Examining Child and Parent Anxiety During the Ambulatory Surgical Process:

A Comparison of Using the Induction Room vs. Operating Room for Anesthetic Induction

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Introduction

Truth In Numbers

3.2 million children under the age of 15 received anesthetic induction for outpatient surgery in 2006.
(Rabbitts et al., 2010)

300% increase in the number of surgical visits to ambulatory surgery centers from 1996-2006.
(Cullen, Hall, & Golosinskiy, 2009)

60% of all children experience significant psychological and/or physiological manifestations of anxiety
(Kain & Mayes, 1996)

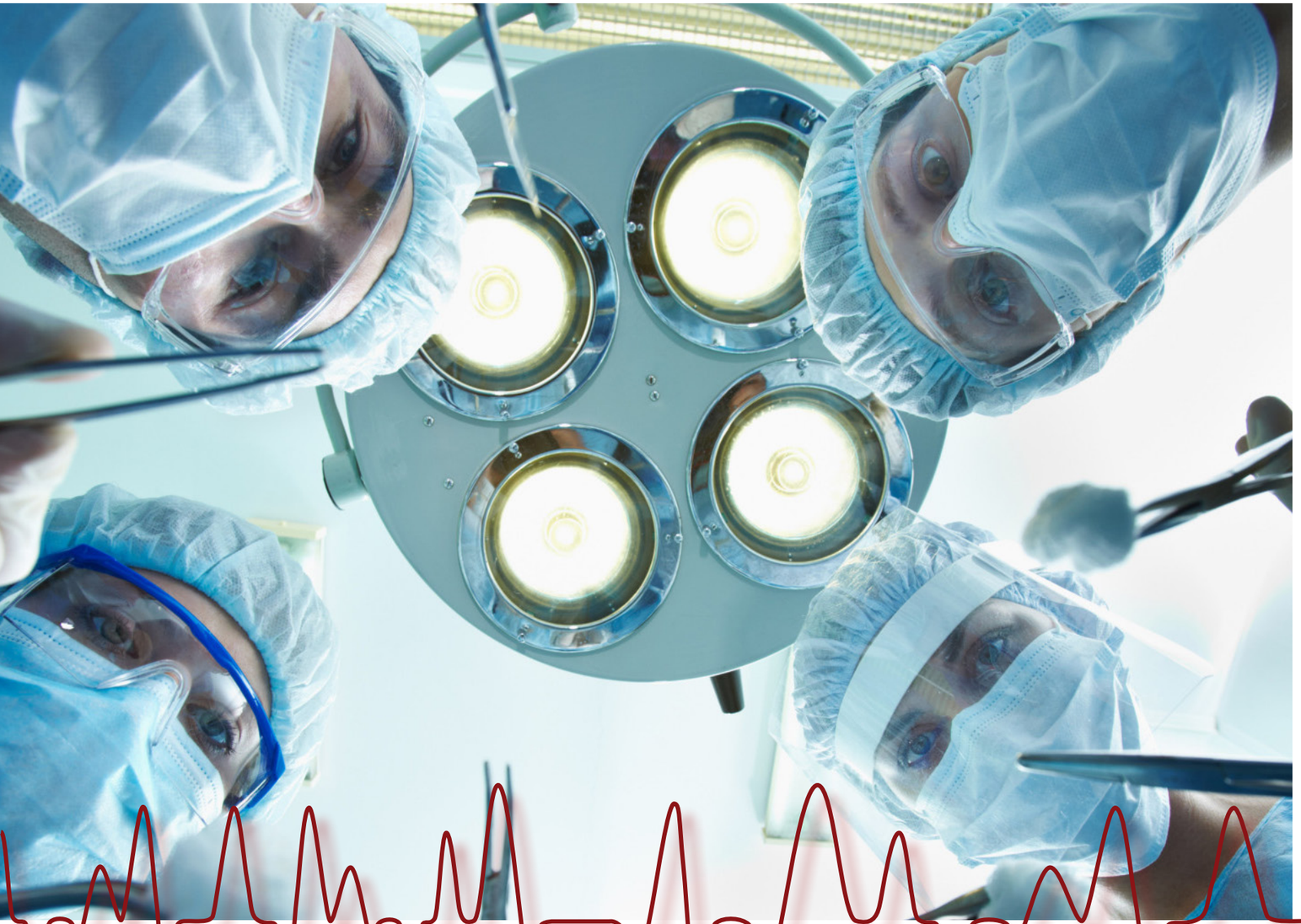
The Challenge

preoperative phase can be especially stressful
(Kain & Mayes, 1996; Lander & Warnock, 1999)

behavioral preoperative preparation programs are the ***time-intensive*** and ***cost-prohibitive***
(Kain, Wang, Caldwell-Andrews, et al., 2006)

the ***overwhelming majority*** of children in the U.S. are induced in the operating room ***alone***
(Kain, Caldwell-Andrews, & Krivutza, 2004)

The Challenge



children are not prepared for how ***frightening*** the physical environment of the operating room is
(Sjöberg et al., 2015)

induction rooms can provide a ***calm environment*** that is removed from the imposing environment of the operating room
(Torkii et al., 2005)

lack of evidence investigated the effect of using an induction room vs. the operating room
(Soni & Thomas, 1989)

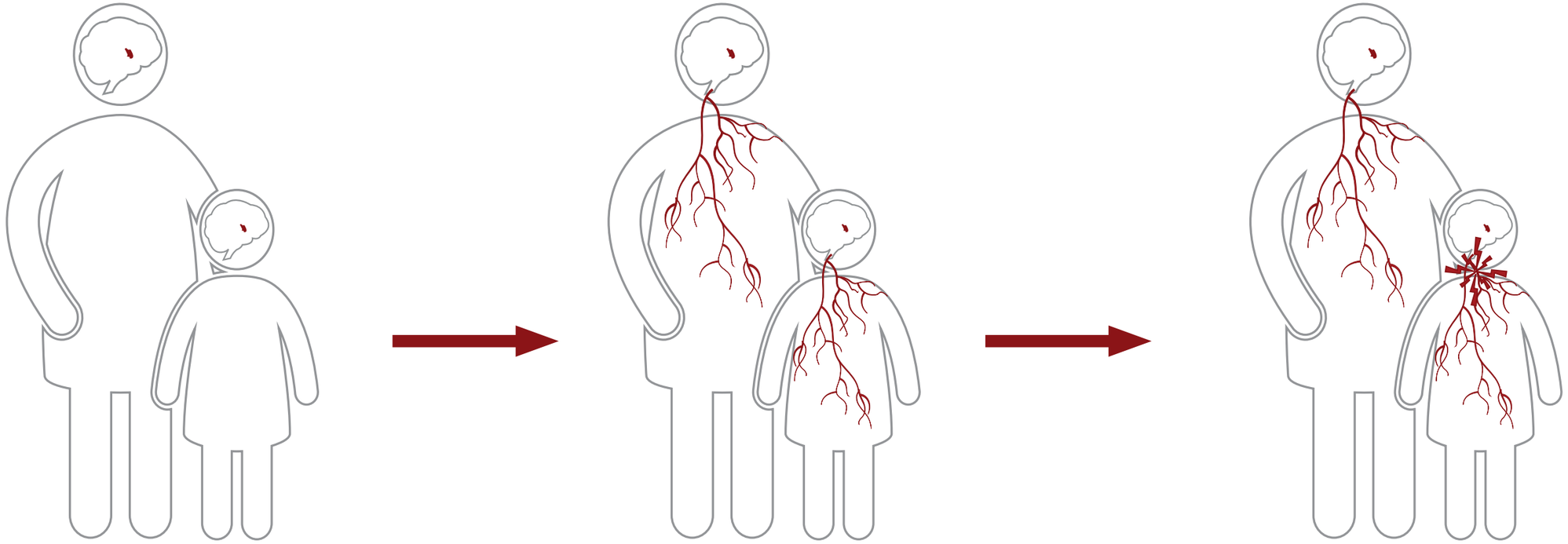
The Challenge

the majority of evidence collected to date has focused on ***retrospective*** data that is garnered using ***adult proxies'***
(Söderbäck, Coyne, & Harder, 2011)

retrospective data inserts biases associated with ***participant recall*** and lacks ***ecological validity***
(Stone, Shiffman, Atienza, & Nebeling, 2007)

adult proxies' can be an ***unreliable representation*** of the child's actual experience
(Nilsson et al., 2013)

More than Feelings



HORMONAL

neuro-endocrine hormones (e.g. cortisol) are released from the hypothalamic pituitary-adrenal axis

METABOLIC

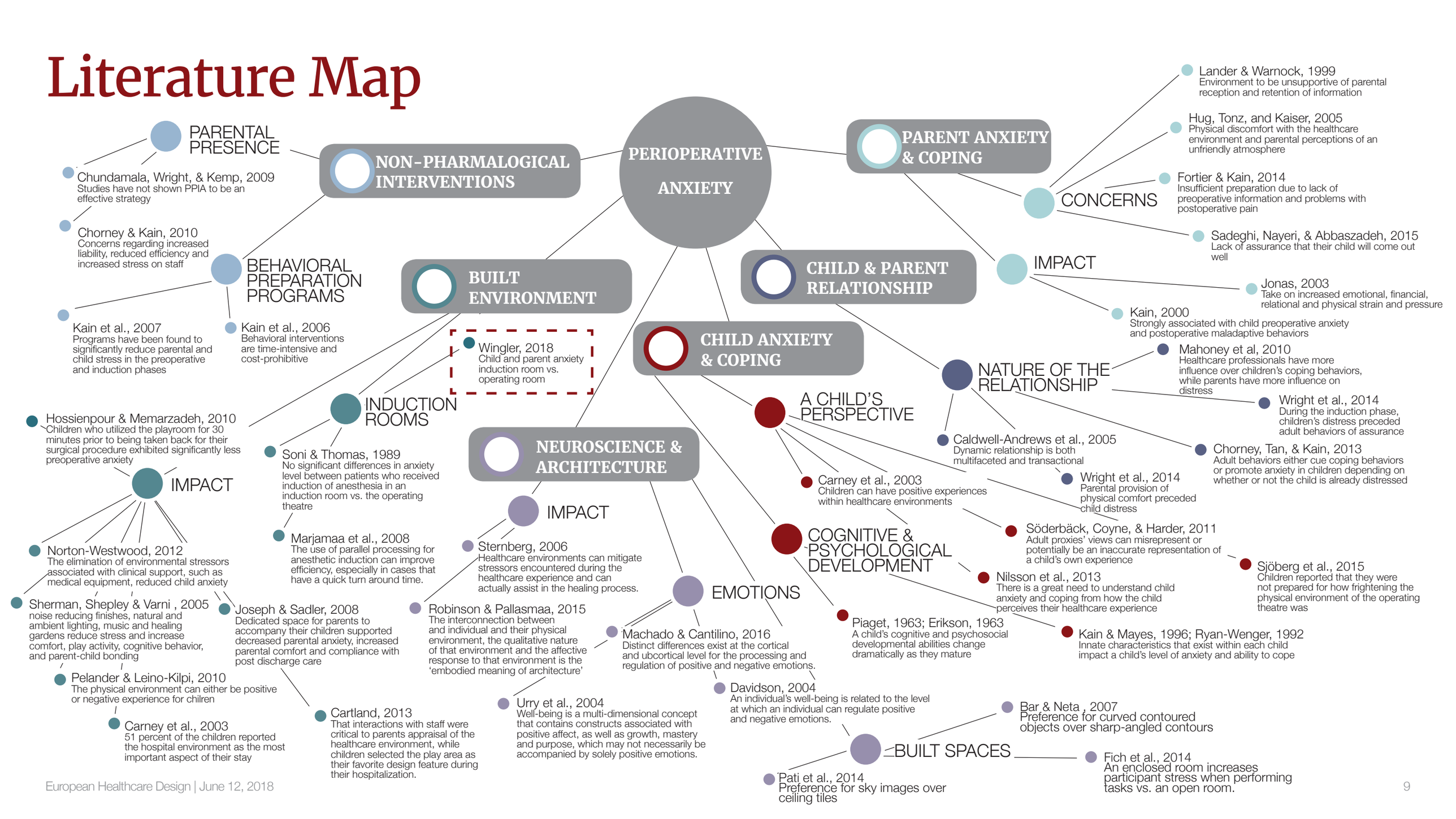
leads to increases in metabolic functions, such as heart rate and sympathetic skin response

IMMUNOLOGICAL

metabolic increase can negatively affect the child's physical ability to heal post-surgery

Literature Review

Literature Map



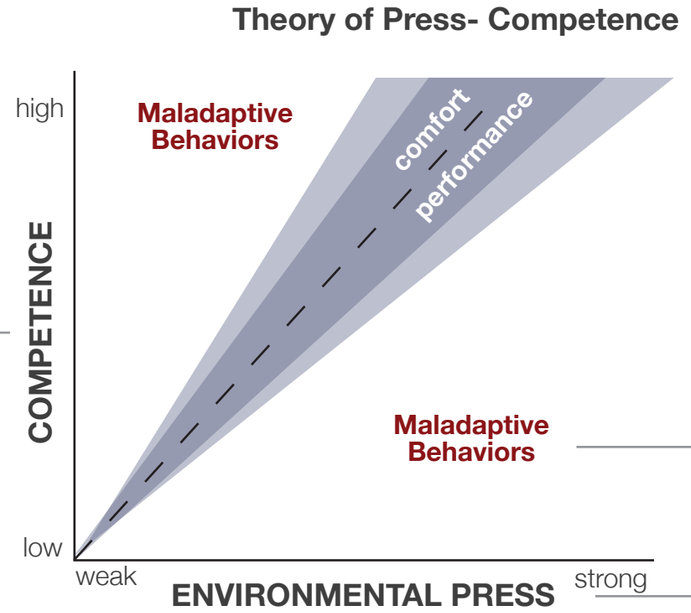
Research Design

Theoretical Foundation

Theory of Stress and Coping

An individual that perceives they have the ability to meet their fear and have a positive outcome is more likely to exhibit effective coping strategies

(Lazarus and Folkman, 1984)



(Lawton, 1986; Nahemow, 2000)

trembling
panick
crying
attempted escape
wetting themselves
emergence delirium
sleep disturbances
eating disorders

(Fortier & Kain, 2014)

Theory of Supportive Design

_ positive distractions & access to nature

_promote social support

_foster a sense of control

(Ulrich, 2001)

Methodological Overview

RESEARCH DESIGN

Case Study: multiple-case study embedded with multiple units of analysis

Primary Unit of Analysis:
ambulatory surgical environment

Embedded Units of Analysis:
child
parent
(Yin, 2014)

METHODOLOGICAL APPROACH

Ecological Momentary Assessment: collects multiple, repeated assessments in real-time of a participant's momentary state in their natural environment
(Stone, Shiffman, Atienza, & Nebeling, 2007)

GENERAL ANALYTIC STRATEGY

Time-series Analysis: in the form of chronological sequences

Comparative Case Analysis: Used To establish theoretical replication
(Yin, 2014)

Sampling Strategy

EMBEDDED UNITS OF ANANYSIS

Child and Parents: Purposive sampling

Criteria:
Child | 6-12
Parent | above 18 accompanying the child
Surgery | tonsillectomies & adenoidectomies

Exclusion: children with a known anxiety spectrum disorders and adolescents
(Singleton & Straits, 2010)

ECOLOGICAL MOMENTARY ASSESSMENT

Population of moments: time-based, variable-interval, random sampling strategy utilizing stratified sampling
(Stone, Shiffman, Atienza, & Nebeling, 2007)

Strata: preoperative, intraoperative and postoperative
(Stone, Shiffman, Atienza, & Nebeling, 2007)

Prompt: random times within each of the strata
(Stone, Shiffman, Atienza, & Nebeling, 2007)

Research Questions & Propositions

RQ1: How does the physical environment of ambulatory surgery centers effect perioperative anxiety in children who are undergoing a surgical procedure and their parent(s), respectively?

P1: Features within the physical environment, which foster a sense of control, provide access to nature and positive distractions and promote social support, will reduce perioperative anxiety in children and their parent(s), respectively.
(Ulrich, 2001)

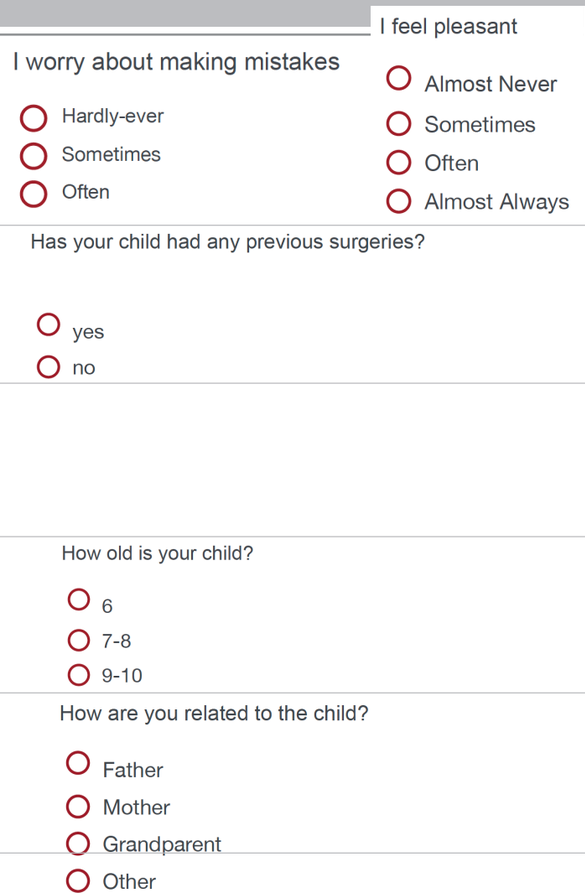
Research Questions & Propositions

RQ2: Does the use of an induction room vs. the operating room for anesthetic induction during the preoperative phase of the ambulatory surgical process effect child and parent perioperative anxiety, respectively?

P2: Children who are induced in induction rooms and their parent(s) will exhibit less anxiety during induction than children who are induced in the operating OR and their parent(s).
(Soni & Thomas, 1989; Torkii et al., 2005)

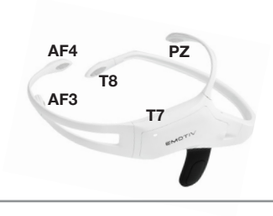
Methods

DEMOGRAPHIC CHARACTERISTICS		
MEASURE	**METHOD**	**INSTRUMENT**
Trait anxiety	Survey	State-Trait Anxiety Inventory Child Scale: 1-3 Parent Scale: 1-4
Surgical naivety	Survey	Demographic Questionnaire Scale: 1-10
Preoperative preparation	Survey	Demographic Questionnaire Scale: 1-10
Age	Survey	Demographic Questionnaire Scale: 1-10
Person participating with Child	Survey	Demographic Questionnaire Scale: 1-10
Number accompanying Child	Survey	Demographic Questionnaire Scale: 1-10



Methods

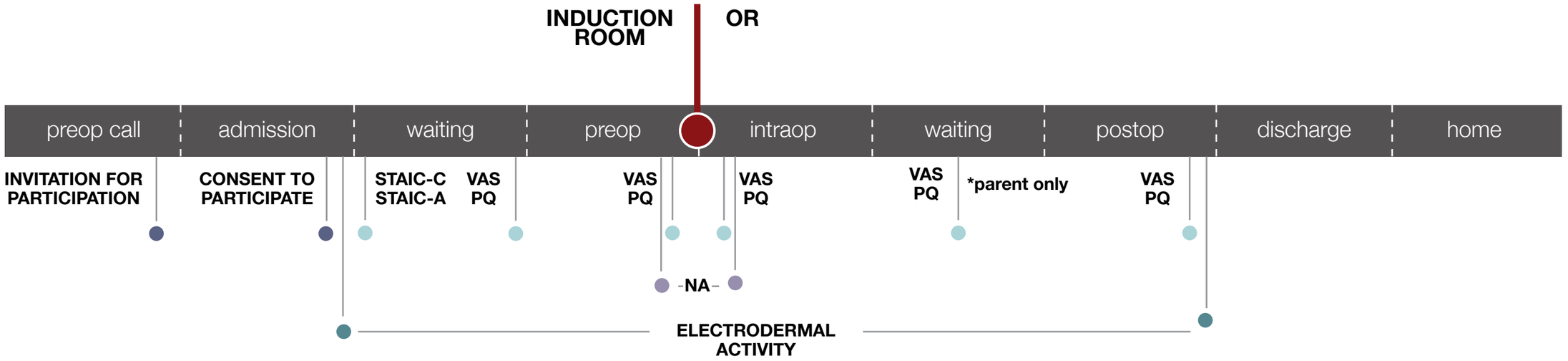
PERIOPERATIVE ANXIETY			
RESPONSE	**MEASURE**	**METHOD**	**INSTRUMENT**
Physiological	Electrodermal Activity (EDA)	Non-invasive Device	Empatica E4 Scale: 1-14
Psychological	Momentary Anxiety (MA)	Survey	Visual Analog Scale Scale: 1-10
	Environmetal Anxiety (EA)	Survey	Visual Analog Scale Scale: 1-10
Neural	Neural Activity	Non-invasive Devices	Emotiv Insight Scale: 1-10



Methods

BUILT ENVIRONMENT			
ENVIRONMENT	**MEASURE**	**METHOD**	**INSTRUMENT**
Ambulatory Surgical	Context	Archival Records	Floor Plans
	Context	Semi-Structured Interviews	Interview Script
DiscreteEnvironments	Context	Environmental Assessment	ASPECT (modified) Scale: 1-6
	Perception of Design Features	Photo Elicitation	Photo Questionnaire Scale: LA 1-5; A 1-5
	Spatial location	Non-participant observations	Observation Logs

Protocol



●	Intervention	**NA**	Neural Activity
VAS	Visual Analog Scale	**STAIC-C**	State-Trait Anxiety Inventory Child
PQ	Photo Questionnaire	**STAIC-A**	State-Trait Anxiety Inventory Adult

Case 1 Findings

Site 1

Seattle Children's Bellevue Clinic and Surgery Center

Year Built: 2010

Architect: NBBJ

Size: 80,000 SF

Surgical Procedures: 4,062 per year

Surgical Suite: 4 ORs, 8 inductior rooms, 14 postoperative rooms

Site 1


01
Registration

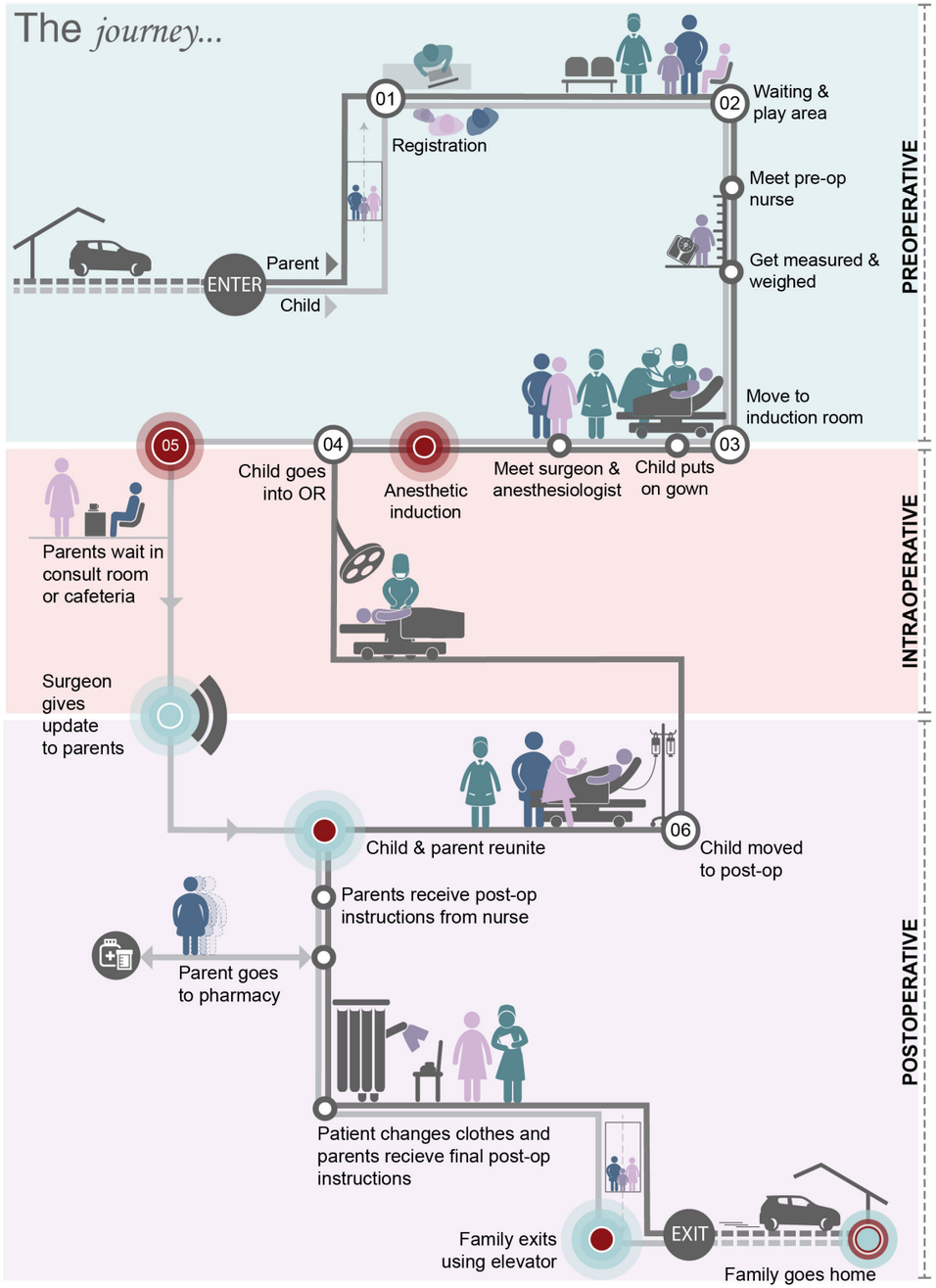

02
Waiting Area


03a
Sunlight Hallway to Induction Room


03b
Induction Room


05
Consult Room


06
Post-op Room


The journey...
01
Registration
02
Waiting & play area
Meet pre-op nurse
Get measured & weighed
PREOPERATIVE
ENTER
Parent
Child
Move to induction room
05
04
03
Child goes into OR
Anesthetic induction
Meet surgeon & anesthesiologist
Child puts on gown
Parents wait in consult room or cafeteria
INTRAOPERATIVE
Surgeon gives update to parents
Child & parent reunite
06
Child moved to post-op
Parents receive post-op instructions from nurse
Parent goes to pharmacy
POSTOPERATIVE
Patient changes clothes and parents recieve final post-op instructions
Family exits using elevator
EXIT
Family goes home

Site 1

N = 50

NUMBER OF DYADS	CHILD	PARENT
9	low	low
7	high	high
6	high	low
3	low	high

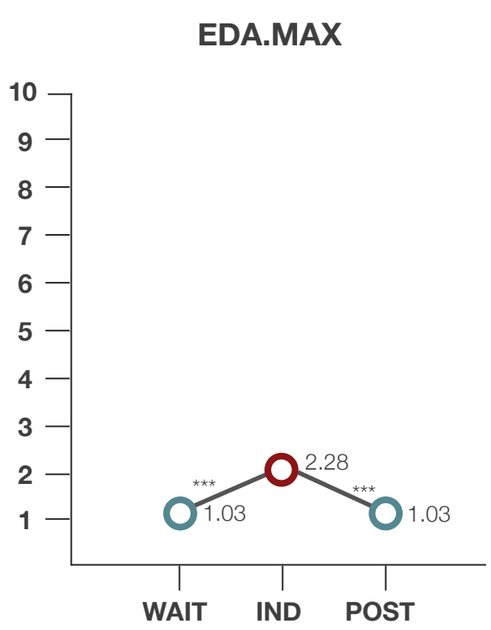
Combination of trait anxiety levels for child/parent dyads at Site 1

CHARACTERISTIC	CATEGORY	N (%)
Child age	6	5 (20%)
	7-8	10 (40%)
	9-10	4 (16%)
	11-12	6 (24%)
Child trait anxiety	low	13 (52%)
	high	12 (48%)
Parent trait anxiety	low	15 (60%)
	high	10 (40%)
Child surgical naivety	yes	20 (80%)
	no	5 (20%)
Preoperative preparation	yes	17 (68%)
	no	8 (32%)
Person participating with child	Mother	22 (88%)
	Father	2 (8%)
	Other	1 (4%)
Number accompanying child	1	8 (32%)
	2	13 (52%)
	≥ 3	4 (16%)

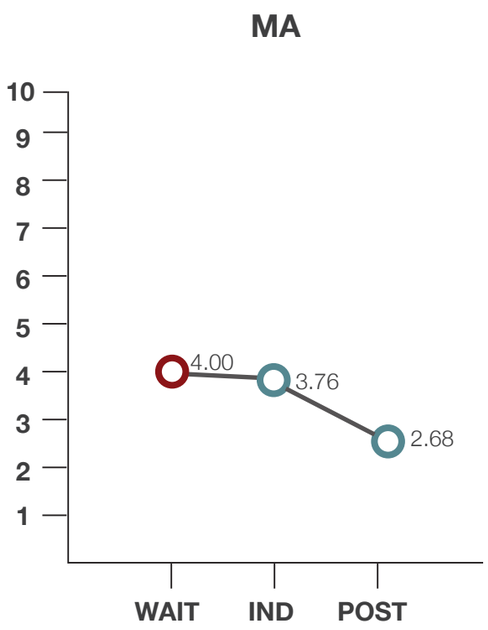
Demographic characteristics of children and parents at Site 1

Site 1 | Children

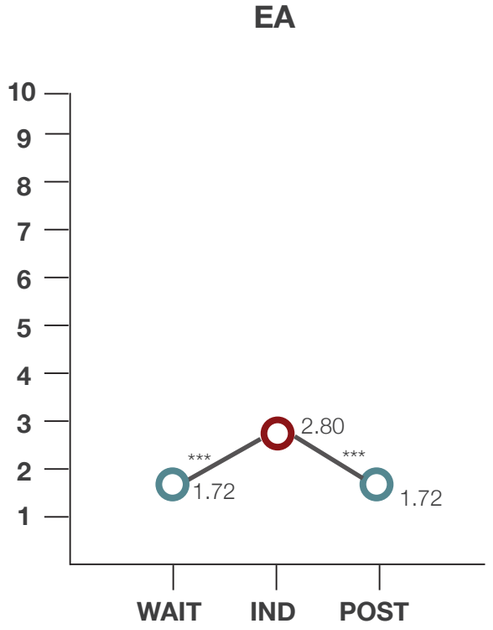
RQ1a: For children, do physiological or psychological responses differ between discrete environments?



F(2) = 8.58, p < .05



F(2) = 2.00, p > .05



F(2) = 6.04, p < .01

FINDING: Children exhibited significantly more EDA.MAX and EA in the induction room than in the other environmental conditions.

Note: *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001

Tests of within-subjects effects for children's mean physiological and psychological responses between discrete environments at Site 1 using one-way repeated measures analysis of variance (ANOVA) and pairwise comparisons

Site 1 | Children

RQ1b: What perception do children have of selected design features within each discrete environment?

ROOM	POSITIVE DISTRACTION	SOCIAL SUPPORT	SENSE OF CONTROL	CLINICAL SUPPORT	OTHER	TOTAL FEATURES
Waiting	+***	+***	-**		- N	+***
Induction	+***		+ N	-***	+ N	- N
Postoperative		+***		-***	+***	+ N

FINDING: Features selected by children as anxiety reducing and producing, in combination, were perceived as balancing each other out, creating a fairly neutral environment.

Note: +: Positive effect; -: Negative effect; N-Not significant at 0.05; *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001
Net effect of selected design features on children's perceptions of discrete environments at Site 1 using one-sample z-test for proportions

Site 1 | Children

INDUCTION

RQ1c: In what way, do do children perceive design features as anxiety reducing or producing for each discrete environment?

LED Lights & TV provided a ***sense of fun and home***

> “ Stars are pretty and TV is fun! ”

> “ TV makes you feel like you are at home. ”

Bed provided a ***sense of comfort***

> “ Because it (the bed) looks similar to our house.”

88% selected ***clinical support***

Anesthesia Equipment & Supply Box considered ***unfamiliar***

> “ It looks like the things I don’t know about. ”

> “ Because they use technology and might hurt for my surgery.”

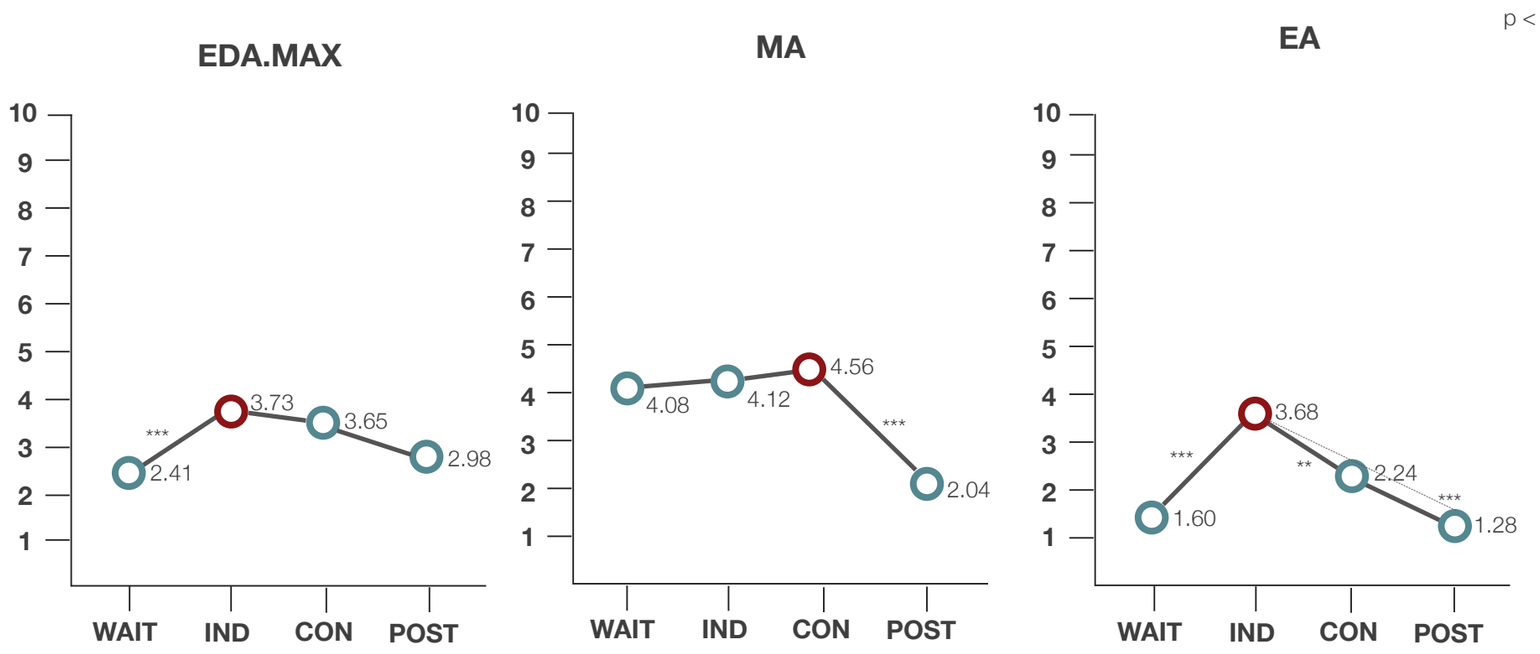
FINDING: LED lights provided a mentally engaging activity that emotionally provided a diversion.

FINDING: Emotionally, clinical support design features contributed to a fear of the unknown.

〈 Reducing Producing 〉

Site 1 | Parents

RQ1d: For parents, do physiological or psychological responses differ between discrete environments?



F(3) = 2.46, p > .05

F(3) = 11.56, p < .001

F(2) = 6.04, p < .01

FINDING: Parents exhibited significantly more EA in the induction room than in the other environmental conditions and significantly more MA in consultation than postoperative.

Note: *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001

Tests of within-subjects effects for parents' mean physiological and psychological responses between discrete environments at Site 1 using one-way repeated measures analysis of variance (ANOVA) and pairwaise comparisons

Site 1 | Parents

RQ1e: What perception do parents have of selected design features within each discrete environment?

ROOM	POSITIVE DISTRACTION	SOCIAL SUPPORT	SENSE OF CONTROL	CLINICAL SUPPORT	OTHER	TOTAL FEATURES
Waiting	+***	+**	- N		- N	+***
Induction	+***		- N	-***	+ N	- N
Consultation	+**	+*	+ N		- N	+**
Postoperative		+***		- N	+ N	+ N

Note: +: Positive effect; -: Negative effect; N-Not significant at 0.05; *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001
Net effect of selected design features on parents' perceptions of discrete environments at Site 1 using one-sample z-test for proportions

FINDING: Parents perceived design features related to social support as having a significantly positive effect.

Site 1 | Parents

INDUCTION

RQ1f: In what way, do do parents perceive design features as anxiety reducing or producing for each discrete environment?

LED Lights & TV provided a ***sense of comfort***

> “Ceiling is relaxing. And, the TV to help my daughter feel distracted while being put to sleep.”

Educational Signage provided a ***sense of security***

> “Patient identification. Relatable information. Proper equipment and education.”

FINDING: Clinical suppport provided parents with reassurance that their child would be well cared for.

69% selected ***clinical support***

Anesthesia Equipment considered a ***reminder***

> “Reminder of the technical side of the day.”

> “Reminds me my son is about to be put to sleep.”

FINDING: Parents acknowledged that functionally the equipment was present to ultimately help their child.

〈 Reducing Producing 〉

Case 2 Findings

Case 2

Seattle Children's Hospital Main Campus

Year Built: 1979

Year Renovated: 1992

Architect: NBBJ

Size Outpatient Services: 170,500 SF

Size Surgical Services: 28,680 SF

Surgical Procedures: 10,682 per year

Surgical Suite: 18 ORs, 24 pre/ postoperative rooms, 12 first phase recovery bays

Site 2


Surgery Center Reception
01
Registration

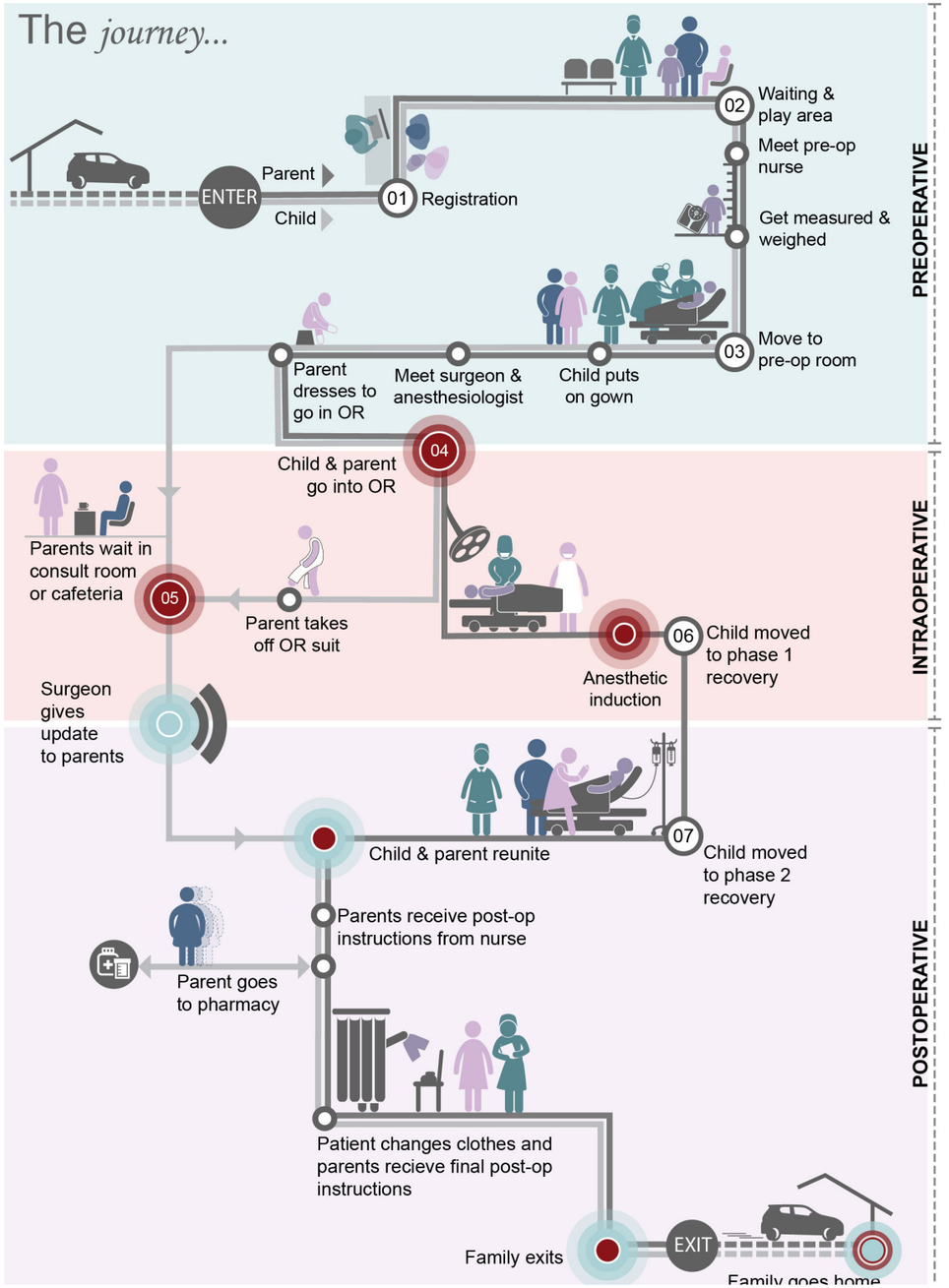

02
Waiting Area


03
Pre-op Room


04
Operating Room


05
Consult Room


06
Phase 1 Recovery


The journey...
ENTER
Parent
Child
01 Registration
02 Waiting & play area
Meet pre-op nurse
Get measured & weighed
03 Move to pre-op room
Parent dresses to go in OR
Meet surgeon & anesthesiologist
Child puts on gown
PREOPERATIVE
04 Child & parent go into OR
Parents wait in consult room or cafeteria
05
Parent takes off OR suit
06 Child moved to phase 1 recovery
Anesthetic induction
Surgeon gives update to parents
INTRAOPERATIVE
07 Child moved to phase 2 recovery
Child & parent reunite
Parents receive post-op instructions from nurse
Parent goes to pharmacy
Patient changes clothes and parents recieve final post-op instructions
Family exits
EXIT
Family goes home
POSTOPERATIVE

Site 2

N = 28

NUMBER OF DYADS	CHILD	PARENT
6	low	low
2	high	high
6	low	high

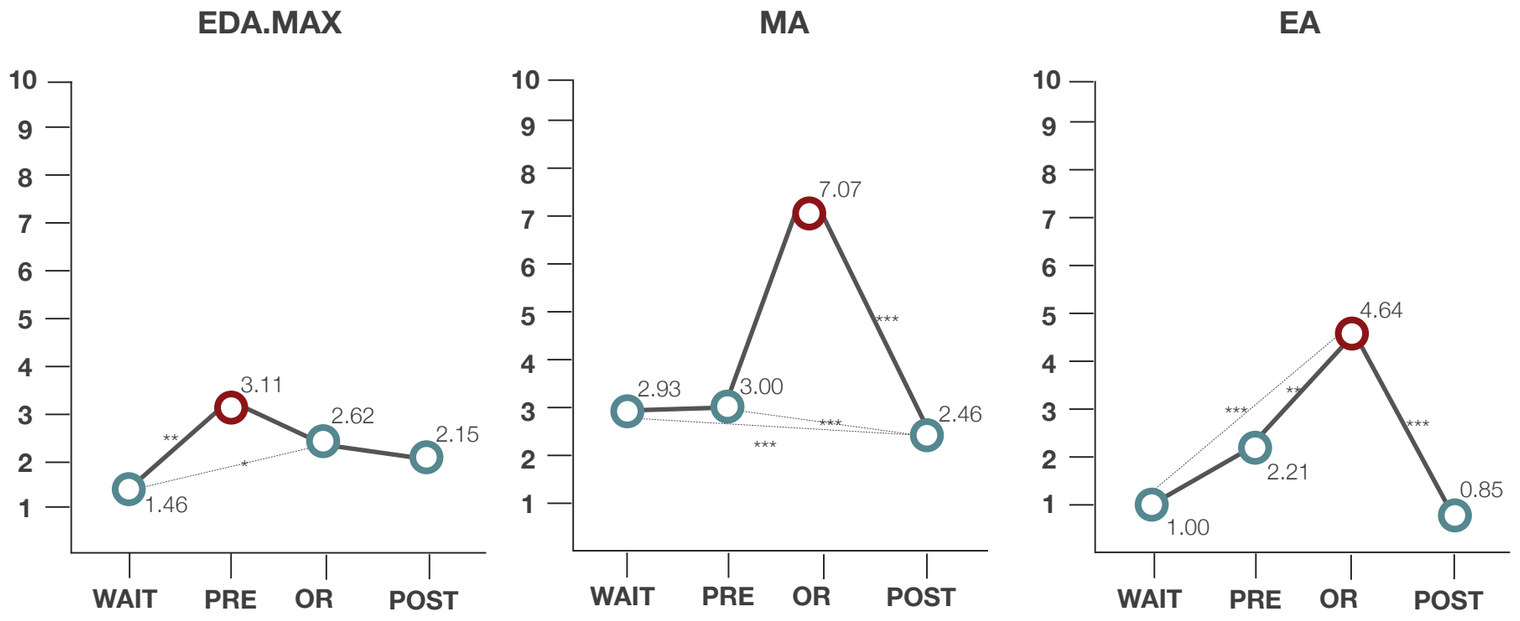
Combination of trait anxiety levels for child/parent dyads at Site 2

CHARACTERISTIC	CATEGORY
Child age	6
	7-8
	9-10
	11-12
Child trait anxiety	low
	high
Parent trait anxiety	low
	high
Child surgical naivety	yes
	no
Preoperative preparation	yes
	no
Person participating with child	Mother
	Father
	Other
Number accompanying child	1
	2
	≥ 3

Demographic characteristics of children and parents at Site 2

Site 2 | Children

RQ1a: For children, do physiological or psychological responses differ between discrete environments?



F(3) = 3.84, p < .05

F(3) = 0.63, p < .001

F(3) = 10.23, p < .001

FINDING: Children exhibited significantly more MA and EA in the OR than in the other environmental conditions.

Note: *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001

Tests of within-subjects effects for children's mean physiological and psychological responses between discrete environments at Site 2 using one-way repeated measures analysis of variance (ANOVA) and pairwise comparisons

Site 2 | Children

RQ1c: What perception do children have of selected design features within each discrete environment?

ROOM	POSITIVE DISTRACTION	SOCIAL SUPPORT	SENSE OF CONTROL	CLINICAL SUPPORT	OTHER	TOTAL FEATURES
Waiting	+*	+***	+N		+N	+***
Preoperative	+**	+**		-***	+**	+N
OR				-***	+*	-***
Postoperative	+N	+**		-N	+N	+N

Note: +: Positive effect; -: Negative effect; N-Not significant at 0.05; *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001

Net effect of selected design features on children's perceptions of discrete environments at Site 2 using one-sample z-test for proportions

FINDING: In the OR, children perceived design features related to clinical support as having a significantly negative effect.

Site 2 | Children

Bed provided a ***sense of comfort***

> “Because you can lay down during the surgery. ”

Parents connection of ***being next*** to mom or dad

> “Mom was there and made me feel comfortable, nothing in the room.”

> “The bed is comfortable, and having dad in here next to me.”

FINDING: Parents contributed greatly to reduced anxiety, more than the design features in the room.

OR

64% selected ***clinical support***

RQ1e: In what way, do do children perceive design features as anxiety reducing or producing for each discrete environment?

Boom Lights & Instrument Tray combination of ***everything***

> “All of the cords and things, and the whole room. Just everything. ”

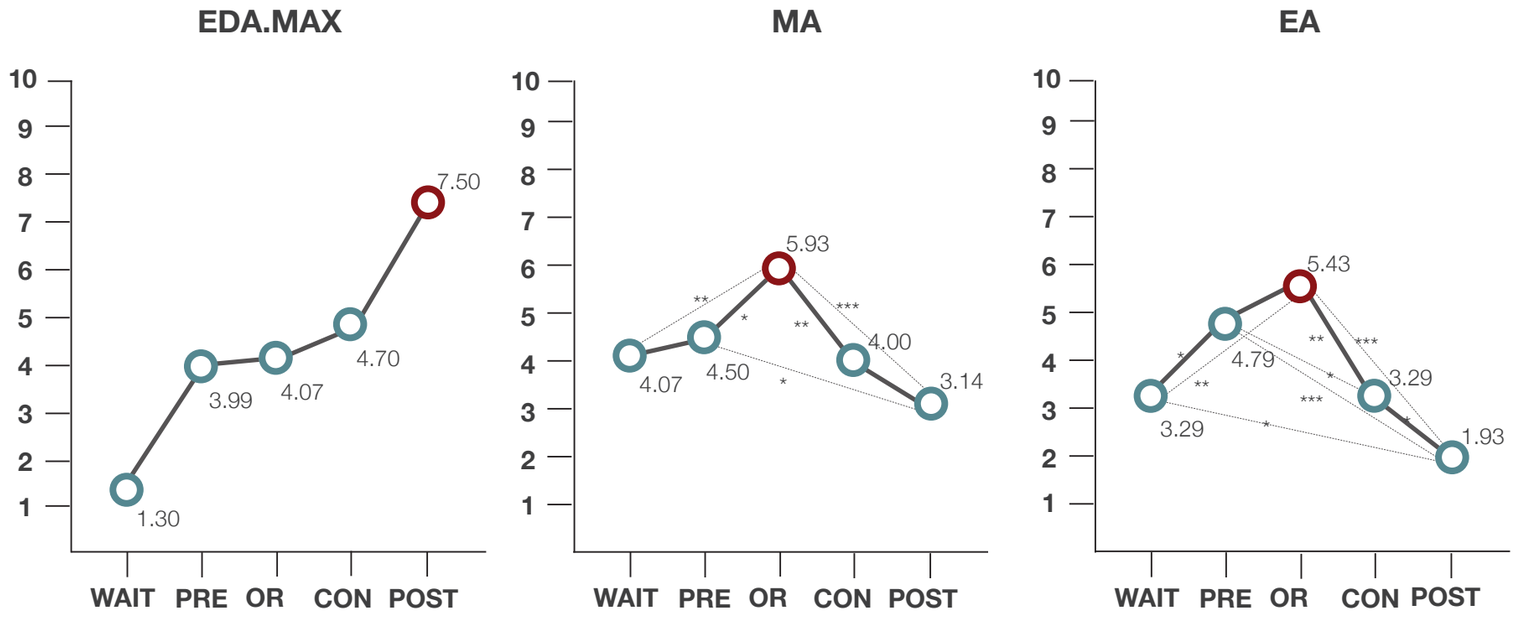
> “Because it is really crowded and makes me more anxious.”

FINDING: Emotionally, clinical support features contributed to a sense of ease.

〈 Reducing Producing 〉

Site 2 | Parents

RQ1b: For parents, do physiological or psychological responses differ between discrete environments?



F(4) = 2.20, p > .05

F(4) = 5.51, p < .001

F(4) = 9.82, p < .001

FINDING: Parents exhibited significantly more EA and MA in the OR than in the other environmental conditions.

Note: *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001
Tests of within-subjects effects for parents' mean physiological and psychological responses between discrete environments at Site 2 using one-way repeated measures analysis of variance (ANOVA) and pairwise comparisons

Site 2 | Parents

RQ1d: What perception do parents have of selected design features within each discrete environment?

ROOM	POSITIVE DISTRACTION	SOCIAL SUPPORT	SENSE OF CONTROL	CLINICAL SUPPORT	OTHER	TOTAL FEATURES
Waiting	+N	+N	+N		+N	+N
Preoperative	+N	+*		-***	+*	-**
OR				-***	+N	-**
Consultation	+**	+***	+N	-*	-N	+**
Postoperative	+N	+N		-***	+**	-N

Note: +: Positive effect; -: Negative effect; N-Not significant at 0.05; *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001

Net effect of selected design features on parents' perceptions of discrete environments at Site 2 using one-sample z-test for proportions

FINDING: Parents perceived design features related to clinical support as having a significantly negative effect in four of the five environmental conditions.

Site 2 | Parents

Care Team Members *sense of comfort*

> "The room was quite overwhelming and focusing on the bed and the staff was the only thing that offered comfort. The nurse was kind and introduced herself, which helped only slightly."

> "Nothing much to comfort just the staff members to ease us."

Anesthesia Monitors provided a *sense of comfort*

> "Comfort, safety and monitoring tools."

FINDING: Parents felt they could decompress after sending their child into surgery.

OR

71% selected ***clinical support***

RQ1f: In what way, do do parents perceive design features as anxiety reducing or producing for each discrete environment?

Surgical Equipment contributed to the overwhelming *nature*

> "Because it's in the operating room. Even though I know my daughter is in great hands,

FINDING: For some parents, clinical support contributed the sense that the team was prepared.

〈 Reducing Producing 〉

CROSS-CASE FINDINGS

Site 1 vs. Site 2 | Children

RQ2a: For children, do physiological or psychological responses differ across discrete environments?

ROOM	RESPONSE	CHILD SITE 1 *MEAN (SD)*	CHILD SITE 2 *MEAN (SD)*	DF	F-RATIO	P-VALUE	EFFECT SIZE
W/W	EDA.ucl	0.36 (0.45)	0.55 (1.00)	1	1.1051	0.3016	
W/W	MA	4.00 (2.68)	2.93 (2.20	1	0.0111	0.9168	
W/W	EA	1.72 (1.57)	1.00 (1.62)	1	0.0884	0.7683	
IND/PRE	EDA.ucl	0.76 (1.172)	1.05 (1.70)	1	2.5816	0.1183	
IND/PRE	MA	3.76 (3.05)	3.00 (2.80)	1	1.3969	0.2462	
IND/PRE	EA	2.8 (2.36)	2.21 (2.78)	1	0.0119	0.914	
IND/OR	EDA.ucl	0.76 (1.17)	1.51 (1.75)	1	4.6736	0.0385*	1.0071
IND/OR	MA	3.76 (3.05)	7.07 (2.62)	1	18.1385	0.0002***	1.9841
IND/OR	EA	2.80 (2.36)	4.64 (3.39)	1	6.1957	0.0184*	1.1596
POST/POST	EDA.ucl	0.21 (0.12)	0.60 (0.70)	1	9.7353	0.0039**	1.4535
POST/POST	MA	2.68 (2.90)	2.46 (2.76)	1	0.4008	0.5315	
POST/POST	EA	1.72 (2.23)	0.85 (1.34)	1	0.2231	0.6401	

*Note: *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001*
Effect of discrete environments on children's physiological and psychological responses across cases using simple regression model and effect size

FINDING: Children's anxiety responses for all measures differed significantly across the induction and OR environments, as well as the postoperative environment for EDA.ucl.

Site 1 vs. Site 2 | Parents

ROOM	RESPONSE	PARENT SITE 1 *MEAN (SD)*	PARENT SITE 2 *MEAN (SD)*	DF	F-RATIO	P-VALUE
W/W	EDA.ucl	1.11 (1.53)	0.52 (0.57)	1	0.6064	0.4422
W/W	MA	4.08 (2.1)	4.07 (2.13)	1	0.4861	0.4909
W/W	EA	1.60 (2.10)	3.29 (1.64)	1	2.6915	0.111
IND/PRE	EDA.ucl	1.52 (1.80)	1.18 (1.58)	1	0.1516	0.6997
IND/PRE	MA	4.12 (2.74)	4.50 (2.28)	1	0.4091	0.5271
IND/PRE	EA	3.68 (2.78)	4.79 (2.49)	1	0.0978	0.7565
IND/OR	EDA.ucl	1.52 (1.80)	2.14 (1.83)	1	1.3844	0.2483
IND/OR	MA	4.12 (2.74)	5.93 (2.95)	1	0.7584	0.3905
IND/OR	EA	3.68 (2.78)	5.43 (3.18)	1	0.2098	0.6501
POST/POST	EDA.ucl	1.09 (1.01)	1.18 (1.01)	1	0.1520	0.6993
POST/POST	MA	4.56 (2.79)	4.00 (1.88)	1	1.3929	0.2469
POST/POST	EA	2.24 (2.31)	3.29 (1.82)	1	0.3574	0.5543
POST/POST	EDA.ucl	1.13 (1.54)	3.42 (6.88)	1	1.3752	0.2499
POST/POST	MA	2.04 (2.37)	3.14 (2.66)	1	0.6998	0.4092
POST/POST	EA	1.28 (1.37)	1.93 (2.23)	1	0.1869	0.6685

*Note: *-significant at 0.05; **-significant at 0.01; ***-significant at 0.001*
Effect of discrete environments on parents' physiological and psychological responses across cases using simple regression model and effect size

RQ3b: For parents, do physiological or psychological responses differ across discrete environments?

FINDING: Parents' anxiety responses did not differ significantly across any of the environmental conditions at Site and Site 2.

IMPLICATIONS

Implications

1. Integrating induction rooms into the ambulatory surgical environment should be considered to support reduced anxiety for children
2. A child's perspective of the healthcare experience may be underestimated or misrepresented if only proxy evaluations are used
3. Non-pharmacological stratedgy vs. pharmacological strategies
4. Potential implications for postoperative recovery
5. Counter balance between design features is especially salient for environments that require a considerable amount of clinical support
6. Child and parent percpetions of the functional and emotional affordances provided by design features differs

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Thank you!