

ESM Methods

Cluster analysis of cognitions and fear concerning hypoglycaemia in participants in the HARPdoc RCT

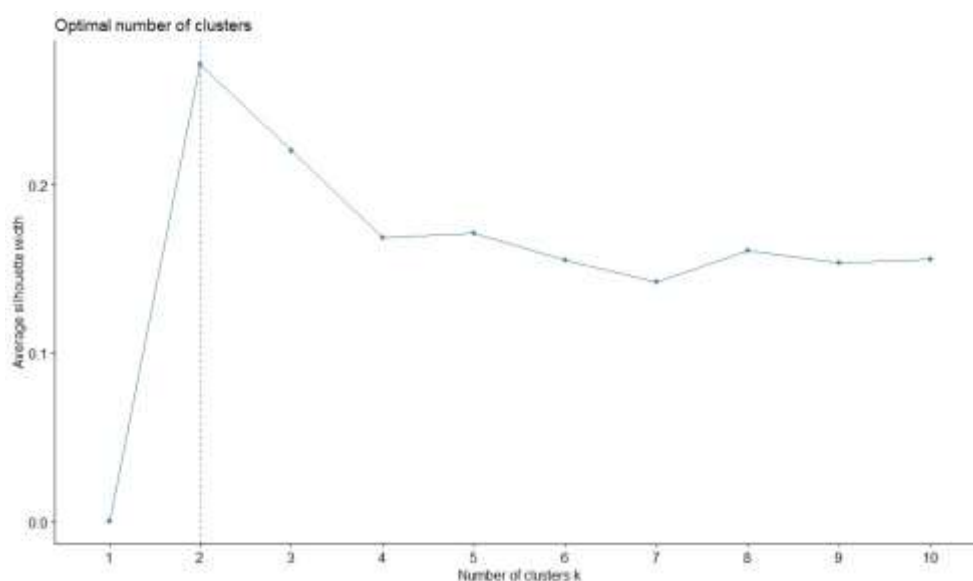
In order to characterise the HARPdoc participants by their scores on the Attitudes to Awareness (A2A) and Hypoglycaemia Fear (HFS-II) questionnaires, K-means clustering was performed in R (version 3.6.1). HFS-II responses were first partitioned according to a factor analysis that had been conducted across both HARPdoc and COBrA cohorts [1]. Mean item scores for these factors, and for A2A factors, were weighted according to the question eigenvalue from the original factor analyses [1, 2]. The factor scores were the mean of the weighted item responses within each factor. This weighting step ensured that clustering occurred according to the responses most closely aligned with each factor. Individual scores for each factor were then normalised by subtracting the mean score and dividing by the SD. The optimal number of clusters was identified with a silhouette analysis using the *factoextra* package. The silhouette method was chosen as an objective measure of cluster cohesion (Figure S1). Stability validation was conducted using the *clValid* package which calculated several stability measures, the average proportion of non-overlap, the average distance, the average distance between means and the figure of merit. These stability measures provided inconsistent results (2-10 clusters) and K-mean clustering was then performed using the optimal number of clustering centres (two; SF1) from the Silhouette analysis as this matched our theoretical basis. We used the Hartigan and Wong (1979) algorithm as implemented in *kmeans* [3]. This algorithm uses the Euclidean distance as the similarity measure.

Propensity matching methodology

Stata command *psmatch2* firstly estimated the propensity score of the cohort membership (HARPdoc vs hypoglycaemia aware COBrA participants) based on specified covariates gender and duration of diabetes, selected as known demographic factors that influence hypoglycaemia experience [4, 5]. Participants were then matched on a 1:1 basis with no replacements, using a calliper set to 0.2 SD of the propensity score (the maximum tolerated difference between matched subjects).

ESM Fig. 1

Output from the silhouette analysis supporting the use of a two-cluster solution.



References

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3. Hartigan JA, Wong MA (1979) Algorithm AS 136: A K-Means Clustering Algorithm. *Appl Stat* 28(1):100. <https://doi.org/10.2307/2346830>
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5. Amiel SA, Maran A, Powrie JK, Umpleby AM, Macdonald IA (1993) Gender differences in counterregulation to hypoglycaemia. *Diabetologia* 36(5):460–464. <https://doi.org/10.1007/BF00402284>