

Sentiment analysis of open-text survey responses: Using PROMs to assess differences in affective states

Michiel A. J. Luijten^{1,2,3,4}, Chris Gibbons⁵, Conrad J. Harrison⁶, Hedy A. van Oers^{1,2,3}, Josjan Zijlmans^{1,2}, Jacintha M. Tieskens⁸, Hekmat Alrouh⁹, Emma M. Broek⁸, Janna N. de Boer^{10,11}, Lotte Haverman^{1,2,3}, Tinca J. C. Polderman^{1,2,8,11,12,13}

¹ Amsterdam UMC Location University of Amsterdam, Emma Children's Hospital, Child and Adolescent Psychiatry & Psychosocial Care, Meibergdreef 9, 1100 AD, Amsterdam, The Netherlands
² Amsterdam Public Health, Mental Health, Amsterdam, The Netherlands
³ Amsterdam Reproduction and Development, Child Development, Amsterdam, The Netherlands
⁴ Amsterdam University Medical Center, Vrije Universiteit Amsterdam, Epidemiology and Data Science, Amsterdam, The Netherlands
⁵ Health Data Intelligence and Life Sciences, Oracle, Austin, Texas, United States of America
⁶ Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, United Kingdom
⁷ Amsterdam Public Health, Quality of Care, Amsterdam, The Netherlands

⁸ LUMC Curium – Child and Adolescent Psychiatry, Leiden University Medical Center, Leiden, The Netherlands
⁹ Vrije Universiteit Amsterdam, Department of Biological Psychology, Amsterdam, The Netherlands
¹⁰ Department of Biomedical Sciences and Systems, Cognitive Neurosciences, University of Groningen, University Medical Center Groningen (UMCG), Groningen, The Netherlands
¹¹ Karakter Child and Adolescent Psychiatry University Centre, Nijmegen, Netherlands
¹² Levelle, Academic Center for Child and Adolescent Psychiatry, Amsterdam, Netherlands
¹³ Department of Child and Adolescent Psychiatry and Accare Child Study Center, University of Groningen, University Medical Center Groningen, Groningen, Netherlands

Background

The COVID-19 pandemic and associated governmental regulations significantly impacted anxiety levels in children. However, there is limited research detailing which specific regulations influenced anxiety and how. This study integrates quantitative and qualitative data using structural topic modeling (STM) and sentiment analysis to address this gap.

Aims

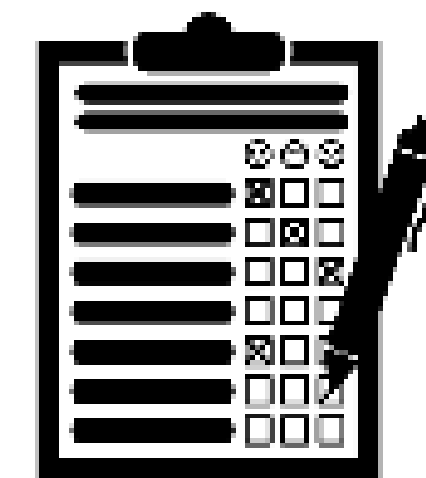
- 1) To extract topics from open answers given by children on how they experienced the pandemic.
- 2) To evaluate the sentiment behind the responses (positive or negative) overall and per topics.
- 3) To investigate differences between responses of children with and without (sub)clinical anxiety.

Methods

Participants



3.821 Children



6.672 Responses

- Children and adolescents aged 8-18 years old completed an open-ended question bi-annually from April 2020 until March 2023 (7 measurement occasions)

Measures

- Open answers to the question: “How are the corona-regulations for you?”
- PROMIS Anxiety V2.0 Computerized Adaptive Test, with anxiety classified as (sub)clinical for PROMIS T-scores > 50.6.

Analyses

- We applied structural topic modeling to cluster words
- We performed sentiment analysis on all responses and the resulting topics (resulting in polarity scores where -1 is negative, +1 positive)
- We split results by presence of (sub)clinical anxiety (yes/no) and performed independent T-tests (with Cohen's D >0.20 as relevant)



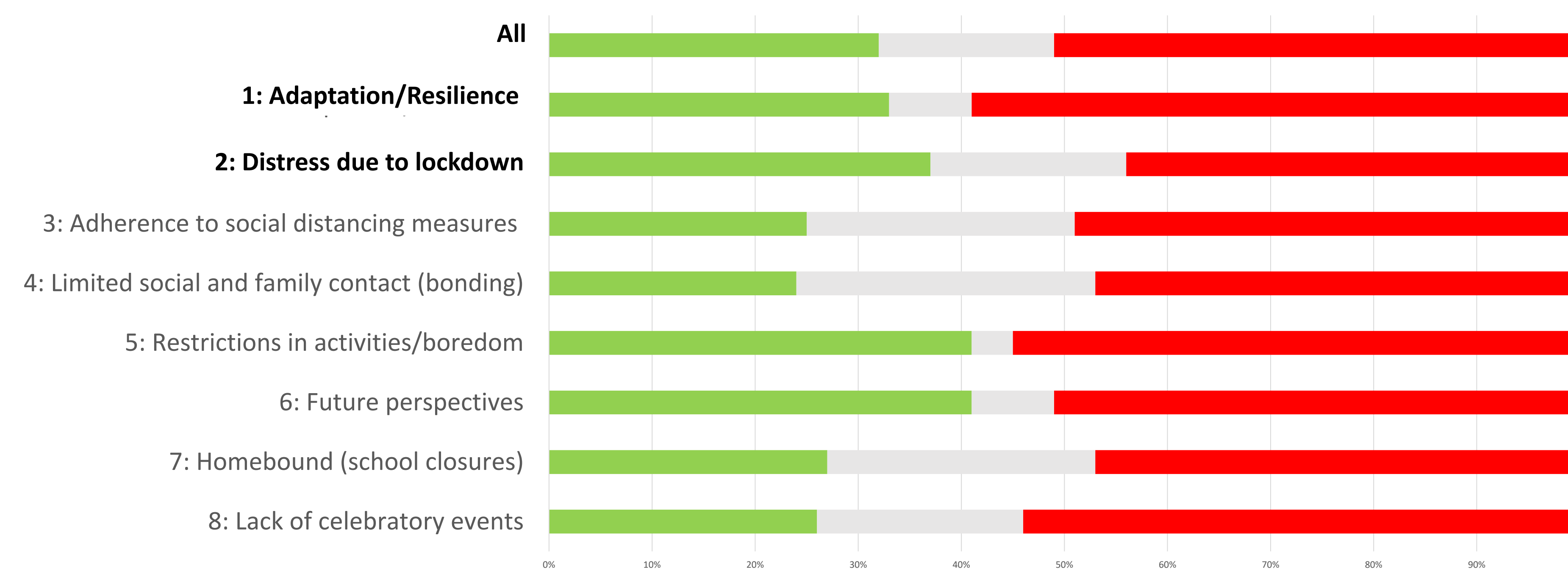
Results

Example Topic(s)	Terms	Quotes	% Anxiety	Polarity scores				% Positive (polarity > 0.01)			% Negative (polarity < -0.01)		
				A	B	Effect size D	Total	A	B	Total	A	B	Total
All	All	All	41.1%	-0.12	-0.06	-0,14	-0.09	32%	28%	30%	51%	48%	49%
1: Adaptation/Resilience	with, sometimes, well, difficulty, especially, difficult, mother, falls, problems, problem, heavy, lessons, tricky, understand, learn	1A. "Sometimes it's difficult. Sometimes suddenly a different teacher. But otherwise, it's okay."	39.5%	-0.19	-0.10	-0,24	-0.14	33%	30%	31%	59%	49%	53%
		1B. "It's okay now, there are actually no more rules. Home schooling wasn't fun, I did miss my friends. But I didn't have any further problems with it."											

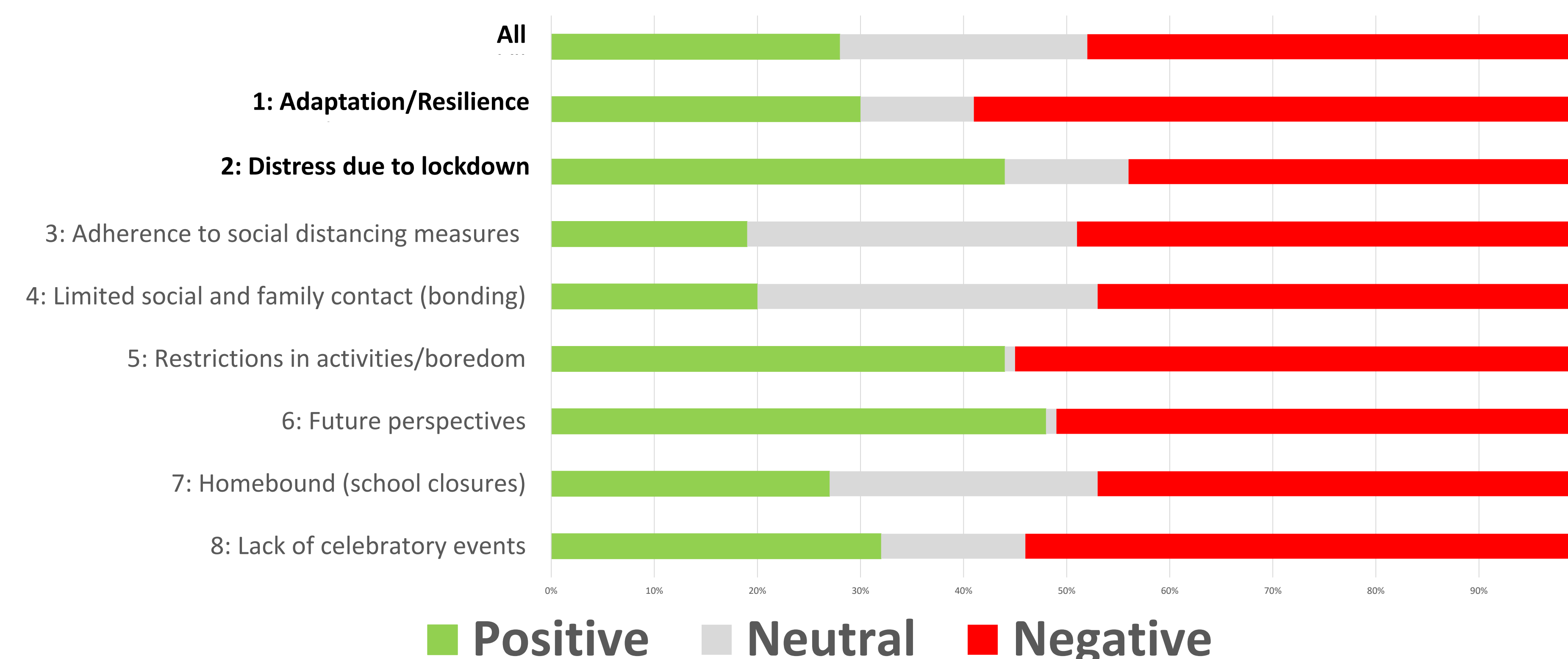
Example Quotes

Example Quotes	Polarity Score
"I found it quite cozy at home; Dad is still working from home. I'd like it to stay that way."	0.8
"I didn't really have much trouble with it. We just did fun things that were allowed, and I met up with friends online."	0.21
"What is necessary is necessary. I don't worry too much."	0
"It's a shame that I can't meet up with people much, because it's not allowed, and I have to study at home, which is also unfortunate. I miss my classmates."	-0.5
"I find it very upsetting that I can't be with my friends."	-0.98

A. (Sub)clinical Anxiety Scores



B. Non-(sub)clinical Anxiety Scores



41.1%

Anxiety (T-score > 50.4)

- Misses friends/family during isolation.
- Uses terms such as: “Difficult” and “hard”.



58.9%

No Anxiety (T-score ≤ 50.4)

- Misses (leisure) activities.
- Uses terms such as: “Annoying” and “stupid”.
- Mentions specific regulations mentioned (e.g. “washing hands”, “social distancing”, “school closures”).
- Mentions general terms (e.g. “the rules”).

Conclusions

This study identified topics of COVID-19 regulations associated with elevated anxiety symptoms in children. Results indicate that children with (sub)clinical anxiety experienced the pandemic more negatively and may have greater difficulties coping with and adapting to lockdown measures.