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Review article

Internal consistency and temporal stability of the Community Assessment of Psychic Experiences (CAPE): A reliability generalization meta-analysis

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ABSTRACT

Psychotic experiences (PE) are prevalent in general and clinical populations and can increase the risk for mental disorders in young people. The Community Assessment of Psychic Experiences (CAPE) is a widely used measure to assess PE in different populations and settings. However, the current knowledge on their overall reliability is limited. We examined the reliability of the CAPE-42 and later versions, testing the role of age, sex, test scores, and clinical status as moderators. A systematic search was conducted on the Scopus, Web of Science, PubMed, EBSCOhost, ProQuest, and GoogleScholar databases. Internal consistency and temporal stability indices were examined through reliability generalization meta-analysis (RGMA). Moderators were tested through meta-regression analysis. From a pool of 1,015 records, 90 independent samples were extracted from 71 studies. Four versions showed quantitative evidence for inclusion: CAPE-42, CAPE-20, CAPE-P15, and CAPE-P8. Internal consistency indices were good ($\alpha/\omega \approx .725$–$0.917$). Temporal stability was only analyzed for the CAPE-P15, yielding a moderate but not-significant effect ($r=0.672$). The evidence for temporal stability is scant due to the limited literature, and definitive conclusions cannot be drawn. Further evidence on other potential moderators such as adverse experiences or psychosocial functioning is required.

1. Introduction

Psychotic experiences (PE), are symptoms occurring at a much lower level of intensity and distress than those seen in clinically significant psychosis (Kelleher and Cannon, 2011; Stainton et al., 2021). PE are prevalent in general and clinical populations (Cosgrave et al., 2021; Schultze-Lutter et al., 2022), particularly in adolescents and young adults (Healy et al., 2019; Lindgren et al., 2022). Mainly those persistent and stress-inducing, are associated with high risk for mental disorders (Barnes et al., 2022; Ratheesh et al., 2023; Staines et al., 2023; Yates et al., 2019) increased healthcare costs and mental health services use (Rimvall et al., 2020), worse psychosocial functioning (Calkins et al., 2017), higher risk for suicidal ideation (Yates et al., 2019), and lower recovery rates in patients with depressive and anxiety disorders (Knight et al., 2020a; Wiedemann et al., 2024; Wigman et al., 2012). There is currently a consensus about the need to systematically and accurately assess PE in general (Staines et al., 2022) and clinical populations (Ashford et al., 2022; Knight et al., 2020a). However, there is a significant variety of measurement tools (Hinterbuchinger and Mossaheb, 2021; Lee et al., 2016; Staines et al., 2022) and further evidence about scalability and reliability of these questionnaires is required (Birkenæs et al., 2023).

One of the most used self-reported questionnaires to assess PE is the Community Assessment of Psychic Experiences (CAPE). Originally based on Peters et al.'s Delusional Inventory (PDI; Peters et al., 1999), the CAPE measures three types of PE: positive, negative, and depressive symptomatology. The original 42-item version (CAPE-42) was first validated (Stefanis et al., 2002) in a Greek population and has shown good reliability and a stable internal structure across different countries and cultures (Jaya et al., 2021; Mark and Toulopoulou, 2016; Vermeiden et al., 2019; Wüsten et al., 2018). The 20-item positive symptoms subscale, sometimes called either CAPE-20 or CAPE-P (Wigman et al.,

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2012; Yildirim, 2023), has also been widely used in research suggesting high predictive value for later psychosis (Welham et al., 2009). Nevertheless, some issues concerning the CAPE-20′s internal structure (Armando et al., 2010; Wigman et al., 2011) and associations with psychopathology have been reported (Berenbaum et al., 2009). Prior studies have found 4–5 factors and unclear associations with distress, depression, and poor functioning, particularly for factors assessing magical thinking/grandiosity (Armando et al., 2010; Wigman et al., 2011). Aiming to refine the CAPE-20, the study by Capra et al. (2013) re-examined its internal structure and found a three-factor model composed by 15-item focused on paranoid ideation (PI, 5 items), bizarre experiences (BE, 7 items) and perceptual anomalies (PA, 3 items). The CAPE-P15 has been tested in different countries including participants from the general population and clinical settings, demonstrating good psychometric properties (Bukenaite et al., 2017; Capra et al., 2017; Núñez et al., 2015a). It is currently used in research evaluating interventions to treat common mental disorders including psychotic experiences in primary care (Ashford et al., 2022; Wiedemann et al., 2024). Recently an 8-item version was developed by Wang et al. (2020, 2022a). It addresses hallucinatory (6 items) and delusional experiences (2 items) and has been used and validated exclusively in Chinese populations, where meaningful associations have been found with protective and risk factors, such as chronic physical illness, family history of psychiatric illness, dysfunctional family relationship and poor school climate (Wang et al., 2022a).

Overall, studies on the different CAPE versions provide relevant evidence supporting its cross-cultural validity as a measure for assessing PE in different contexts (Fonseca-Pedrero et al., 2012; Siddi et al., 2019; Wang et al., 2021). However, the evident high variability in terms of specific sample types, recruitment procedures, and participants' specific attributes such as age and sex distribution, the generalization of these results is not currently guaranteed (Wüsten et al., 2018). This is particularly true when examining its psychometric reliability, which provides information on a measure's stability and consistency across time (Nunnally and Bernstein, 1994). A first review examining validity and reliability coefficients of this measure was conducted by (Mark and Toulopoulou, 2016). While this study is frequently cited as a source of evidence to support the reliability of the CAPE, their procedures and results have some important limitations. The authors identified 22 studies, with a total of 18 independent samples reporting Cronbach's alpha (9 for the PS, 5 for the NS, and 4 for the DS subscales). However, the specific studies and estimates included in their analysis were not described, preventing the replicability of their findings. Additionally, their analysis of variability sources employed methods such as splitting the studies based on age-ranges and performing mean comparisons between these groups. Finally, this review was exclusively focused on the CAPE-42, with no information reported for other commonly used versions of this questionnaire. Another relevant psychometric issue about the CAPE is the scarcity of studies looking into its temporal stability. Prior research studying this aspect for the CAPE-42 found an overall good test-retest reliability for its three dimensions (Konings et al., 2006). With regards to the CAPE-P15, mixed results have been reported, ranging from weak (Wang et al., 2021) to strong correlations between time intervals (Kim et al., 2020; Sun et al., 2020). The lack of empirical evidence related to this matter represents a relevant gap in research, as clinicians require accurate information about the persistence of PE across the lifespan that may indicate progression to severe mental disorders (Staines et al., 2023).

Acknowledging the need to systematically and accurately assess PE in community and clinical settings (Johnson et al., 2022; Knight et al., 2020a), the value of self-report measures to assess PE in clinical practice (Monshouwer et al., 2023), and the still insufficient evidence regarding the overall reliability comprising both internal consistency and temporal stability of the CAPE and its versions, this study aimed to: i) conduct reliability generalization meta-analysis (RGMA) to estimate pooled reliability coefficients of the CAPE and its variants across existing studies; ii) examine between-studies heterogeneity in the distribution of these coefficients; and iii) to determine whether variables such as age, sex distribution, or clinical status -that is, if the sample was composed exclusively by clinical, non-clinical individuals or a mixture of both- may act as potential moderators that could explain this variability.

2. Method

2.1. Literature search strategy

This meta-analysis was conducted under the Preferred Reporting Items Systematic Review and Meta Analysis (PRISMA) guidelines (Page et al., 2021), also following the recommendations by Sánchez-Meca et al. (2021) for reporting reliability generalization meta-analysis (REGEMA Checklist; see Supplementary Table S1). A systematic search was performed in the Scopus, Web of Science, PubMed, EBSCOhost, ProQuest, and GoogleScholar databases in November 2023 with no date restriction. This review was registered in the PROSPERO database under registration number CRD42023447595.

The key term "Community Assessment of Psychic Experiences" guided the literature search. The articles title, abstract, and keywords were examined when possible. The detail on the search syntax employed for each database is presented in Supplementary Table S2. Detection of duplicate records was carried out according to digital object identifiers (DOIs) and titles. Then, a manual check was conducted to ensure that each record was unique.

2.2. Study selection

The literature search results were assessed for eligibility based on the following inclusion criteria: (a) scientific research articles (b) related to the CAPE in any of its versions and (c) written in either English or Spanish.

Then, eligible articles were subsequently reviewed according to the following exclusion criteria: The article (a) was not peer reviewed; (b) is published either as a theoretical, review, non-empirical or case study; (c) did not calculate or report any reliability coefficients or, (d) if reported, these coefficients were induced (i.e. solely based on reports from previous studies; Shields and Caruso, 2004). Studies with induced reliability indices were excluded from our analysis in order to avoid potential bias due to repeated variance (Sánchez-Meca et al., 2021).

2.3. Data extraction

All articles deemed eligible for meta-analysis went through the data extraction process. Two independent reviewers (CVH and DN) were in charge of reviewing the articles and extracting the required data. Cronbach's alpha (α), McDonald's omega (ω), and test-retest correlation coefficients were collected. The reviewers also extracted demographic data such as sample size, mean age of the participants, sex distribution (female percentage), clinical status (non-clinical/mixed/clinical), the country in which the study was carried out, the CAPE version, its language, and the scores obtained by the participants on each dimension. In case of discrepancies between the reviewers regarding the eligibility of a particular study, they were resolved by consulting with a third external reviewer (either JP or PJ).

2.4. Data analysis

To determine the pooled reliability indices of the different CAPE versions across studies, multiple RGMAs were conducted. Interpretation for Cronbach's alpha (α) and McDonald's omega (ω) coefficients derives from commonly accepted cut-off criteria, where values above 0.70 are seen as acceptable, above 0.80 are viewed as good, and above 0.90 are considered as excellent (Tavakol and Dennick, 2011; Zinbarg et al., 2005). The CAPE properties have been studied and validated in a wide

range of samples, including students (Kang et al., 2023), patients (Jaya et al., 2021), or individuals from the general population (Sahu et al., 2023), and in different cultural contexts and languages (Pignon et al., 2019; Vermeiden et al., 2019). Therefore, we expected that the true effect might vary for reasons other than a mere sampling error. As a result, our analyses were based on a random-effects model (REM), which allows for the possibility of genuine variability of reported effects across studies (Borenstein et al., 2009; Dettori et al., 2022), in conjunction with the restricted maximum likelihood (REML) estimator as recommended for studies with potentially high heterogeneity levels (Tanriver-Ayder et al., 2021).

In the same line, the Hartung-Knapp-Sidik-Jonkman method (Hartung, 1999; Knapp and Hartung, 2003; Sidik and Jonkman, 2002) was employed for estimation of the confidence intervals. This method adjusts the standard errors to provide wider and more realistic estimates, thus better reflecting the true uncertainty around the overall effect size which may be underestimated when assuming a standard normal distribution (IntHout et al., 2014; Sánchez-Meca and Marín-Martínez, 2008). We also calculated prediction intervals, which account for both the between-study variability and the uncertainty of the overall effect estimate, providing ranges within which the true effects are expected to lie for 95 % of similar future studies and can be relevant for clinical practice (Riley et al., 2011; Spineli and Pandis, 2020).

Separate analyses were conducted for each CAPE version with sufficient quantitative evidence coming from at least two independent samples. As suggested by Rücker et al. (2011) and Mathes & Kuss (2018), REM-based meta-analysis involving a low number of studies may induce important biases. However, these results are still informative of the overall internal consistency of the measure.

In order to analyze internal consistency coefficients, and given the non-normal distributions of both Cronbach's alpha and McDonald's omega values, these were transformed following Bonett (2002)'s procedure. Bonett's transformation allows these indices to stabilize and normalize their variances and distributions for analysis (Sánchez-Meca et al., 2013). After conducting the analyses, the pooled estimates were then back-transformed into alpha and omega coefficients for interpretation.

To examine temporal stability, we conducted classical meta-analysis based on correlation coefficients. Again, due to the non-normal nature of this coefficient, the values were transformed this time into standardized Z scores using Fisher's r-to-Z method (Borenstein et al., 2009). Following the same procedure as the one applied to the internal consistency analysis, pooled Z scores were then back-transformed into correlation coefficients.

Next, we performed heterogeneity tests through the I^2 index and the Cochran's Q test to determine the degree of variability between studies. These analyses offer insights concerning the existing evidence for heterogeneity and how it contributes to the variability observed in the results. While the I^2 index quantifies the percentage of variability in estimates that can be attributed to heterogeneity rather than sampling error, the Cochran's Q test determines the presence of heterogeneity by testing the hypothesis that there are no statistically significant differences between studies (Higgins and Green, 2011). For the I^2 index, values ranging 0–40 % are considered to be within non-significant levels of heterogeneity, while values ranging 40–60 % and 75–100 % are respectively interpreted as moderate and high levels of heterogeneity (Higgins et al., 2003; Huedo-Medina et al., 2006). In addition, we obtained the influence diagnostics plots, which help identify whether one or more studies are acting as outliers, thus distorting and potentially influencing the overall results. For an in-depth methodological description of this procedure, see Viechtbauer & Cheung (2010). Furthermore, we examined the corresponding funnel plots and conducted Egger's Z regression in order to determine if there was evidence for potential publication bias and asymmetry on the distribution of the internal consistency coefficients across studies.

Finally, meta-regression analyses were carried out to assess the role of potential moderators to determine their ability to explain the overall variability of the coefficients' distribution. For this, the participants' mean age (M_{age}), the sex distribution based on the percentage of female subjects, and the clinical status (non-clinical/mixed/clinical), and the standard deviation of the participants' scores were included as predictors in the model.

All statistical analyses were conducted using RStudio version 2023.06.0, with R version 4.3.3 through the *metafor* package developed by Viechtbauer (2010).

3. Results

3.1. Study selection

A systematic search was conducted on six databases, with 1010 records being initially retrieved. After filtering duplicate studies, 259 independent records remained for screening based on title and abstract. This first screening followed the established inclusion criteria in order to determine their eligibility. Whilst performing the data extraction process from the remaining studies, full texts were examined based on the exclusion criteria.

After the study selection and data extraction processes were carried out, we identified a number of studies referring to the measure as 'Community Assessment of Psychotic Experiences', instead of 'Community Assessment of Psychic Experiences'. This led to their exclusion by default in our first search. In order to avoid excluding these studies, a complementary search was carried out. As a result, 16 unique articles with the same issue were found. After applying the same criteria, 5 of these studies were eligible for inclusion.

Thus, in the end a total of 71 studies were finally eligible for inclusion in meta-analysis. Four versions of the CAPE reported sufficient quantitative data: The original CAPE-42 (Stefanis et al., 2002), the CAPE-20 (van Gastel et al., 2011), the CAPE-P15 (Capra et al., 2013), and the CAPE-P8 (Sun et al., 2017) (For a detailed description of the items used in each version, see the Data Availability section). Fig. 1 presents the flow diagram detailing the study selection process.

3.2. Sample characteristics

Ninety independent samples were extracted from the 71 studies included in the analysis. The total sample size was 261,951 (M_{age}=24.100; SD_{age}=4.994; female=60.44 %). Most study samples included non-clinical populations ($k = 78$; 86.66 %), with 10 % ($k = 9$) being only clinical and 3.33 % ($k = 3$) mixed. The studies were conducted in at least 25 countries, with those from (Scheunemann et al., 2020, 2021) being performed in non-specified countries. Overall, CAPE versions in 15 languages have been used up to the date of this review. A summary of the studies included in our analysis is provided in Supplementary Tables S3 to S6.

3.3. Reliability generalization meta-analysis

A total of 17 independent meta-analyses were conducted: Seven for the CAPE-42 (based on its three dimensions and total score), one for the CAPE-20 (based on its total score), eight for the CAPE-P15 (based on its three dimensions and total score), and one for the CAPE-P8 (based on its total score). 10 meta-analyses were based on Cronbach's alpha (α), and seven on McDonald's omega (ω) coefficients.

Results for all RGMAs and their heterogeneity tests are detailed in Table 1. The forest, funnel, and influence diagnostics plots for the α-based PS dimension -which had the largest number of included studies- is presented in Fig. 2. Plots for the rest of the analyses are displayed in Supplementary Figs. S1 to S16.

We found very good pooled internal consistency coefficients for the CAPE, with α and ω values being over the 0.70 cut-off, and statistically significant effects regardless of the version ($\alpha_{pooled} \geq .725$; $\omega_{pooled} \geq .746$).

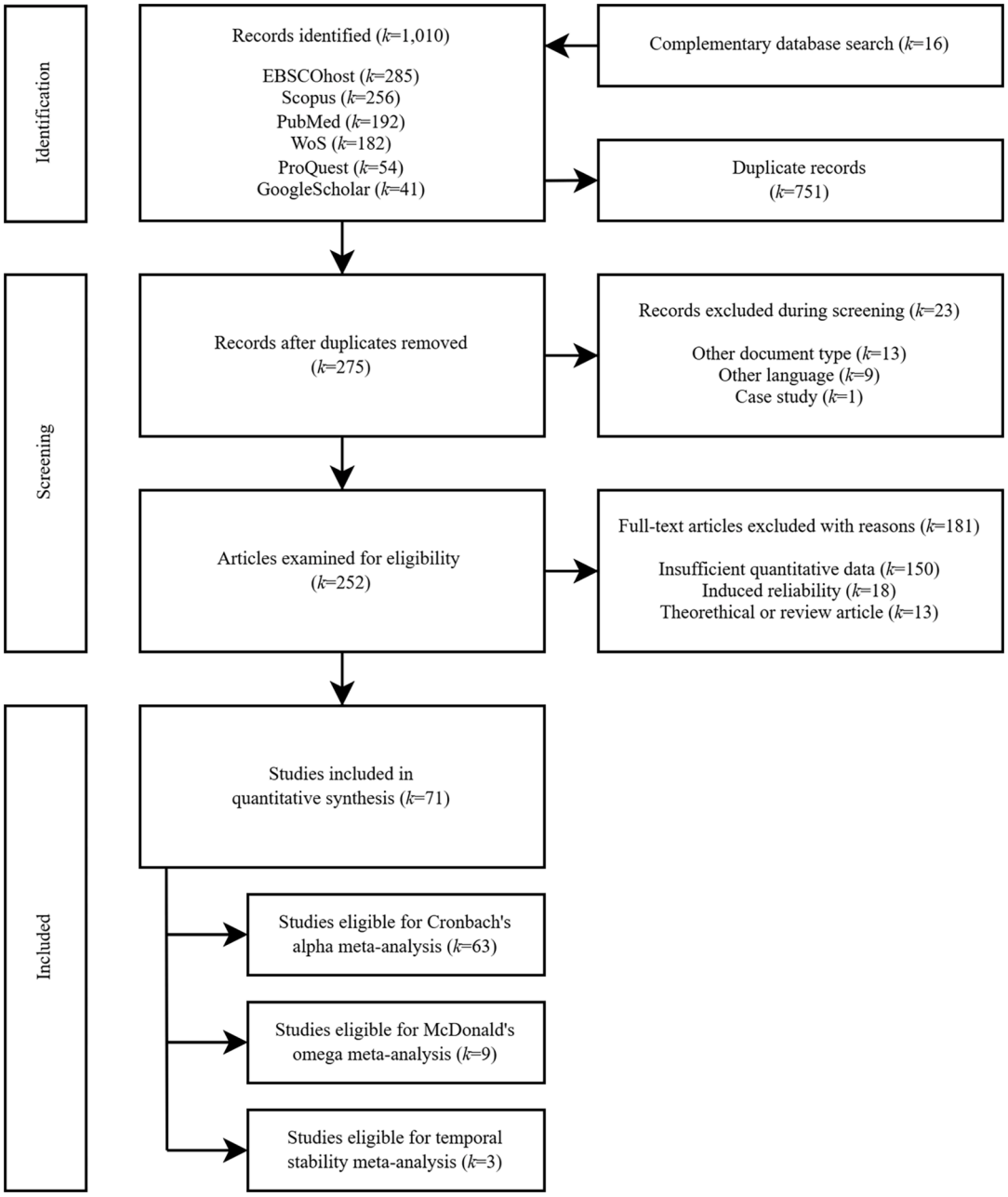

Fig. 1. Flow diagram for the study selection process.

Heterogeneity tests revealed high levels of between-study variability across coefficients ($p_Q<0.05$; $I^2\geq87.94$ %). Assessment of publication bias based on funnel plot and Egger's Z regression supports the high between-study variability, although significantly asymmetric distributions were only observed for the BE_α subscale of the CAPE-P15 ($p_{Zegger}>0.05$).

For the temporal stability meta-analysis, three studies were included. Only the total score of the CAPE-P15 was eligible for inclusion in the quantitative synthesis. Results showed a moderate but not statistically significant effect for temporal stability of the measure (r=0.672; r_Z=0.815; SE=0.241; p=.077; CI=[.303–0.866]; PI=[−.847–0.994]), with high between-studies heterogeneity levels (I^2=96.30 %). Detailed results and plots are presented in Supplementary Table S7 and Fig. S17, respectively. In addition, Supplementary Table S8 presents a summary of all studies assessing for temporal stability of the CAPE, regardless of their inclusion in the analysis.

3.4. Meta-regression

Results for all meta-regression analyses conducted are detailed in Table 2. A bubble plot for sex distribution as a significant moderator for PS —which had the largest number of included studies— is presented in Fig. 3, with the rest being included as Supplementary Figs. S18 to S24. It should be noted that ω-based analysis could only be conducted for the CAPE-P15 due to the reduced number of studies exploring this coefficient for the CAPE-42, CAPE-20, and CAPE-P8.

First, in the α-based analysis, results show that sex distribution and age were statistically significant moderators for the PS (QM=6.081; R^2=0.112; p=.018) and NS (QM=7.726; R^2=0.183; p=.009) subscales of the CAPE-42, respectively. Age also showed to be a significant moderator for DS (QM=6.073; R^2=0.170; p=.020). The scores' variability showed to be a statistically significant moderator for NS (QM=6.735; R^2=0.209; p=.017), BE (QM=29.408; R^2=0.5423; p=.032)

Table 1
Reliability generalization meta-analysis results.

			REM										Heterogeneity tests				
			k	IC	IC_{BT}	SE	*p*	CI (95 %)			PI (95 %)		Q	*p*	I^2	Z_{Egger}	*p*
Cronbach's Alpha (α)	CAPE-42	PS	50	.855	1.932	.051	.000	[.840	–	.869]	[.704	– .929]	6554.213	.000	98.23 %	-0.633	.530
		NS	41	.842	1.847	.048	.000	[.826	–	.857]	[.713	– .913]	742.615	.000	94.76 %	2.380	.022
		DS	33	.838	1.823	.046	.000	[.823	–	.853]	[.730	– .903]	568.660	.000	93.28 %	1.834	.076
		Total	23	.917	2.492	.093	.000	[.900	–	.932]	[.791	– .967]	2795.858	.000	98.69 %	-0.487	.631
	CAPE-20	Total	8	.885	2.158	.168	.000	[.828	–	.922]	[.621	– .965]	3608.387	.000	99.54 %	-0.395	.707
	CAPE-P15	PI	7	.725	1.292	.083	.000	[.664	–	.776]	[.521	– .842]	121.085	.000	91.90 %	-1.048	.342
		BE	6	.738	1.340	.180	.001	[.584	–	.835]	[.149	– .919]	219.479	.000	98.13 %	-2.271	.086
		PA	6	.739	1.342	.140	.000	[.625	–	.818]	[.379	– .890]	96.460	.000	95.57 %	.020	.985
		Total	21	.886	2.172	.084	.000	[.864	–	.904]	[.742	– .950]	3332.846	.000	99.13 %	-1.420	.172
	CAPE-P8	Total	7	.883	2.148	.105	.000	[.849	–	.910]	[.759	– .944]	3500.697	.000	99.85 %	-0.854	.432
McDonald's omega (ω)	CAPE-42	PS	2	.871	2.046	.483	.148	[.000	–	.999]	[.000	– .999]	116.551	.000	99.14 %	–	–
		NS	2	.873	2.065	.347	.106	[.000	–	.998]	[.000	– .999]	58.767	.000	98.30 %	–	–
		DS	2	.853	1.916	.134	.044	[.195	–	.973]	[.000	– .991]	8.295	.004	87.94 %	–	–
		Total	–	–	–	–	–		–			–	–	–	–	–	–
	CAPE-20	Total	–	–	–	–	–		–			–	–	–	–	–	–
	CAPE-P15	PI	4	.746	1.372	.071	.000	[.682	–	.798]	[.605	– .837]	10.592	.014	75.62 %	-2.415	.137
		BE	3	.823	1.731	.168	.009	[.636	–	.914]	[.272	– .957]	45.843	.000	95.50 %	-2.081	.285
		PA	3	.828	1.760	.255	.015	[.484	–	.943]	[.000	– .981]	114.824	.000	97.54 %	.604	.654
		Total	6	.907	2.378	.233	.000	[.831	–	.949]	[.552	– .981]	733.384	.000	99.05 %	.512	.636
	CAPE-P8	Total	–	–	–	–	–		–			–	–	–	–	–	–

REM=Random-effects model; *k*=number of included studies; IC=Pooled internal consistency coefficient (α or ω); BT=Bonett transformed value; SE=Standard error; CI (95 %)=Confidence interval; PI (95 %)=Prediction interval; Q=Cochran's statistic; I^2=Heterogeneity index; Z_{Egger}=Egger's regression statistic; PS=Positive symptoms; NS=Negative symptoms; DS=Depressive symptoms; PI=Persecutory ideation; BE=Bizarre experiences; PA=Perceptual anomalies; –=Insufficient data for calculations, or the number of parameters to be estimated is larger than the number of observations. Note: *p* values are statistically significant when <0.05.

and PA (QM=130.395; R^2=1.000; *p*=.008).

In the ω-based analysis, results showed that age was a statistically significant moderator for PA (QM=2936.147; *p*=.012), and clinical status was a significant moderator only for the total score of the CAPE-P15 (QM=11.511; *p*=.028).

4. Discussion

The present study synthesizes the available evidence on the reliability of the CAPE and its variations for the measurement of PE across different settings, populations and cultural contexts. This is the first reliability generalization meta-analysis (RGMA) examining for both internal consistency and temporal stability of the different existing versions of the Community Assessment of Psychic Experiences (CAPE). We reviewed a total of 71 articles, where four versions of the measure were eligible for inclusion in the analysis. The CAPE-42 (Stefanis et al., 2002), the CAPE-20 (van Gastel et al., 2011), the CAPE-P15 (Capra et al., 2013) and the CAPE-P8 (Sun et al., 2017). These measures demonstrated to have high overall internal consistency levels, which supports previous research indicating that the CAPE is a stable and reliable tool for the assessment of PE in diverse clinical and non-clinical settings (Bukenaite et al., 2017; Siddi et al., 2018). Regarding temporal stability, we found a moderate but ultimately not significant effect for the total score of the CAPE-P15, suggesting that the evidence on the ability of the measure to detect changes on psychotic symptoms between time intervals is, to date, still insufficient.

Our results showed that this measure holds high reliability indices across its different versions, with pooled internal consistency values ranging between 0.725 and 0.917. The highest indices were observed for the total scores of the CAPE-42 and CAPE-P15, which suggests that these versions can be considered suitable for both research and clinical purposes (Charter, 2003; Nunnally and Bernstein, 1994). The CAPE-20 and CAPE-P8 also showed good internal consistency levels overall, although the number of eligible studies were relatively lower. The subscales of the CAPE-P15 showed slightly lower pooled internal consistency values, ranging between 0.725 and 0.739. This could be attributed to the existing between-studies heterogeneity, with studies reporting some variability in the internal consistency coefficients for these subscales (Capra et al., 2013; Sun et al., 2020; Wastler and Núñez, 2022). Although this could initially point out that these subscales in particular are slightly less consistent, prior evidence has shown evidence indicating that the underlying construct of the CAPE-P15 can be adequately represented by either general factor assessing positive symptoms, or by its three separate dimensions (Núñez et al., 2015).

The good internal consistency indices of the CAPE-42 total score and its subscales mirror prior research concluding that is a reliable scale to

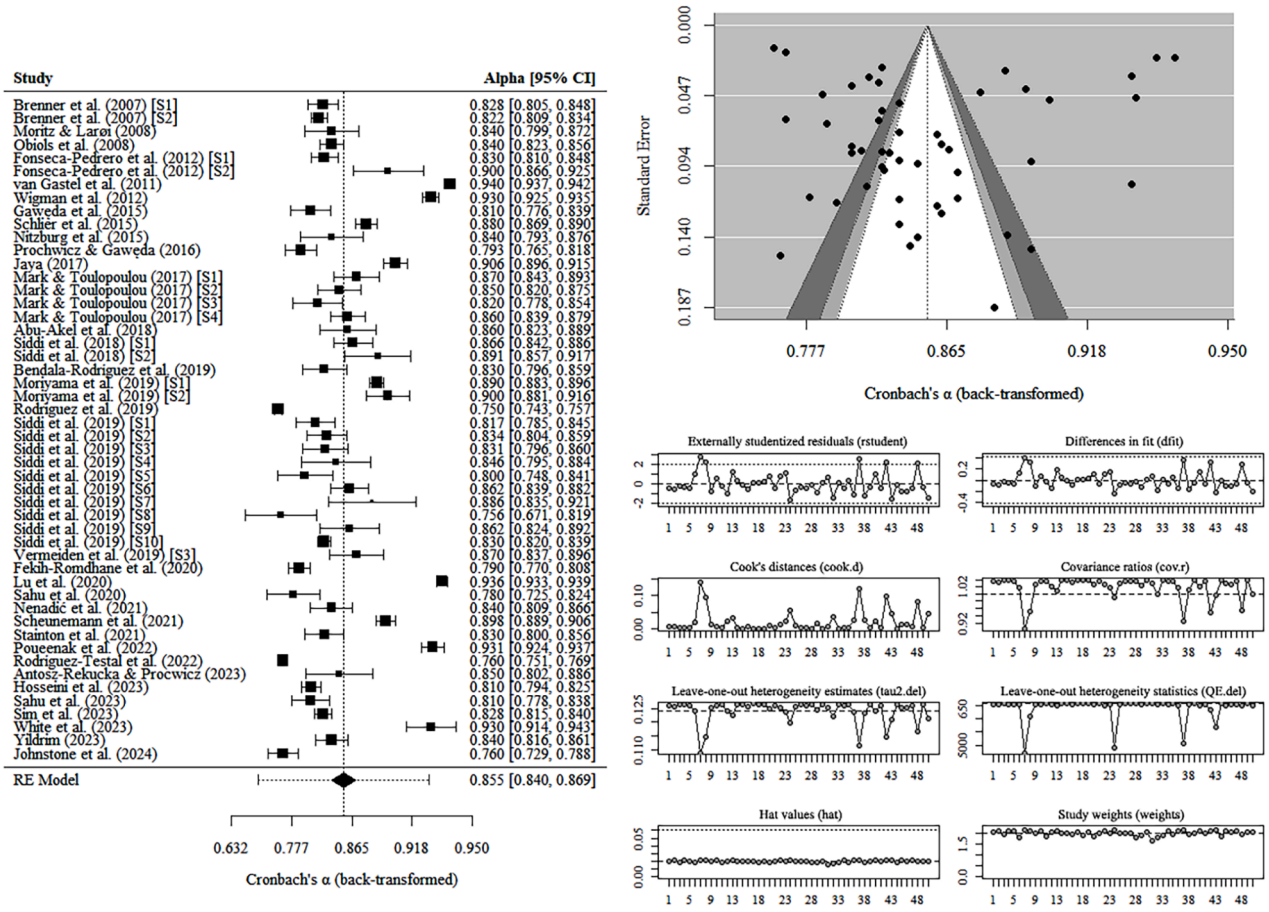

Fig. 2. Forest, funnel, and influence diagnostics plots for the CAPE-42's positive symptoms dimension meta-analysis based on Cronbach's alpha.

assess PE (Bendala-Rodríguez et al., 2019; Brenner et al., 2007; Gawęda et al., 2015; Moritz and Laroi, 2008; Rodríguez-Testal et al., 2019; Siddi et al., 2019; van der Linden et al., 2020; van Gastel et al., 2011; Wigman et al., 2011). This is also reflected when the PS subscale has been used on its own (Wigman et al., 2012; Yildirim, 2023). Similarly, our findings on the internal consistency of the CAPE-P15 fit with previous studies revealing good reliability (Capra et al., 2013; Sun et al., 2020). However, we observed slightly high variability for the subscales assessing BE and PA, with internal consistency indices ranging from 0.470 to 0.850, and 0.560 to 0.830 respectively (see Supplementary Table S5). Nonetheless, as stated by Williams et al. (2022), the low alpha values for these particular dimensions might be attributed to low variability of the scale items. Finally, we also found good internal consistency for the CAPE-P8, which showed a narrower range for pooled Cronbach's alpha coefficients (0.834 to 0.910). Second, our findings on the temporal stability of the CAPE confirmed the very limited available evidence on this reliability index. Our analysis only could focus on the CAPE-P15, which showed a moderate pooled correlation between measurements over time, with intervals ranging from 14 (Sun et al., 2020) to 182 days (Wang et al., 2021). Recent literature points out that persistent or recurring PE are strongly associated with psychiatric disorders and other negative outcomes in the general population (Staines et al., 2022) and clinical samples (Johnson et al., 2022). In this regard, our findings highlight the need for further research on the capability of existing tools to accurately measure the transient or recurrent nature of PE (Staines et al., 2023).

Our initial results looking into between-studies heterogeneity identified high variability that could not be explained by a mere sampling error. Heterogeneity levels were over 70 % regardless of the CAPE version, suggesting the influence of potential moderating factors, such as sex, age or clinical status. Our findings partially supported this. Although we found that higher percentages of females were associated with a decreased internal consistency, this effect was not observed across all the questionnaire versions and their subscales. This also occurred with the participants' mean age, which showed to be significantly associated with higher frequency of negative symptoms. Moreover, we found that clinical status had a moderating effect for the total CAPE-P15, where the overall internal consistency of the measure, based on the omega coefficient, was higher in clinical samples. Although this might suggest the sensitivity of the scale is higher in clinical settings, these findings could be interpreted as incidental or could be understood as a result of the low number of studies included in this analysis. Nevertheless, this sheds light on the potential effects of other clinical (e.g., anxiety and depressive symptoms) and demographic variables, such as living area (urban, suburban or rural), family history of psychiatric illnesses, personal history of being bullied or suffering other kind of significant distress (Hielscher et al., 2019), and the burden of previous traumatic events (Sun et al., 2015).

Our findings have implications for both research and clinical practice. Although recognized as markers for clinical severity (Kaeser et al., 2024; van Os et al., 2014), PE are usually underdetected by clinicians (Mossaheb et al., 2012). In the context of well-established prevention programs, and in conjunction with other clinical markers (Kelleher and Cannon, 2021), addressing PE thorough measures such as the CAPE might improve the timely detection and intervention of individuals at risk for mental health problems in settings such as schools (Staines et al., 2023), primary care (Bukenaite et al., 2017; Wiedemann et al., 2024) and specialist mental health services (Anagnostopoulou et al., 2024). Additionally, the clinical presentation of PE within these settings is not fully understood, making it difficult to deliver direct interventions for

Table 2
Meta-regression analysis results.

			Cronbach's Alpha (α)									McDonald's omega (ω)								
			MEM						Heterogeneity tests			MEM						Heterogeneity tests		
		Mod	*k*	Estimate	SE	R^2	QM	*p*	Q	*p*	I^2	*k*	Estimate	SE	R^2	QM	*p*	Q	*p*	I^2
CAPE-42	PS	Age	44	-0.001	.007	.000	.038	.846	4121.121	.000	97.88 %	—	—	—	—	—	—	—	—	—
		Female %	46	-0.870	.353	.112	6.081	.018	3316.613	.000	97.58 %	—	—	—	—	—	—	—	—	—
		Sample	50	.183	.104	.033	3.057	.087	6033.044	.000	98.01 %	—	—	—	—	—	—	—	—	—
		Scores	23	.039	.038	.002	1.076	.311	717.301	.000	96.87 %	—	—	—	—	—	—	—	—	—
	NS	Age	35	.019	.007	.183	7.726	.009	502.876	.000	93.32 %	—	—	—	—	—	—	—	—	—
		Female %	39	-0.288	.331	.000	.759	.389	647.509	.000	94.49 %	—	—	—	—	—	—	—	—	—
		Sample	41	.158	.092	.053	2.961	.093	717.971	.000	94.57 %	—	—	—	—	—	—	—	—	—
		Scores	22	1.445	.557	.209	6.735	.017	359.570	.000	94.78 %	—	—	—	—	—	—	—	—	—
	DS	Age	29	.015	.006	.170	6.073	.020	262.877	.000	89.16 %	—	—	—	—	—	—	—	—	—
		Female %	30	-0.063	.335	.000	.036	.852	338.384	.000	91.40 %	—	—	—	—	—	—	—	—	—
		Sample	32	.116	.079	.046	2.172	.151	421.255	.000	91.85 %	—	—	—	—	—	—	—	—	—
		Scores	17	.302	.152	.177	3.947	.066	240.531	.000	95.08 %	—	—	—	—	—	—	—	—	—
	Total	Age	21	-0.003	.010	.000	.113	.741	1740.997	.000	97.82 %	—	—	—	—	—	—	—	—	—
		Female %	23	.360	.675	.000	.284	.600	2602.080	.000	98.67 %	—	—	—	—	—	—	—	—	—
		Sample	23	-0.036	.191	.000	.035	.853	2275.761	.000	98.41 %	—	—	—	—	—	—	—	—	—
		Scores	11	.463	.453	.012	1.044	.334	134.826	.000	95.61 %	—	—	—	—	—	—	—	—	—
CAPE-20	Total	Age	6	-0.009	.019	.000	.198	.680	466.635	.000	99.34 %	—	—	—	—	—	—	—	—	—
		Female %	6	-5.000	2.810	.303	3.167	.150	437.752	.000	98.91 %	—	—	—	—	—	—	—	—	—
		Sample	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Scores	3	-2.272	2.454	.000	.858	.524	23.072	.000	95.67 %	—	—	—	—	—	—	—	—	—
CAPE-P15	PI	Age	7	-0.015	.011	.139	1.776	.240	67.905	.000	90.62 %	4	-0.013	.006	.883	4.537	.167	3.280	.194	29.80 %
		Female %	7	-0.552	.642	.012	.739	.429	46.726	.000	89.52 %	4	.278	.741	.000	.743	.743	9.532	.009	77.45 %
		Sample	7	-0.048	.102	.000	.220	.659	119.047	.000	93.48 %	4	-0.037	.103	.000	.753	.753	.130	.010	84.54 %
		Scores	4	-0.107	.342	.000	.098	.784	52.235	.000	95.94 %	—	—	—	—	—	—	—	—	—
	BE	Age	6	-0.083	.083	.003	.984	.377	57.910	.000	97.31 %	3	.137	.083	.486	2.695	.348	6.986	.008	48.59 %
		Female %	6	.157	1.429	.000	.012	.918	148.242	.000	98.04 %	3	1.684	.685	.756	6.041	.246	4.002	.045	75.02 %
		Sample	6	-0.044	.215	.000	.042	.848	214.575	.000	98.69 %	3	-0.191	.169	.131	1.279	.461	27.617	.000	96.38 %
		Scores	4	2.416	.446	5.423	29.408	.032	9.752	.008	79.53 %	—	—	—	—	—	—	—	—	—
	PA	Age	6	-0.080	.053	.420	2.244	.209	17.512	.002	89.64 %	3	-0.248	.005	1.000	2936.147	.012	.039	.843	0.00 %
		Female %	6	-1.469	.715	.651	4.225	.109	16.154	.003	65.07 %	3	-2.861	.434	.973	43.468	.096	1.633	.201	38.76 %
		Sample	6	.218	.130	.247	2.799	.170	86.822	.000	94.89 %	3	.101	.370	.000	.074	.831	107.078	.000	99.07 %
		Scores	4	2.488	.218	1.000	130.395	.008	.749	.688	0.00 %	—	—	—	—	—	—	—	—	—
	Total	Age	21	-0.031	.019	.078	2.629	.121	3185.010	.000	99.08 %	6	.024	.022	.045	1.211	.333	284.751	.000	98.83 %
		Female %	21	-1.202	.762	.073	2.490	.131	3314.536	.000	99.05 %	6	2.290	1.953	.068	1.374	.306	501.736	.000	98.68 %
		Sample	21	-0.051	.152	.000	.113	.740	3318.171	.000	99.20 %	6	.451	.133	.680	11.511	.028	176.333	.000	98.68 %
		Scores	8	.071	.481	.000	.022	.888	115.459	.000	93.07 %	—	—	—	—	—	—	—	—	—
CAPE-P8	Total	Age	7	-0.005	.018	.000	.096	.769	3498.170	.000	99.89 %	—	—	—	—	—	—	—	—	—
		Female %	7	.572	.757	.000	.571	.484	3185.087	.000	99.87 %	—	—	—	—	—	—	—	—	—
		Sample	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Scores	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

MEM= Mixed-effects model; *k*=number of included studies; Mod=Moderator; SE=Standard error; R^2=Coefficient of determination; QM=Moderator test statistic; Q=Cochran's statistic; I^2=Heterogeneity index; statistic; PS=Positive symptoms; NS=Negative symptoms; DS=Depressive symptoms; PI=Persecutory ideation; BE=Bizarre experiences; PA=Perceptual anomalies; −=Insufficient data for calculations, or the number of parameters to be estimated is larger than the number of observations. Note: *p* values are statistically significant when <0.05.

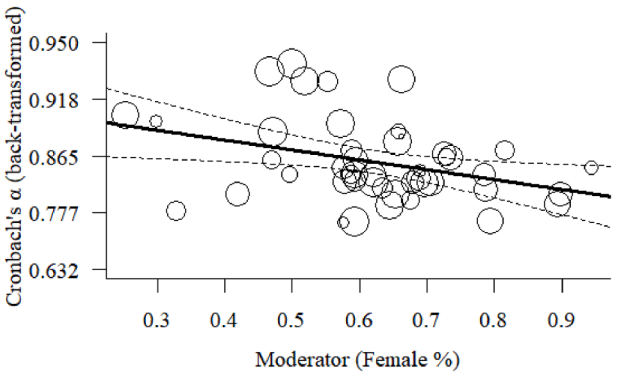

Fig. 3. Bubble plot for the meta-regression analysis testing the moderating role of sex distribution for the CAPE-42's positive symptoms subscale based on Cronbach's alpha.

subclinical phenomena, despite its influence on common mental disorders.

4.1. Limitations and future directions

The present study has certain limitations that must be addressed. First, we could not examine other versions of the CAPE such as the CAPE-State (Englund et al., 2023), the CAPE-33 (Ragazzi et al., 2020), or the CAPE-P4F (Yung et al., 2009) as these have seen little use, thus lacking sufficient quantitative evidence for inclusion. Second, due to a reduced number of studies calculating the McDonald's omega coefficient, our results based on this coefficient may suffer from certain bias, which is reflected in higher confidence intervals. While these results are still informative and represent the available evidence, they may only reflect a rough pooled internal consistency estimate. Third, there were very few studies assessing the temporal stability of the measure, most of which were focused on the CAPE-P15. Finally, although not a limitation per se, it should be noted that the CAPE-P8 has been exclusively validated in the Chinese population and mostly in school-settings. In contrast with other adaptations, which have been used in a variety of countries and have shown good reliability estimates in different cultural contexts, the ability to conclude the same for this version based on the existing evidence is limited. However, given that this brief version has shown good overall internal consistency, future studies should aim to examine its properties in other settings, languages, and populations. Further research should also focus on the assessment and report of other potential sources of heterogeneity such as psychosocial functioning or cognitive impairments, substance use and adverse childhood experiences. These have been regarded as factors associated with the potential transitions to psychopathology and could, to some extent, help understand the specific aspects of clinical status that could explain this variability (Bórquez-Infante et al., 2022; Kelleher and Cannon, 2021; Matheson et al., 2022).

5. Conclusion

The four examined versions of the CAPE: The CAPE-42, CAPE-20, CAPE-P15 and CAPE-P8 have shown to be highly reliable and internally consistent measures to assess psychotic experiences. However, the evidence regarding its temporal stability is still scant and inconclusive. This is particularly relevant given the importance of recurring PE in the progression towards severe mental disorders in both general and clinical populations. We observed a high between-studies heterogeneity, which could be partially explained by age, sex, clinical status and the test scores. Further research is still required to better understand the context-specific variables that impact on reliability indices for the CAPE, and to improve the assessment of psychotic experiences using complementary approaches such as clinical and experimental methods.

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Data availability

Documentation for this study, including raw exports from the six databases, the dataset used for analysis, and the items of the CAPE-42, CAPE-20, CAPE-P15, and CAPE-P8 are publicly available in an Open Science Framework repository at: https://osf.io/k452g. The CAPE-42, along with its translations into different languages and scoring system, are also available on its official website at: https://cape42.homestead.com.

CRediT authorship contribution statement

César Villacura-Herrera: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jesús Pérez:** Writing – review & editing, Validation, Supervision, Investigation. **Peter B. Jones:** Writing – review & editing, Validation, Supervision, Investigation. **Daniel Núñez:** Writing – review & editing, Writing – original draft, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The authors have no conflicts of interest to disclose.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2024.115988.

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