

Power analysis

An a priori sample size calculation for multiple regression by G*Power 3.9.1.7 based on a fixed model (model parameters are fixed or non-random quantities) is performed⁵⁶. Based on effect size obtained from literature²⁰ ($F(P) = 18.27 (.001)$; adjusted $R^2 0.38.$), we assume that the final model will explain 30% of variability.

This analysis revealed that 171 patients are needed to detect a medium effect size (Cohen's $f^2 = 0,15$) with a probability of 0,05 and a power of 0,90 and using 15 predictors.

Allowing for a 35% loss to follow up, a sample size of 285 is considered large enough.

Statistics

Baseline / summary demographic and psychological data of the patients will be presented: 1. for continuous data as means \pm standard deviation or as median with interquartile range; 2. for categorical items as frequencies and proportions. Normal distribution will be indicated by characteristics (skewness and kurtosis) and will be further checked by Shapiro-Wilk and Kolmogorov-Smirnov tests as well as with Q-Q plots. Numerical variables may have high skewed and non-normal distribution (Gaussian Distribution) caused by outliers, highly exponential distributions, etc. These distributions can be converted to normal by data transformation e.g. the log transformation, the square root transformation, the Box-Cox transformation.

Further analyses:

A. Firstly, Principal components analysis of the MAQ questionnaire

The large volume of data resulting from current analysis is highly complex and multidimensional.

Simple non-parametric methods like principal component analysis (PCA) may be valuable to examine the internal structure of such complicated datasets and to explore the interrelations among variables.

PCA is a technique used to emphasize variation and bring out strong patterns in a large dataset. It is an exploratory tool favored to reduce redundancy in multivariate data and, as in the current study, is also useful to reveal measurements that best reflect the dynamics of a particular phenomenon; in this case, which traits contribute most of the variation in the development and expression of pain perception.

B. Regression analysis

Univariate analysis allows us to explore the impact of one covariable on the independent variable while multivariate analysis allows us to understand the relationship between several covariables and their association with the independent variable.

first an univariate regression will be conducted to identify variables who are individually associated with **parental misconceptions about pain medication (MAQ)** and some relevant predictors will be considered: parental age, parental gender, SES, child age, child gender, parental religion, surgical group characteristics (three groups related to their expected related pain in children at home -mild, moderate, severe), APAIS, parental NRS-distress and NRS-sympathy, NRS-exp-Pain, HBS, PCS-P-Trait, PCS-P-State. To avoid issues with multicollinearity, independent variables which correlate highly with other independent variables will be excluded for further analyses.

Secondly an univariate regression will be conducted to identify variables who are individually associated with **increased pain intensity scores (PPPM-D) at home** and pain medication adherence (% of a maximum prescribed pain medication – number during consecutive days) as outcome parameters. Relevant predictors will be considered: parental age, parental gender, SES, child age, child gender, parental religion, surgical group characteristics (three groups related to their expected related pain in children at home -mild, moderate, severe), MAQ, APAIS, parental NRS-distress and NRS-sympathy, NRS-exp-Pain, HBS, PCS-P-Trait, PCS-P-State. To avoid issues with multicollinearity, independent variables which correlate highly with other independent variables will be excluded for further analyses.

Several grouping variables (levels) sorting data into categories or groups can be defined.

Grouping variables can be: gender (i.e. male/female), level of education (grade I, grade II, grade III), surgical characteristics .

Principal Component Analysis (PCA)⁵⁷

Furthermore we will use PCA to examine the internal structure of this complicated dataset and explore interrelations among variables.

Separate **multiple regression models (MLR)**⁵⁸ and a **Generalized Linear Mixed-Effects Model (GLMM)**⁵⁹ will be constructed to assess if, state anxiety / need for information, parental NRS-distress and NRS-sympathy, health beliefs, parental pain catastrophizing (trait and state) might explain PPPM-D scores at home and medication adherence after day care surgery in children.

'Longitudinal data have traditionally been analyzed using techniques like the paired t test or repeated measures analysis of variance (RM-ANOVA). In recent years, linear mixed-effects models—also referred to as multilevel models or hierarchical models—are becoming increasingly popular because they are much more flexible and overcome many of the limitations of more traditional methods.'^{39,59,60}
Frequentist (traditional) analysis

The results will be reported as adjusted R^2 and standardized β .

All analyses will be performed with IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM. Corp.

Additional option: Bayesian approaches

*Bayesian approaches to GLMM inference offer several advantages over frequentist (traditional) and information-theoretic Methods*⁶¹.

*Bayesian modeling can be done in Winbugs*⁶².

Variables summary

1. parental age = years
2. parental gender = 1 or 0
3. SES classified into three categories: I. no education, elementary school; II. secondary school; III. higher education or university
4. child age = months
5. child gender = 1 or 0
6. parental religion: Catholic, Islamic, Atheist, other?
7. surgical group characteristics - three groups related to their expected related pain in children at home: mild, moderate, severe)
8. MAQ = % = numbers: A [strongly disagree - disagree - slightly disagree] B [uncertain]

C [Strongly agree - agree - slightly agree]²¹

9. APAIS – two subscale: state anxiety (score range 0 – 20) and need for information (score range 0 – 10)

10. parental NRS-distress – score range 0 - 10

11. parental NRS-sympathy – score range 0 - 10