980; Martin-Löf, 1974).

The lowest CAPE-P15 scores (cut-off values) for which the upper 95% CI limit was above the threshold for UHR were 1.20 and 1.07 for frequency and distress, respectively. Figure 1 depicts CAPE-P15 mean scores and their 95% CI limits for frequency and distress. It shows SEM variations and scores' 95% CI limits that cross the UHR threshold.

Table 2 and Figure 1 about here

4. Discussion

Comprising over a thousand people with CMD attending primary mental health services, our study confirmed that the CAPE-P15 is a reliable tool for the detection and measurement of PE. In addition, its SEM, as estimated with both CTT and IRT, may also offer a useful choice of cut-off values that increase sensitivity to identify more people with PE who may otherwise remain undetected. These highly-sensitive cut-off scores should not replace the original cut-off value for UHR (Bukeinate et al. 2017); they would simply detect more people whose CAPE-P15 score's upper 95% CI limit crosses the UHR cut-off of 1.47.

Nonetheless, by increasing the CAPE-P15's sensitivity, we reduce its specificity. By revising the cut-off thresholds to 1.30 and 1.29 (or 1.20 and 1.09) for frequency of and distress associated with PE respectively, we would not only identify more people with CMD-P, but also without such condition. The decision to lower the threshold should ultimately be driven by the injunction *primum*

non nocere (first do not harm) and patient benefit (Sokol, 2013). In this regard, growing evidence places PE towards the most severe end of a continuum of mental distress in CMD (Stochl et al. 2014). Consequently, components of evidence-based psychological therapies recommended for those with most severe PE (at UHR) (National Institute for Health and Care Excellence, 2014) might also be effective for people with milder PE. This should be subject to the tolerability and safety of such interventions and whether higher demands in service provision could be met without affecting routine clinical practice.

In this context, the UK National Institute for Health Research (NIHR) recently funded the TYPPEX programme (NIHR, 2018), which will develop training and supervision for therapists in IAPT services to detect and treat people with CMD-P in their caseloads more effectively. It aims to enhance the existing cognitive behavioural therapy skills used by IAPT therapists to treat CMD but will include working with psychotic experiences. High-sensitivity CAPE-P15 cut-off values should help prevent people with CMD-P from 'falling through the cracks' so they receive an intervention specifically designed to enhance recovery rates for this group in primary care.

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Table 1: McDonald's hierarchical ω, Standard Error of measurement (SEM) and 95% confidence interval limits for the CAPE-P15

	CAPE-P15 Frequency	CAPE-P15 Distress
Omega	0.957	0.962
SEM	0.085	0.089
Lower 95% CI	1.300	1.290
Upper 95% CI	1.640	1.650

Table 2: CAPE-P15 item fit statistics for Rating Scale Model

	CAPE-P15 Frequency				CAPE-P15 Distress			
	Chisq*	p-value	Out-fit Meansq	In-fit Meansq	Chisq**	p-value	Out-fit Meansq	In-fit Meansq
Q1	1028.35	0.05	1.08	0.88	709.29	1.00	0.84	0.74
Q2	846.11	1.00	0.89	0.81	661.16	1.00	0.79	0.71
Q3	915.31	0.82	0.96	1.04	781.55	0.93	0.93	1.02
Q4	774.60	1.00	0.81	1.01	684.61	1.00	0.81	1.02
Q5	1017.97	0.08	1.07	1.26	910.53	0.05	1.08	1.14
Q6	1071.19	0.01	1.12	1.13	965.51	0.00	1.15	1.07
Q7	772.10	1.00	0.81	0.98	731.30	1.00	0.87	1.01
Q8	754.21	1.00	0.79	0.86	779.52	0.93	0.93	0.97
Q9	650.50	1.00	0.68	0.89	703.68	1.00	0.84	0.96
Q10	805.66	1.00	0.84	0.91	815.40	0.72	0.97	1.04
Q11	769.54	1.00	0.81	1.03	790.40	0.89	0.94	1.13
Q12	927.73	0.73	0.97	1.14	634.79	1.00	0.76	1.10
Q13	686.99	1.00	0.72	1.23	624.30	1.00	0.74	1.18
Q14	526.58	1.00	0.55	1.26	455.00	1.00	0.54	1.40
Q15	931.21	0.70	0.97	1.17	1051.17	0.00	1.25	1.43

* degrees of freedom = 955; ** degrees of freedom = 840

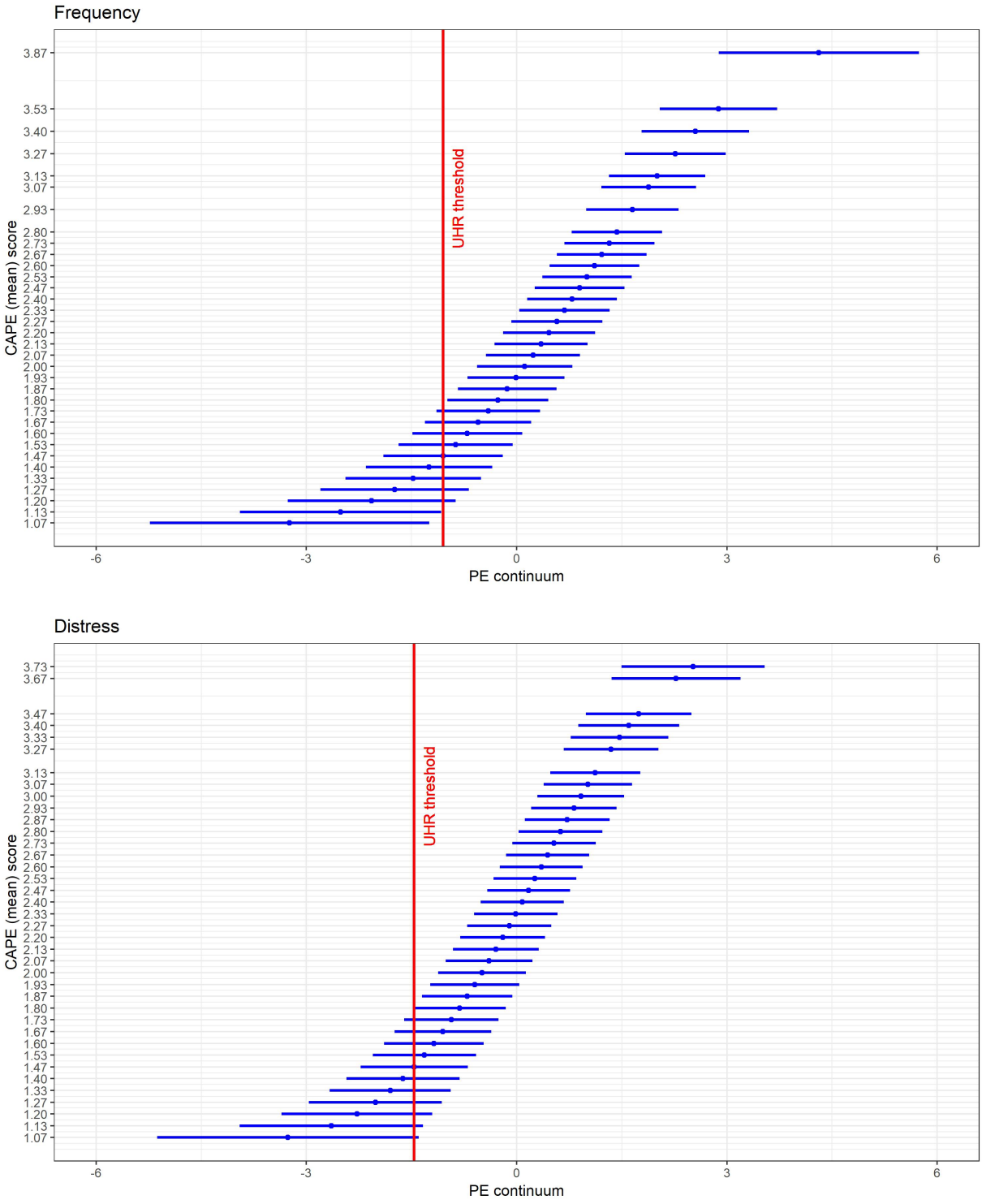

Figure 1: Point estimates and 95% confidence limits of frequency (top panel) and distress (bottom panel) scores on the PE continuum and with respect to UHR threshold.