Child Distress During Laceration Repair: Effectiveness of a music intervention

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Presentation Overview

- Background & Literature Review
- Experimental Methods
  - Description of Dataset
- Analysis
  - Research Question #1
  - Research Question #2
- Results Summary
- Conclusion
- Limitations

Background

- In Canada, over 95,000 children annually visit emergency departments because of injuries

- There is a projected shortage of 78,000 nurses by 2011

- Need to find innovative ways to treat procedural pain

- Tested an intervention to reduce procedural distress

Literature Review

- There are long term deleterious effects associated with untreated procedural pain

- Psychological interventions can have a strong effect on procedural pain

- Parents almost always accompany their children to the emergency department

- Music was demonstrated to be a useful *adjunct* to treating pain

Can you please include some references
(so it doesn't seem like you made all this up ☺)
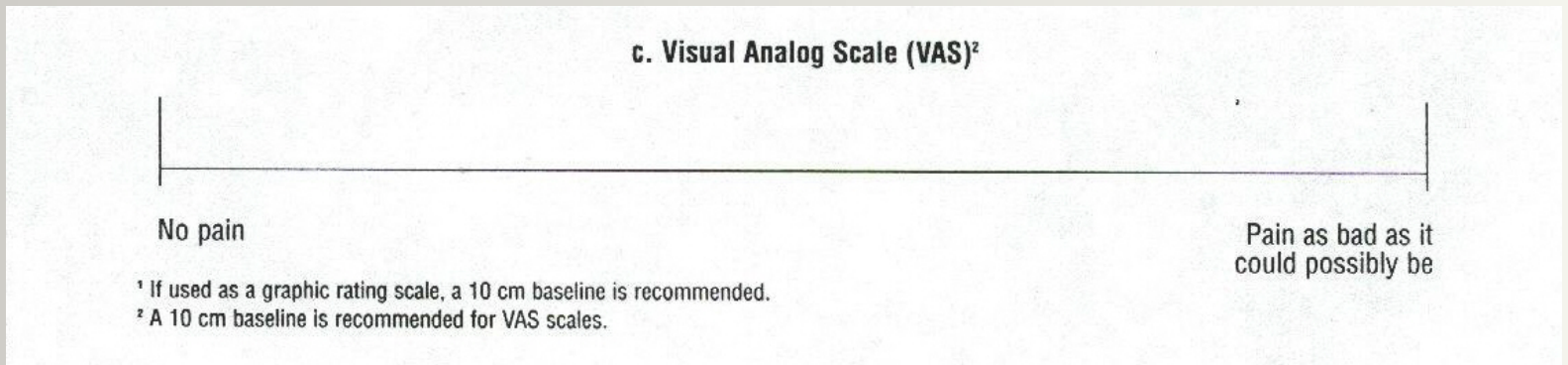
Distress = Pain + Fear

Experimental Methods

- Design: Quasi-experimental
- Sample: 57 patients
- Inclusion criteria:
  - Children aged 1-5 years
  - one or both parents present
  - requiring simple laceration repair
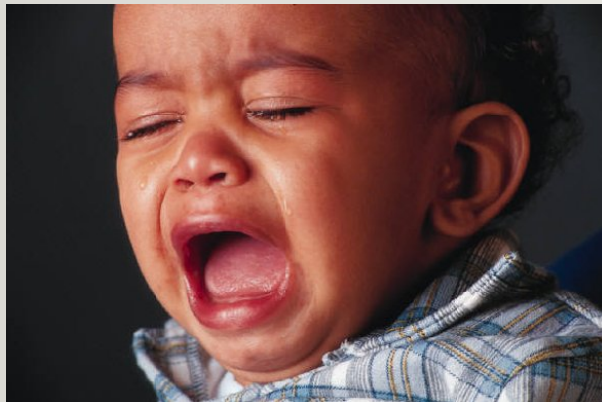- Intervention:
  - Music during procedure

Measures

- Visual Analogue Scale (VAS)

c. Visual Analog Scale (VAS)[2]

No pain

Pain as bad as it could possibly be

[1] If used as a graphic rating scale, a 10 cm baseline is recommended.
[2] A 10 cm baseline is recommended for VAS scales.

- Procedure Behavior Check List (PBCL)

Dataset

Variables: Independent

- Condition: 1 = control, 2 = intervention
- Age = age in months
- Parent: 1 = mother, 2 = father, 3 = both, 4 = other (which parent was present during the laceration repair)
- Fatherpresent: Was the father present, 1 = yes, 2 = no
- Type: Type of analgesia repair, 1 = Tissue adhesive only, 2 = LET (topical anesthesia) + sutures, 2 = LET + Injectable lidocaine + sutures
- Location: Location of laceration, 1 = Scalp, 2 = face, 3 = other
- Repair = Type of repair, 1 = single layer closure, 2 = deep stiches

Variables: Dependent

Parent
- ParentDisS: Parent reported distress at the start of the procedure, 0 – 100
- ParentDisO: Parent reported distress overall, 0 – 100

Physician
- MdDisS; MD reported distress at the start of the procedure
- MDDisO: Md reported distress overall

Observers (1 & 2)
- Distress1pre: Objective distress before the procedure, 0 – 40
- Distress1dur: Objective distress during the procedure, 0 – 40
- Distress1post: Objective distress after the procedure, 0-40
- TimeProced1: Total time of the procedure, in seconds
- MeanDistress: A mean objective distress score, between scorer 1 and 2, 0-100
- MeanTime: Mean procedure time, in seconds

Observers

- Distress1pre: Objective distress before the procedure, 0 – 40
- Distress1dur: Objective distress during the procedure, 0 – 40
- Distress1post: Objective distress after the procedure, 0-40
- TimeProced1: Total time of the procedure, in seconds
- Partic1: Amount of time parent participated, in seconds
- Adjust1: Distress1dur * 2.5, gives a score of objective distress from 1-100
- MeanDistress: A mean objective distress score, between scorer 1 and 2, 0-100
- MeanTime: Mean procedure time, in seconds
- MeanPartic: Mean parental participation, in seconds
- MeanProportion: Mean proportion of parental participation (MeanPartic / MeanTime)

Methods of Analysis

- Preliminary data exploration (PCA and cluster analysis)
- Preliminary data analysis & diagnostics
- Analysis using linear models
  - T test
  - Regression
  - ANOVA / ANCOVA

Principal Component Analysis

- ## Variables considered

Condition	Age
Parent present	Type of repair
Location of lac	Length of lac
Method	Sex
Parent reported distress at start	Parent reported distress overall
MD reported distress at start	MD reported distress overall
Scorer1 - pre-procedural distress	Scorer1 - procedural distress
Scorer1 - post-procedural distress	Scorer1 - time to complete procedure
Scorer2 - pre-procedural distress	Scorer2 - procedural distress
Scorer2 - post-procedural distress	Scorer2 - time to complete procedure
Scorer1 - parental participation	Scorer2 - parental participation

Principal Component Analysis

- Varimax rotation with eigenvalue > 1
- Resulted in 6 components

Principal component	Variances explained
PC1	32.035
PC2	22.660
PC3	10.559
PC4	7.066
PC5	5.802
PC6	4.995

Principal Component Analysis

- ## After rotation

Component1	Component2	Component3
Condition	Age	Parent present
Type	Parent distress overall	MD distress at start
Length	MD distress overall	Pre-proc distress1
Method	Procedural distress1	Post-proc distress1
Procedure duration1	Procedural distress2	Pre-proc distress2
Procedure duration2		Post-proc distress2
Component4	Component5	Component6
Parent participation2	-Condition	Parent distress start
	Sex	Parent participation1

Hierarchical Cluster Analysis

- Same variables as in PCA
- 2 clusters
  - Cluster1: everything else
  - Cluster2
    - Time to complete procedure1
    - Time to complete procedure2
  - Not very helpful

Preliminary Analysis: Correlations

Correlation among various distress reports

$H_0: R = 0$, $H_A: R \neq 0$

	Parent Overall♪	MD Overall♪	Observer1 Overall♪	Observer2 Overall♪	Mean Observer♪
Parent♪	1♪	.676 ♪	.674 ♪	.650 ♪	**.680 ♪**
MD♪	.676 ♪	1♪	.755 ♪	.775 ♪	**.776 ♪**
Observer1♪	.674♪	.755♪	1♪	.877♪	**.965♪**
Observer2♪	.650♪	.775♪	.877♪	1♪	**.962♪**
Mean Observer♪	**.680♪**	**.776♪**	**.965♪**	**.962♪**	**1♪**

(all numbers significant with p<.01)

Preliminary Analysis: Sample Size Calculation

- For testing individual IVs:

  $N \geq 100 + J$

- For statistical (stepwise) regression

  $N \geq 40 * J$

where J = number of IVs

For our dataset, J = 4

$N = 57 < 104 \Rightarrow$ problem?

Preliminary Analysis: Regression Diagnostics

- Factors considered

Age	Sex
Condition	Method
Type of repair	Length of laceration
Location of laceration	Parent present
Mean time of procedure	Mean time of parental participation

- DV = mean procedural distress score (meanDistress)

Preliminary Analysis: Regression Diagnostics

- Significant factors
  - Age, condition, method, parent present
  - From both backward and forward stepwise linear regression
  - Model explains 52% of the total variance in data

Preliminary Analysis: Regression Diagnostics

- Test of independence
  - Durbin-Watson = 2.075 => no autocorrelation

- Test of extreme cases
  - Cook's distance: maximum < 1
    - No univariate outliers in the data
  - Mahalanobis distance: maximum < 18.467
    - No multivariate outliers in the data

- Test of Multicollinearity
  - Condition index maximum < 30, VIF < 10, Tolerance > 0.1
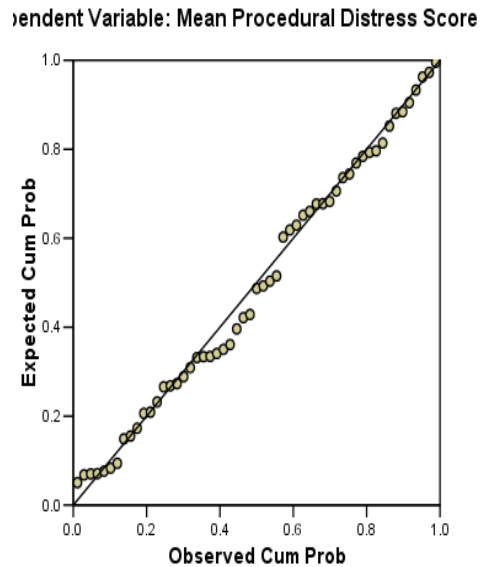 - No multicollinearity
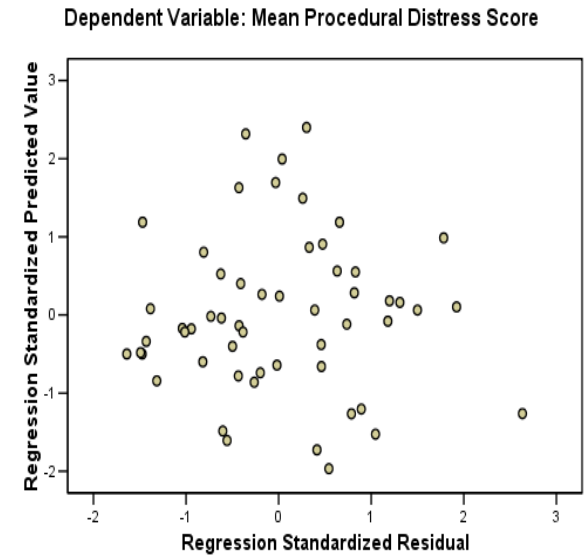
Preliminary Analysis: Regression Diagnostics
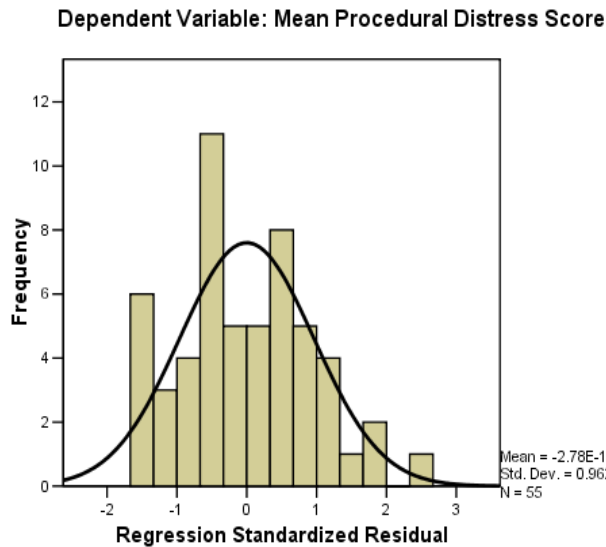
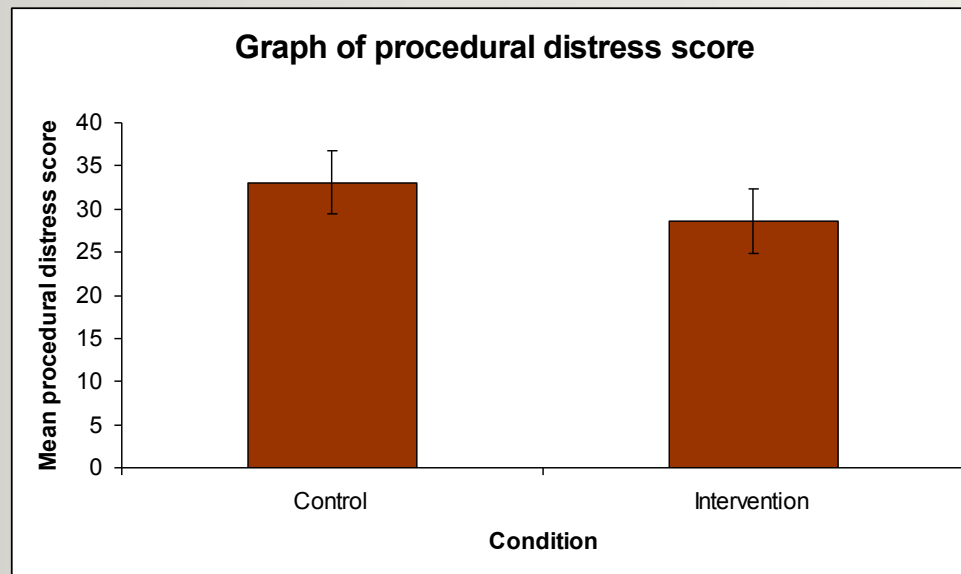- Assumptions of normality, linearity and homoscedasticity are satisfied

Research Question #1

Does a music intervention influence children's level of distress during laceration repair?

Analysis: T-test of means

$$H_0: \mu_{control} = \mu_{intervention}, \quad H_A: \mu_{control} \neq \mu_{intervention}$$

Graph of procedural distress score

- No significant difference between the control and the intervention groups (t=.85 , p=.401)

Analysis: T-test of means

$$d = \frac{\overline{Y}_{\exp erimental} - \overline{Y}_{control}}{s_{pooled}}$$

$$\frac{28.6\text{-}33.1}{19.68}$$

- Effect size: Cohen' d = -0.23 (small effect)

Research Question #2

What variables predict a child's level of distress during laceration repair?

Regression Analysis♪

- IV = condition, age, method, parent present
- DV = mean procedural distress score
- Model significant (p = .000, R^2 = .517)
- Significant NEGATIVE correlation
  – Between overall distress and condition (B = -9.487)
  – Between overall distress and age (B=-.540)
- Significant POSITIVE correlation
  – Between overall distress and method (B=23.607)
  – Between overall distress and parent present (B=4.593)

Regression analysis
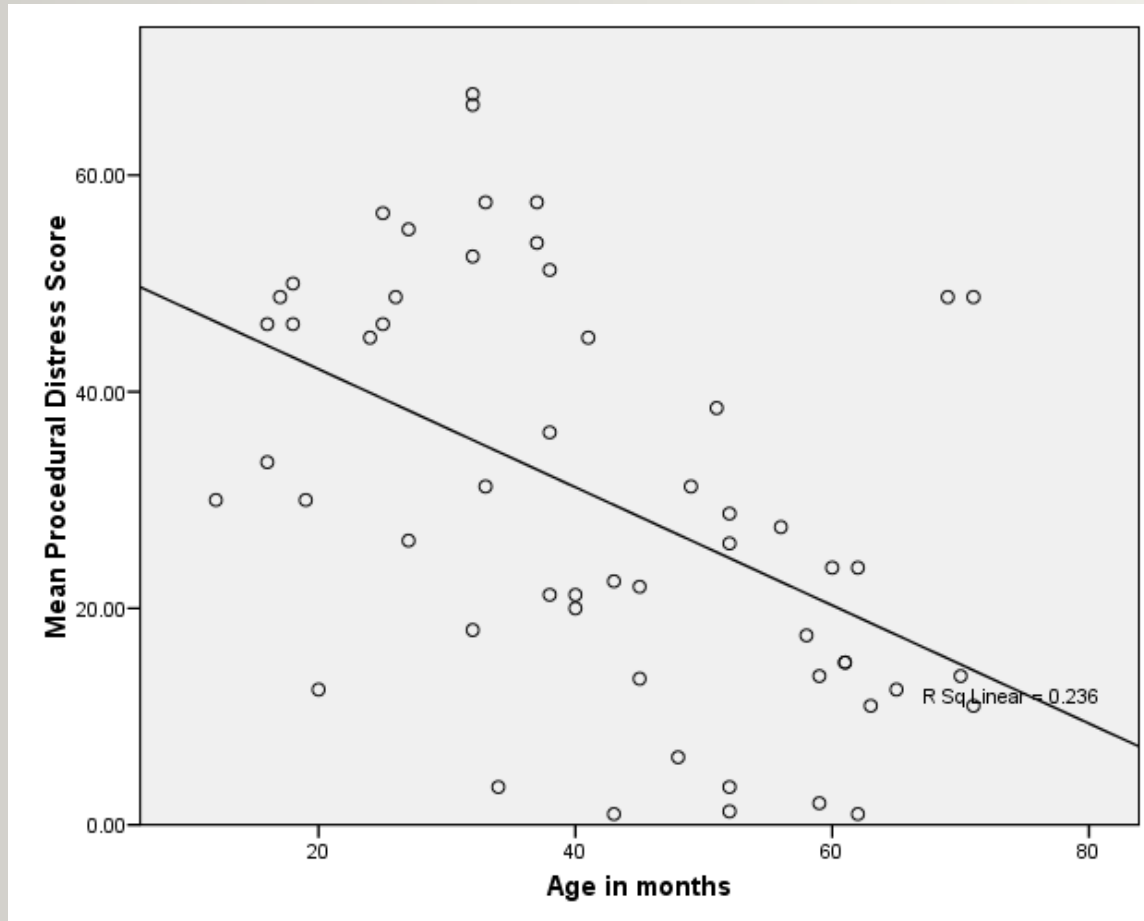
ANCOVA♪

- DV = Mean procedural distress score
- IV = condition
- Covariate = Pre-procedure distress score (observer2)

- ANCOVA Result
  - Result: model significant (p = 0.003)
    - Covariate significant (F = 12.952, p = 0.001)
      - Pre-procedure distress score and Mean procedural distress score are related
    - Condition not significant (p = 0.908)

ANCOVA♪

- 2x3 ANCOVA with condition and location
  - IV = condition, location
  - Covariate = age
  - DV = Mean procedural distress score
  - Significant main effect of age (F = 19.249, p = 0.000)
  - Non-significant main effects of condition, location, and interaction effect of condition and location
  - About 30 % of data are explained by the model.
  - **The only significant factor is "age".**

Location on distress

The effect of location of repair on distress
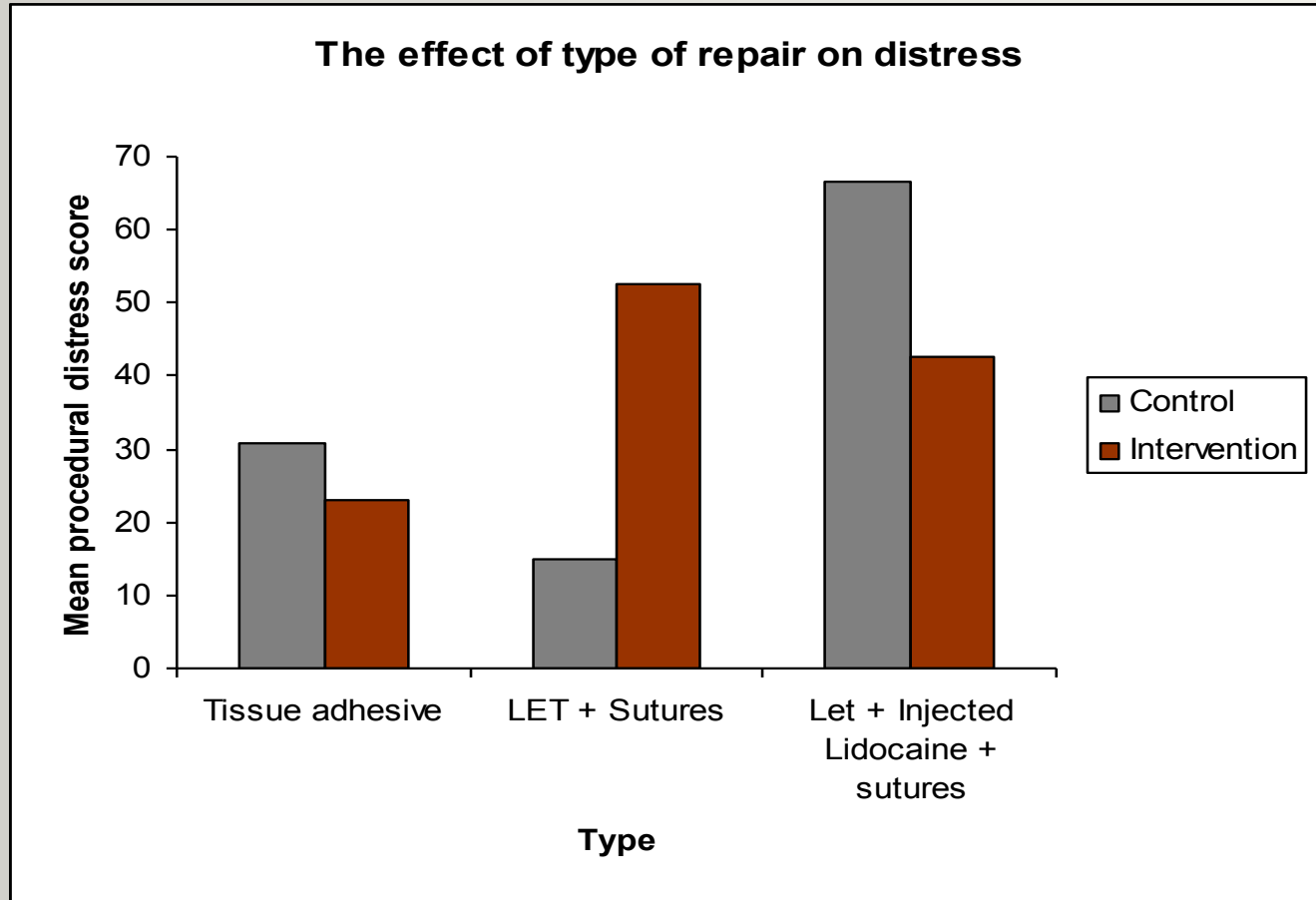
ANCOVA♪

- 2x3 ANCOVA
  - IV = type, condition
  - DV = Mean procedural distress score
  - Covariate = age
  - **Significant effects**
    - Main effect of age (F=23.697, p=.000)
    - Main effect of type (F=5.989, p=.005)
  - Non-significant other effects -- main effect of condition, interaction effect

Type and distress



The effect of type of repair on distress

ANCOVA♪

- 2x2 ANCOVA
  - IV = repair, condition
  - DV = Mean procedural distress score
  - Covariate = age
  - Significant main effect of age ($F=25.101$, $p=.000$)
  - Significant main effect of repair ($F=12.872$, $p=.001$)
  - Non-significant other effects
    - main effect of condition ($F=2.006$, $p=.163$),
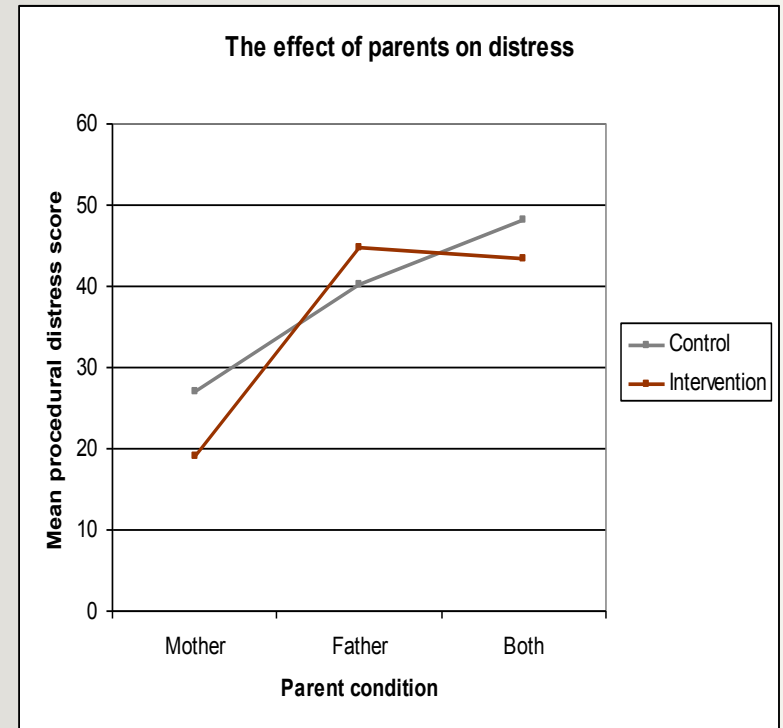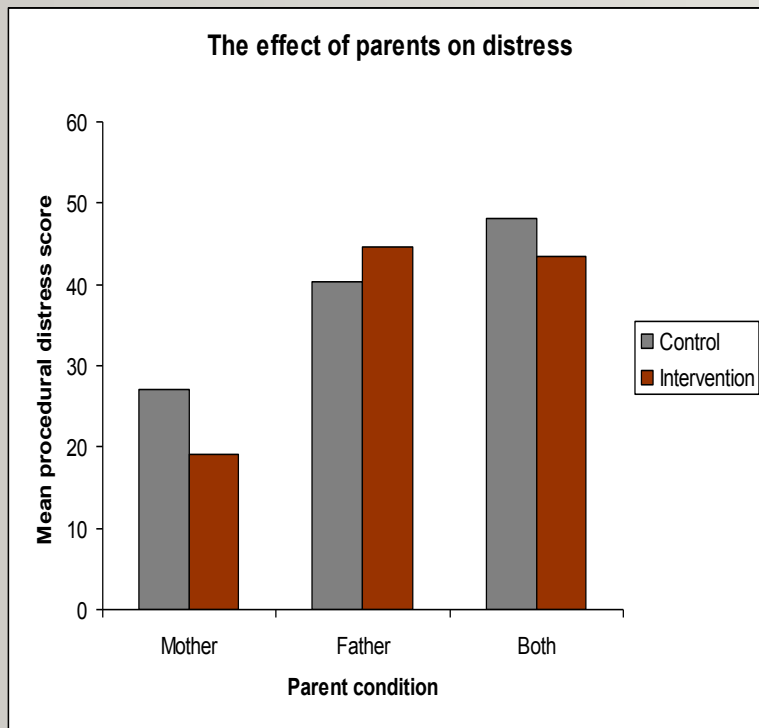   - interaction effect ($F=0.016$, $p=.898$)

Method and distress

The effect of method of repair on distress
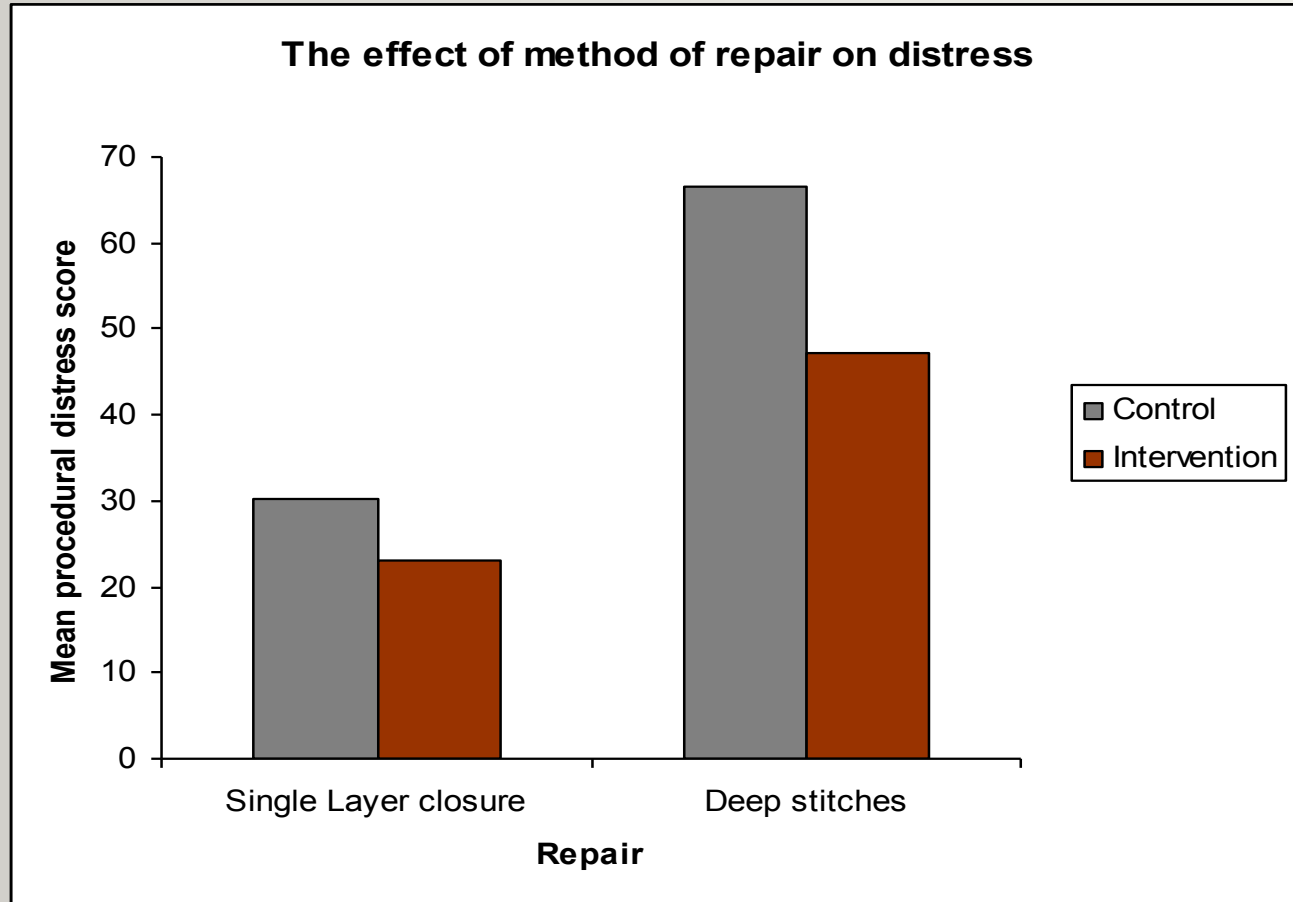
2-way ANOVA♪

- 2x4 ANOVA
  - IV: condition, parent present
  - DV: Mean procedural distress score
    - Model significant (p=.006)
  - **Parent significant (p=.003)**
  - Condition not significant (p=.628)
  - Non-significant interaction (p=.660)

The effect of parents on distress

2-way ANOVA: Post Hoc♪

- Tukey's

(I) Parent Present♪	(J) Parent Present♪	Mean Difference (I-J)♪	Std. Error♪	Sig.♪
Mother♪	Father♪	-19.08*♪	6.77♪	.018♪
	Both♪	-22.34*♪	5.78♪	.001♪
Father♪	Mother♪	19.08*♪	6.77♪	.018♪
	Both♪	-3.26♪	7.89♪	.910♪
Both♪	Mother♪	22.34*♪	5.78♪	.001♪
	Father♪	3.26♪	7.89♪	.910♪

(* The mean difference is significant at the .05 level)

Results: Summary

- T-test (IV = condition, DV = Objective distress) found no difference between groups

- ANCOVA performed with age as covariate, where AGE is significant

Conclusions

- May be other covariates that are exerting an effect on distress

- Children were twice as distressed when father was present in the procedure room

Limitations

- Lack of randomization
- Prior medical experience not taken into account
- Sample size?
- No pre-exposure of children to music
- Choice of music
- No self-report of distress level
- Inclusion criteria: non-painful laceration repairs

Questions?