

# Automatic thematic analysis in mental health narratives using language models

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Deezer technical interview on a Github repository

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  - ▶ Thematic analysis studies how people construct meaning
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  - ▶ Computational approaches offers time savings over manual annotation, and the power to analyze a larger amount of data
- We developed a pipeline that (a) clusters narratives from different cohorts, (b) generates descriptions for each cluster, and (c) links clusters to variation in clinical scores and sociodemographic factors

## Data collection

We collected clinical scores and narratives from **four cohorts**. A French general population cohort ( $n=1809$ ), and three clinical populations: Italian ( $n=116$ ), Chinese ( $n=52$ ), and Spanish ( $n=90$ ) cohorts

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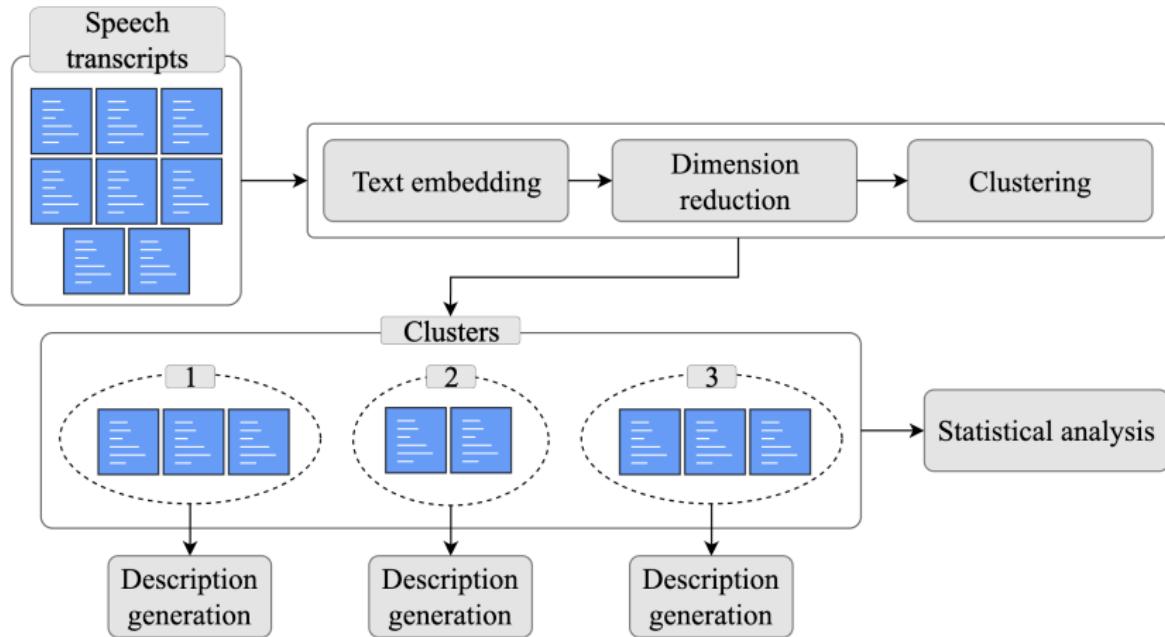
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**Open-ended questions:** *Describe your last 24 hours / a negative event that happened to you in the past / a positive event that happened to you in the past / a negative event you think might happen in the future / a positive event you think might happen in the future / Describe how you are feeling at the moment and how your sleep has been lately*

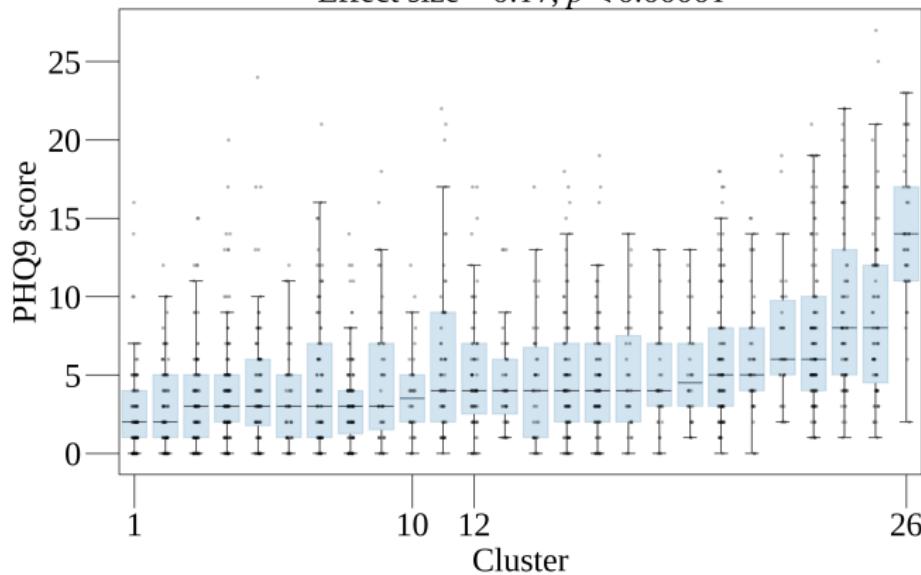
# Pipeline for semantic clustering and description generation



# Distribution of depression scores across clusters

*How you are feeling and how your sleep has been lately*

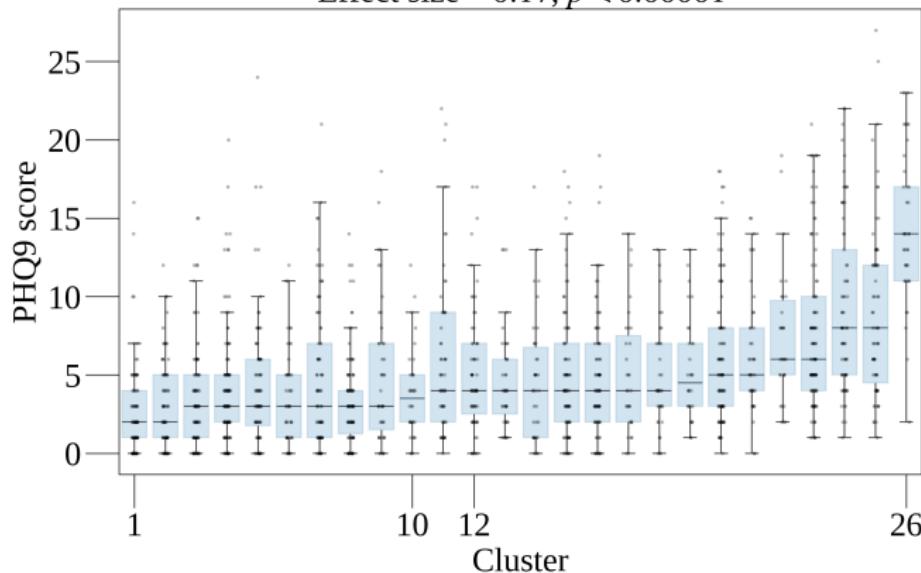
Effect size = 0.17,  $p < 0.00001$



# Distribution of depression scores across clusters

*How you are feeling and how your sleep has been lately*

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→ Depression scores vary significantly: cluster 26 highest ( $13.4 \pm 5.4$ ), cluster 1 lowest ( $2.6 \pm 2.2$ )

# Generated cluster descriptions

**Cluster 1 description:** The individuals express consistent satisfaction with their current well-being, emphasizing good sleep quality, restful or pleasant nights, and a general sense of relaxation, even when noting variations in sleep duration or occasional fatigue. (age=39±19, n=92)

**Cluster 10 description:** The individuals express frequent nighttime urinary interruptions disrupting sleep, often attributed to age-related conditions like prostate issues or overactive bladder, alongside mixed reports of physical well-being, mental resilience, and lifestyle factors such as retirement or exercise influencing their overall health and sleep patterns. (age=69±15, n=34)

**Cluster 12 description:** The individuals express stress related to academic exams, significant life decisions, and workloads, alongside sleep disturbances caused by lifestyle changes, increased responsibilities, or environmental adjustments, while some also highlight temporary relief from pressures through personal achievements or upcoming positive events. (age=24±9, n=67)

**Cluster 26 description:** The individuals express sleep disturbances characterized by insomnia, frequent awakenings, and restless sleep, alongside pervasive anxiety, emotional instability, and self-esteem issues, which collectively contribute to persistent fatigue, impaired daily functioning, and a diminished sense of well-being. (age=25±9, n=37)

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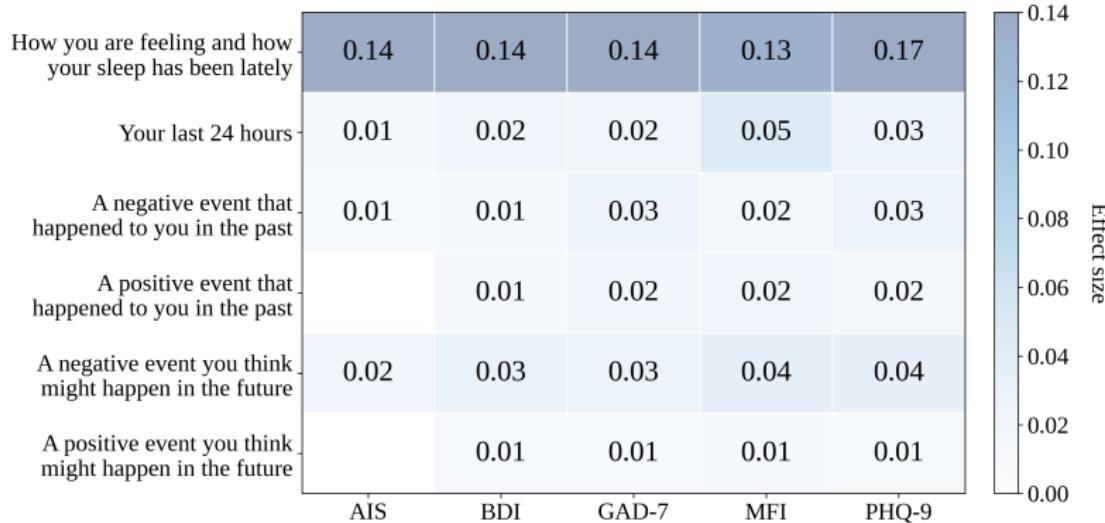
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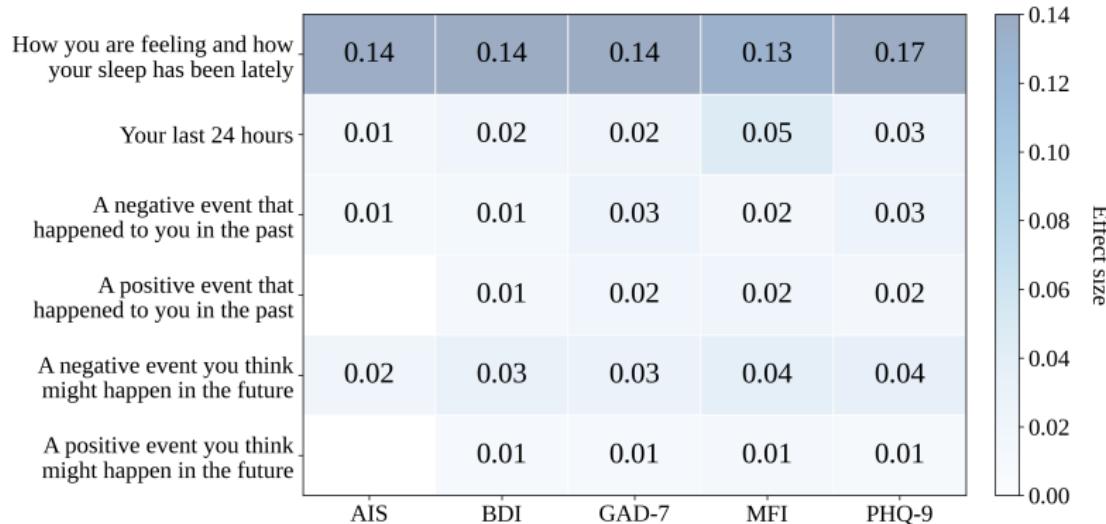
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→ Clustering captures symptom severity and age-related circumstances

# Effect size across questions and clinical scores

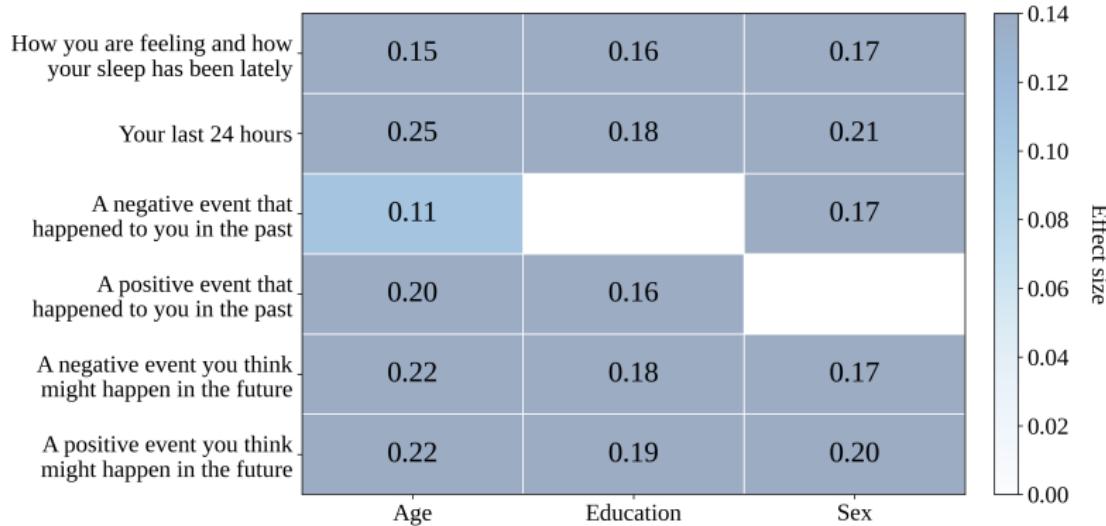


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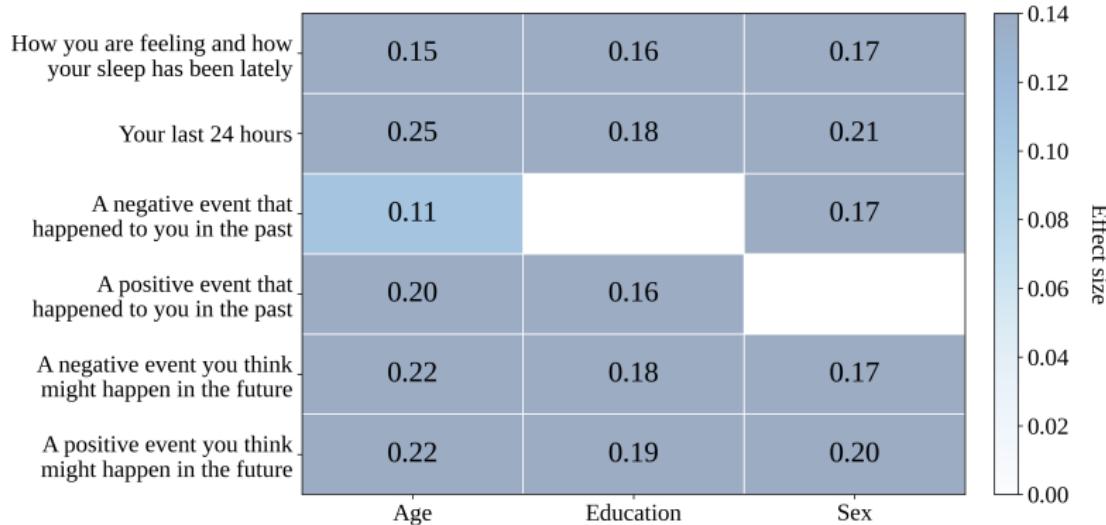


→ Certain questions better discriminate clinical scores

# Effect size across questions and sociodemographics



# Effect size across questions and sociodemographics



→ Nearly all questions discriminate sociodemographics

# Appendix

# Demographics

	General Population n=1809	Androids n=116	MODMA n=52	VOCES n=90
<b>Demographics</b>				
<b>Language</b>	French	Italian	Chinese	Spanish
<b>Age</b>	***	n.s.	n.s.	***
Mean (SD)	37.8 (18.2)	37.4 (12.0)	31.3 (9.2)	38.6 (14.9)
Range	18–91	19–71	18–52	21–76
<b>Sex, n (%)</b>	n.s.	n.s.	n.s.	n.s.
Female	1187 (66.2)	84 (72.4)	16 (30.8)	39 (43.3)
Male	595 (33.2)	32 (27.6)	36 (69.2)	48 (53.3)
Other	11 (0.6)	0 (0.0)	0 (0.0)	3 (3.3)
<b>Education, n (%)</b>	n.s.	n.s.	n.s.	n.s.
No diploma	52 (2.9)	11 (9.5)	7 (13.5)	-
Secondary	291 (16.2)	37 (31.9)	8 (15.4)	-
Higher short	213 (11.9)	52 (44.8)	0 (0.0)	-
Higher long	1236 (69.0)	16 (13.8)	37 (71.2)	-

# Clinical evaluation

	General Population n=1809	Androids n=116	MODMA n=52	VOCES n=90
<b>C-SSRS</b>	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Suicidal risk, n (%)	-	-	-	60 (66.7)
No suicidal risk, n (%)	-	-	-	30 (33.3)
<b>MADRS / MDD</b>	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Depression, n (%)	-	64 (55.2)	23 (44.2)	-
No depression, n (%)	-	52 (44.8)	29 (55.8)	-
<b>PHQ-9</b>	<i>n.s.</i>	<i>n.s.</i>	***	***
Mean (SD)	5.2 (4.6)	-	9.4 (8.5)	10.5 (6.8)
Range	0–27	-	0–25	0.0–26.0