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RESUMO

Resposta psicofisiológica ao choro não stressante do bebé: orientação sexual e dimensões da vinculação

A ativação psicofisiológica ao choro de bebés embora independente do género (Groh & Roisman, 2009), está associada ao estatuto paternal (Gottman and Levenson, 1988) e a fatores psicológicos (Wood & Gustafson, 2001). **Objetivos**: avaliar se a orientação sexual está associada à resposta psicofisiológica a choros não-stressantes de bebés e quais as caraterísticas sociodemográficas e psicológicas que podem estar associadas a esta resposta. **Método**: aplicamos o paradigma psicofisiológico a 52 homens não-pais, 27 homossexuais e 25 heterossexuais, para medir a reatividade psicológica a e fisiológica aos choros. A reatividade fisiológica (HR e RSA) foi medida utilizando o sistema VU-AMS. Aplicamos o questionário ECR para medir as dimensões da vinculação, STAI-S para medir a ansiedade e um questionário para recolher as características sociodemográficas. **Resultados**: obtivemos dois clusters de reatividade psicofisiológica, "Ativado" e "Desativado". No cluster "Ativado" foi registado aumento HR e diminuição RSA, no "Desativado, diminuição HR e aumento RSA. Não foi encontrada associação entre os clusters e orientação sexual mas a dimensão da Ansiedade na vinculação mostrou ser melhor preditor para o cluster "Ativado". **Conclusão:** a resposta psicofisiológica de homens não pais a choros de bebés não é predita pela orientação sexual, contudo, está altamente relacionada com dimensões psicológicas e relacionais.

Palavras-chave: resposta psicofisiológicas, choros de bebés, orientação sexual, dimensões da vinculação, ansiedade.

ABSTRACT

Psychophysiological response to non-distressed infant cry: Men sexual orientation and attachment dimensions

Psychophysiological arousal to infant cry appears to be independent of gender (Groh & Roisman, 2009). However, different patterns of reactivity are related to parental status (e.g. Gottman and Levenson, 1988) and psychological factors (Wood & Gustafson, 2001). **Objectives**: examine if sexual orientation is associated with psychophysiological response to infant cry stimulus, and explore men socio-demographic and psychological factors that may be associated to psychophysiological response to the same stimulus. **Method:** a psychophysiological paradigm was applied to 27 homosexual and 25 heterosexual self-identified men to assess psychological and physiological reactivity to infant non-distressed cries. Physiological activity (HR and RSA) was assessed by Stimuli paradigm, recorded using VU-AMS system. Attachment dimensions were measured with ECR and anxiety level with STAI-S. A questionnaire was used to collect socio-demographic characteristics. **Results:** Two groups of psychophysiological reactivity were identified: "Activated" and "Deactivated". Participants on "Activated" cluster shown increase HR and RSA withdrawal, on "Deactivated" cluster revealed HR decrease and RSA increase. Although no association was found between clusters and sexual orientation, Anxious Attachment scale provided the best predictor of Activated clusters. **Conclusion**: psychophysiological non-fathers response to infant non-distressed cries isn't predicted by sexual orientation but is highly related to psychological and relational dimensions.

Key words: psychophysiological response, infant cries, sexual orientation, attachment dimensions, anxiety.

1. BACKGROUND

Cry is characterized as a signal of distress (Irwin, 2003; Murray, 1985), involving vocalizations and a repertoire of facial and body movements (Irwin, 2003) that changes according to infant's level of distress (Wood & Gustafson, 2001). Cries are motivated by internal or endogenous causes and also by external causes, being mostly provoked by hunger, pain, physical discomfort and loneliness (Zeifman, 2001b). Although commonly perceived as a reaction to pain or unpleasent stimulus linked to greater distress, its appearance can be dissociated from physiological indices of distress, as in early fatigue (Zeifman, 2001b; Wood & Gustafson, 2001). Cry is a variable signal expressed with different patterns and structures (Owings & Zeifman, 2004). The acoustic structure is correlated with changes in the severity of distress (Owings & Zeifman, 2004). Distressed cries differ from non-distressed ones especially in characteristics such as fundamental frequency (f_0 - generated by vibration of the vocal folds and heard as the pitch of the cry), e.g. pain crying often involves hyperphonated cries and has a higher-frequency, being perceived as more aversive and distressed than low-frequency cries (Owings & Zeifman, 2004; Venuti et al., 2012).

Several researches were performed to study "cry types", and adults' response to them. Most showed that adults can hear gradations in infants' cries and differentiate them, especially individuals with parental experience (see Gustafson, Wood & Green, 2000; Wood & Gustafson, 2001), allowing them to respond according to the cry gradation (Gustafson & Harris, 1990).

Cry has being reported as a paradoxical stimuli, an highly aversive sound, either eliciting nurturing, alerting caregiver for the infant needs and to attend to the infant (Boukydis, 1985; Murray, 1985), or hostile responses (Murray, 1985; Zeifman, 2001a) evoking intense negative emotions. Research with videotaped presentation of a smiling and crying infant found that both elicited different physiological and self-reported emotions among listeners; namely, infant crying caused autonomic arousal and reports of aversion (Frodi & Lamb, 1978).

As part of a biological system and one of the primary interactive behaviors (Nelson, 2005), crying is known as the main form of communication since birth (Lummaa, et al., 1998). Infants' cry restrains specific information about child's needs and emotion, motivating adults' caregiving behavior (Owings & Zeskind, 2004). This behavior has an adaptive value, promoting infant survival whenever he requires parents' support (Murray, 1985; Zeifman, 2001a; Owing & Zeskind, 2004) requesting protection from potential threats and regulating subsequent negative affect (Simpson et al, 2007).

In order to study differentiation in response to infant cries, we examined the psychophysiological response to non-distressed cries in men without paternal experience.

Psychophysiological response to infant cry

Psychophysiological arousal to infant stimuli appears to be an universal event, mostly characterized by a significant increase in heart rate and skin conductance (Groh & Roisman, 2009; Frodi & Lamb, 1980; Crowe & Zeskind, 1992), and also a parasympathetic withdraw (Del Vecchio et al., 2009) facilitating active engagement and monitoring to a goal (Porges, 1995). Males and females, parents and non-parents show physiological arousal and stronger autonomic responses to the sound of infant crying compared to other sound stimuli with similar characteristics (Groh & Roisman, 2009; Frodi et al., 1978; Boukydis & Burgess, 1982). Gottman and Levenson (1988) reinforce that physiological response (systolic blood pressure, electrodermal, basal skin conductance levels) to infant distress signals is higher in males and in non-parents. However, recent studies have shown that non-parents experience heart rate deceleration when presented to infants' cries (Stallings et al., 2001; Giardino et al., 2008; Zeskind, 1987). Generally there weren't found sex differences in skin conductance, heart rate, systolic blood pressure and diastolic blood pressure in response to infant stimulus (Gottman & Levenson, 1988; Groh & Roisman, 2009). Research on gender differences in physiological reactivity to stressful stimuli suggests that the extent of physiological change is the outcome of a complex interaction of the gender of the participant, the type of stressor, and the type of cognitive appraisal of the stressor employed by the participant (Brewster et al, 1998).

Cardiac deceleration is considered a natural orienting response to new stimuli related to sensory intake, necessary to a correct appraise and judgment of the situation (Andreassi, 2000). Pedersen and colleagues (1996) suggested that parents' heart rate deceleration occur because they perceive infant cries more accurately, eliciting caregiving system and leading them to select an appropriate response. However, this pattern of psychophysiological deactivation could be a reflection of alertness to the cries, but with no action intention (Furedy et al., 1989).

Crying can also be evaluated as a negative stimulus (Murray, 1985; Zeifman, 2001a). Previous studies reported that during the presentation of cry stimuli non-parent showed more cardiac reactivity and negative emotions, perceiving infant cries as more aversive than parents

(Out et al., 2010; Kovar, 2011; Zeskind & Lester, 1978). Those results have been associated with risk for child abuse, once, contrary to highly sensitive parents, abusers tend to show a vagal increase on physiological arousal (Joosen et al., 2012). However, abusers tend to show hyper-reactivity to other stimulus such as pleasant child stimulus, aversive stimulus non-related to infants and during baseline conditions (Frodi & Lamb, 1980). Thus, a pattern of increase in heart rate and withdrawal in respiratory sinus arrhythmia to infant stimulus could be a signal of distress more than a predictor of abuse. Even being different from potential abuser physiological response, this reactivity to infant crying could be seen as an inappropriate distancing behavior as an intent to relieve own distress (Bell & Ainsworth, 1972), triggering fussing and less proper caregiving behaviors.

Beside cry characteristics, other psychological factors may influence adult's response to cries (Wood & Gustafson, 2001) leading us to hypothesized that sexual orientation and attachment dimensions interfere in physiological response to infant's non-distressed cries.

Sexual Orientation, psychophysiology, and infant cries

Physiological research on sexual orientation is mostly focused in sexual arousal among gays, however, Diamond (2003) call for attention to the role of biological basis, social, cultural and interpersonal contexts in mediating the human sexual and affectional experiences. Sexual orientation can be considered a multifaceted construct, influenced in some way by biological factors (Mustanski, Chivers & Bailey, 2002).

Simon (2012) reported the need to study the way in which sexual orientation and gender categories affect emotional reactivity. When presented to films that elicit sadness and disgust, gay men expressed significantly less sadness comparatively to their heterosexual counterparts and women (Simon, 2012). Inexpressive individuals often suppress their emotions and are more physiologically reactive (Gross, 2002); probably gay men tend to use suppression to regulate their emotions (Simon, 2012). Suppression reduce the emotional expression, and it is associated with memory impairment and physiological increase, as sympathetic activation of the cardiovascular and electrodermal systems (Gross, 2002).

In the context of a gay relationship is possible that individuals without fatherhood experience are more oriented and respond more promptly to infant stimuli than heterosexual counterparts once they internalized heterosexism and gender-role conflicts (Robinson & Brewster, 2013), and (probabilistically) had more anxious attachment orientations in significant relationships.

Attachment dimensions, psychophysiology, and sexual orientation

Attachment has an important role in shaping emotional reactions within close relationships (Mikulincer & Shaver, 2005) and interacts with caregiving system (George & Solomon, 2008). In fact, caregiving system was deem by Bowlby as a preprogrammed system associated and regulated by strong motions (Cassidy, 2008; George & Solomon, 2008). According to Cassidy (2008, p. 10), this is *"a subset of parental behaviors (…) designed to promote proximity and comfort when the parent perceives that the child is in real or potential danger".* That is, caregiving system is activated by cues perceived by parents as dangerous or stressful for the infant and, similarly to attachment system, also terminate when proximity to the child is aimed, looking to ensure protection and survival (Cassidy, 2008; Figueiredo, 2013; George & Solomon, 2008). Thus, the caregiving system is activated by attachment behaviors becoming complementary and reciprocal to the attachment system (Figueiredo, 2013; George & Solomon, 2008). That is, adult attachment pattern shape the regulation of negative emotions and physiological responses showing direct implications on emotional experiences (Diamond & Hicks, 2005). It also, differentiates the response to infant stimulus and influence neural, emotional and behavioral responses to infant cry (Riem et al, 2012). Higher vagal tone is related to emotional regulation and adults with lower response to stimulus show higher emotional reactivity and ineffective behavioral coping strategies facing stress circumstances, pointing an association between insecure attachment pattern and deficits in emotional regulation (Diamond & Hicks, 2005; Diamond & Fagundes, 2010).

Psychophysiological responses to infant stimuli (infant distress and non-distress vocalizations) are affected by attachment security (Groh & Roisman, 2009; Groh, 2012). Adults with low levels of secure internal working model showed greater electrodermal reactivity when listen a record with infant crying (Groh & Roisman, 2009). Insecure individuals showed heightened amygdale activation, experienced more irritation and used more excessive force than individuals with a secure representation during infant crying (Riem et al, 2012). However, self reported avoidance and anxiety were not consistently associated with responding to infant crying or laughter (Groh, 2012).

According to Mikulincer (1998), in anger episodes, individuals with secure attachment demonstrate more adaptive responses, more positive affect and less hostile intention than insecures. On the other hand, individuals with high pattern of anxiety tend to be in a state of hyperactivation to suppress their needs, maximizing experiences of negative emotions, exaggerating the appraisal process and being hypervigilant to threat cues (Diamond & Hicks,

2005; Mikulincer, 1998; Shaver & Mikulincer, 2007). Avoidant individuals tend to use deactivating strategies blocking or inhibiting any emotional state associated with threats and feelings of vulnerability. They minimize experiences of negative affect and distract attention from danger cues, indicating lack of responsiveness to physiological signs of anger (Diamond & Hicks, 2005; Mikulincer, 1998; Shaver & Mikulincer, 2007).

Ridge and Feeney (1998) explored sexual orientation differences in general attachment styles, reporting similar patterns among gay and heterosexual samples. However, gay men were reported as being more preoccupied in their attachment compared to heterosexual males and showed a pattern with apparent similarity with insecure attachment (Ridge & Feeney, 1998). Despite those results, researches with gay samples suggest that the existence of a higher frequency of insecure pattern may not be over-represented (Josephson, 2003; Ridge & Feeney, 1998).

Non-parents' psychophysiological responses to infant cry have been studied before (e.g. Stallings, et al., 2001; Kovar, 2011), however this study focuses on the orientation of these responses and the possible related psychological variables.

Therefore, this study aims to:

(1) Examine if there is an association between sexual orientation and psychophysiological response to non-distressed infant cries, being hypothesized a stronger psychophysiological arousal among gay men.

(2) Explore men socio-demographic and psychological factors that may be associated to psychophysiological response to non-distressed infant cries. We hypothesized that psychological factors as attachment anxiety, attachment avoidance, anxiety state and age, body mass index (BMI), number of cigarettes or number of coffees consumed by day may be correlated with psychophysiological response to infant cries. In fact, socio-demographic and health measures interfere in cardiovascular reactivity (Sarafino, 2008).

2. METHOD

2.1. Participants

A total of 56 men, self-identified as homosexual or heterosexual, living in the North of Portugal and Lisbon were contacted by telephone, social networks, blogs and e-mail between November 2012 and July 2013, constituting, therefore, a convenience sample. There were inclusion criteria: read and write European Portuguese and have no previous experience of paternal care. Exclusion criteria were: having less than 18 years and more than 45 years of age, being bisexual, hold a physical disease, endocrine or chronic psychiatric problems previously known, and to be medicated with psychotropic drugs.

Participants were paired according to age (20-32 years old; 33-45 years old), education (<12 years of scholarship; ≥ 12 years of scholarship), relationship status (in a relationship; not in a relationship), and occupational status (employed; unemployed).

Due to methodological problems capturing psychophysiological signals, 4 participants were excluded. Final sample was composed by 52 men, 27 homosexual and 25 heterosexual, between 20 and 45 years with an average age of 30.81 years old (*SD* = 6.71). More than half (65.4%) were single, although, 59.6% were in a relationship. Furthermore, 88.5% were employed and 80.8% had more than twelve years of scholarship.

Table 1 shows descriptive characteristics for sexual orientation groups. There were no significant differences or association between the paired groups regarding to socio-demographic measures.

Table 1 –Sample Descriptive Characteristics

		Total (n=52) N (%)	**Gay** (n=27) N (%)	**Hetero** (n=25) N (%)	χ^2	
Employment Status	*Employed*	46 (88.5%)	23 (85.2%)	23 (92%)	0.59	
	Unemployed	6 (11.5%)	4 (14.8%)	2 (8%)		
Relationship Status	*Single*	21 (40.4%)	12 (44.4%)	9 (36%)	0.38	
	In a Relationship	31 (59.6%)	15 (55. 6%)	16 (64%)		
Education Level	*Undergraduate*	10 (19.2%)	4 (14.8%)	6 (24%)	0.71	
	Graduated	42 (80.8%)	23 (85.2%)	19 (76%)		
		M (SD)	*M (SD)*	*M (SD)*	***t***	***d***
Age (years)		30.81 (6.73)	32.07 (7.20)	29.44 (5.99)	1.43	0.40
BMI		23.87 (3.41)	23.16 (3.21)	24.64 (3.52)	-1.59	-0.44
# Cigarettes/day		5.77 (7.82)	5.33 (7.59)	6.24 (8.20)	-0.41	-0.12
# Coffees/day		2.10 (1.75)	2.37 (1.84)	1.80 (1.63)	1.18	0.33

2.2. Measures

2.2.1 Socio-demographic questionnaire (QSD)

The questionnaire allowed the collection of social and demographic data relevant to the characterization of the sample: age, place of birth, ethnicity, religion, occupational status and educational level; also, data from the household, the family of origin, social support, psychiatric history and health problems, medications, regular use of tobacco and alcohol.

2.2.2 Experiences in Close Relationships ECR (Brennan, Clark, & Shaver, 1998; Portuguese version Paiva & Figueiredo, 2010).

The 36-item Experiences in Close Relationships scale was used to assess the two major dimensions of adult attachment style, Attachment Anxiety and Attachment Avoidance.

Participants were asked to complete the measure in terms of how they generally experience relationships, rather than their specific experience in a current relationship. Portuguese validation revealed that the total scale has good internal consistency (α=.86), as also has the 2 sub-scales: anxiety (α=.86) and avoidance (α=.88).

2.2.3 State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1983; Portuguese version Silva, 2003).

This self-report inventory is composed by two 20-item scales (State and Trait) rated in a 4-point Lickert scale. In this study we used STAI State scale to assess participants' level of anxiety once Anxiety State scale is reported as being more sensitive to different stresses (Kendall, 1978).

2.2.4 Stimuli

Participants were presented to 1 video compiling two videos (5 minutes each) intercalated with two inter-stimuli periods (2 minutes each), 4 minutes of baseline (2 minutes of instructions and 2minutes relaxing) and 2 minutes of recovery period (18 minutes total). This psychophysiological paradigm was administered using a laptop (13'') with Windows Media Player and the stimuli were presented at the same volume through Sennheiser HD 201 headphones. During the baseline condition, participants were instructed about the procedure (2 minutes) and were told to relax and look at the laptop until instructions appeared (2 minutes). After baseline condition, the paradigm consisted on 2 x 5 minutes of videos intercalated with 2 minutes of inter-stimulus periods (white screen).

The first video consisted on a practice trial, with a "neutral" video (without infant related elements) with a man sitting on a sofa and reading a book in silence. The second video consisted on seven non-distressed babies crying videos presented in a random order (with an average of 550Hz). For the present project, we analyzed only one minute of each period (baseline and cry). This time is in line with previous studies (e.g. Stallings et al, 2001; see Kreibig, 2010 for review) and avoids physiological time-exposure effect to repeated cry sounds described in previous studies (e.g. Out et al, 2010). For cry condition, 3 crying videos were included in the 1 minute period analyzed, being them randomized and with an average of 20sec each. The psychophysiological paradigm was validated i.e., psychophysiological

responses to cry conditions were proven to differ from baseline condition with a sample of non-parent men with the same socio-demographic characteristics as the present sample (Nunes-Costa, Figueiredo, & Moya-Albiol, 2013).

Figure 1 – Stimuli

2.2.5. Physiological activity

Physiological responses to infant non-distressed cries were evaluated by heart rate (HR) and respiratory sinus arrhythmia (RSA) measures, as described below. Cardiovascular and impedance signals were recorded with the Ambulatory Monitoring System (VU-AMS; VU-DAMS v2.2, Vrije Universiteit, Amsterdam, the Netherlands; http://www.psy.vu.nl/vu-ams/; de Geus et al., 1995; Willemsen et al., 1996). Subjects wore the VU-AMS monitor during the assessment, unobtrusively underneath clothing for about 18 minutes. Reliability and validity aspects and recording methodology of the VU-AMS have been described previously (Vrijkotte, van Doornen, & de Geus, 2004). The system records three lead electro cardiograms ECG and four lead impedance cardiograms (ICG) (BIOPAC Systems, Inc., EL507). Physiological signals were synchronized with the paradigm conditions using an Event Marker button on the AMS device. The experimenter pushed the button immediately before starting the video.

The full ECG signal was stored at a 16-bit sampling rate. All R-peaks in the ECG, scored by the software, were checked and R-peak markers were moved, inserted or deleted. The software also automatically marked inspirations and expirations in the respiratory signals, which were also checked. From the resulting data, QRST-complex was extracted for IBI

calculation by software and RSA automatically obtained as a derivate of parasympathetic nervous system activity. A time domain index of HR variability in the respiratory frequency range (Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996), RSA, is the peak valley estimation (pvRSA); obtained automatically by subtracting the shortest inter beat interval during HR acceleration in the inspirational phase, from the longest inter beat interval during deceleration in the expiration phase. HR-r was obtained by subtracting the baseline HR (1 minute) from men HR measured during hearing infant cry (1 minute). The same procedure was performed for RSA values. In order to avoid physiological time-exposure effect to repeated stimulus (e.g. Out et al, 2010) we analyzed only 1 minute of baseline and cry condition.

2.3. Procedure

Participants were contacted informally and then informed about the study. Information about the study was given to participants by email, by the site http://paraopai.pt.vu and personally. After the contact established, men were informed about the procedure and general aims of the study and who agreed in participating was asked to sign an informed consent.

All subjects participated in one session (approximately 50 minutes) divided in two moments, firstly to fill the questionnaires in the presence of one researcher and, in a second moment, participants were properly connected to AMS-VU and psychophysiological paradigm realized. The sessions took place between 7 p.m. and 9 p.m. in rooms with similar soundproofing, constant temperature 22±1ºC, privacy and comfort conditions.

2.4. Data analysis

Kolmogorov-Smirnov statistics was used and established that data was normally distributed ($p < 0.05$). For the classification of psychophysiological responses on profiles was performed a cluster analysis - according to non-fathers' HR-r and RSA-r - as described next. We performed statistical analysis of the F ANOVA to identify the importance of each variable in the psychophysiological clusters. To explore differences and associations between/with psychophysiological clusters previously identified was performed two-tailed T-tests and Chi-square analyses in all socio-demographic and psychological variables and effect sizes for the between-group differences were calculated using Cohen's *d* (Cohen, 1988).

In order to analyze the correlation between socio-demographic and psychological variables, and psychophysiological clusters were performed Spearmen correlations. To determine how psychological variables (selected from over mentioned Spearmen analysis) are in relation to psychophysiological clusters was performed binary logistic regressions and tested the moderator model. In the first step psychophysiological clusters was entered as dependent variable and psychological variables (sexual orientation and attachment anxiety) as independent variables, on second step there also entered the cross-product of sexual orientation and attachment anxiety to test the moderating effect of sexual orientation.

All statistical analyses were realized with IBM Statistical Package for the Social Sciences (SPSS) 20.0 for Windows with the alpha level fixed at 0.05.

3. RESULTS

(1) Association between sexual orientation and psychophysiological responses to non-distressed infant cries.

For the classification of men in groups according to their psychophysiological responses to infant cry, a two-step procedure was performed. First, the number of clusters was determined by checking the dendrogram generated from a hierarchical cluster analysis using Ward's hierarchical clustering algorithm (1963), the R^2, and cluster distance criteria (Maroco, 2007). HR reactivity (HR-r, beats per minute) and RSA reactivity (RSA-r, msec) were used in the cluster analysis. Each variable considered in the cluster analysis were converted to standard scores (z scores), eliminating the bias introduced by the differences in the scales of the variables and allowing each of them to equally contribute to the formation of the clusters (Hair, Anderson, Tatham, & Black, 1998). In order to allocate sample to clusters we performed a K-means analysis with square Euclidean distance as the similarity index. This analysis led to the adoption of a solution of two clusters explaining 51% (R-sq = 0.514) of total variance.

Participants in first Cluster (56% of the sample) had HR deceleration (*M* = -1.42, *SD* = 3.75) and increase in RSA to infant cries (*M* = 10.29, *SD* = 14.31) being called Deactivated. On second Cluster (44% of the sample) had a visible increase in HR (*M* = 1.92, *SD* = 2.50)

and RSA withdrawal to infant cries (M = -20.97, SD = 16.14). Those participants where labeled Activated. F statistic of the ANOVA analysis revealed that both variables contribute significantly to the differentiation of clusters: RSA-r (F = 54.69, p < .001) followed by HR-r (F = 13.50, p = .001).

Chi-square analysis (table 2) shows no association between sexual orientation groups (Homosexual and Heterosexual) and psychophysiological clusters (Activated and Deactivated) ($\chi^2(1) = 1.32$, p = .278).

Table 2 – Chi-square analyzes between sexual orientation groups and psychophysiological clusters.

	Activated N (%)	**Deactivated** N (%)	χ^2**(1)**	*p*
Sexual Orientation				
Homosexual	14 (60.87)	13 (44.83)	1.32	0.278
Heterosexual	9 (39.13)	16 (55.17)		

(2) Men socio-demographic and psychological factors that may be associated to psychophysiological response to non-distressed infant cries.

Once sexual orientation was not associated with psychophysiological clusters, we performed a correlation analysis with socio-demographic and psychological (attachment dimensions and anxiety state) variables in relation to clusters to explore what could be the factors associated to men pattern of response.

Seeing that socio-demographic factors affect the magnitude of psychophysiological responses, body mass index, age, number of cigarettes smoked and number of coffees per day were controlled. Those factors were proven to affect normal cardiovascular functioning (see Norman & McNeily, 1991; Sarafino, 2008).

Significant correlation was found only for Anxiety Attachment Scale (ρ = -0.32, P < 0.023) (see table 3).

Table 3 – Association/correlation between clusters and socio-demographic and psychological variables

		Activated (n=23) N (%)	**Deactivated** (n=29) N (%)	χ^2	*p*
Employment Status	*Employed*	19 (82.61%)	27 (93.10%)	1.38	0.24
	Unemployed	4 (17.39%)	2 (6.90%)		
Relationship Status	*Single*	11 (47.83%)	10 (34.48%)	0.95	0.33
	In a Relationship	12 (52.17%)	19 (65.52%)		
Education Level	*Undergraduate*	6 (26.09%)	4 (13.79%)	1.25	0.26
	Graduated	17 (73.91%)	25 (86.21%)		
		Clusters [1]		*p*	
Age (years)		-0.16		0.27	
Body Mass Index		-0.06		0.70	
# Cigarettes/day		0.09		0.55	
# Coffees/day		-0.53		0.71	
Attachment					
Anxiety		-0.32*		0.02	
Avoidance		-0.10		0.50	
STAI-S		0.07		0.61	

[1] 1 – Activated; 2 - Deactivated

Our present data revealed no association between psychophysiological clusters and sexual orientation, but a significative correlation between psychophysiological clusters and attachment anxiety dimension was found. On the other hand, previous findings referred to attachment pattern as being related to sexual orientation (Ridge & Feeney, 1998). We intended to analyze if sexual orientation moderated the relation between attachment anxiety and psychophysiological clusters, considering a possible interaction effect between sexual orientation and attachment anxiety even sexual orientation were not individually associated to psychophysiological clusters.

For that we examined three conditions considered essential to show moderation (Baron & Kenny, 1986) represented in figure 2: the effect of men's sexual orientation on psychophysiological clusters (Path a – even the association was not significant); the effect of attachment anxiety on psychophysiological clusters (Path b) and the effect of the interaction between men's sexual orientation and attachment anxiety on psychophysiological clusters (Path c). Our purpose was to consider bidirectional effects on the sexual orientation and attachment dimensions of men, and the way in which they contribute to psychophysiological responses to infant cries.

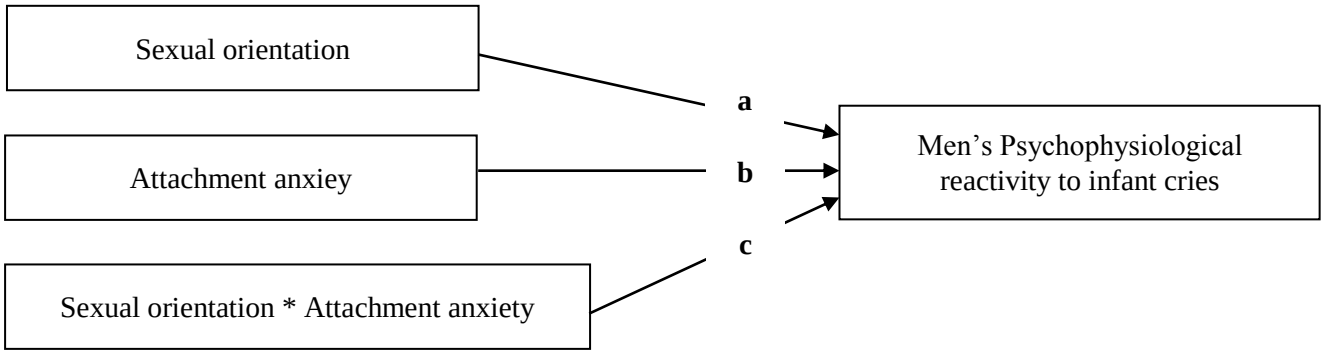

Figure 2- Moderation Model

Binary logistic regression reveled that attachment anxiety dimension provided the best model to predict Activated/Deactivated cluster face to infant cries but no significant interaction was found between attachment anxiety and sexual orientation (see table 4).

Table 4 – Binary logistic regression (outcome: psychophysiological cluster[1])

Variable	**Odds ratio**	**B**	**Wald test**	**d.f.**	***P***
1. In terms of goodness of fit, 55.8% were correctly classified.					
Attachment Anxiety dimension	0.97	-0.03	4.57	1	0.03
Sexual orientation	1.38	0.32	0.27	1	0.60

Variable	Odds ratio	B	Wald test	d.f.	*P*
2. In terms of goodness of fit, 69.2% were correctly classified: Anxiety attachment dimension was the best predictor of Activated psychophysiological cluster.					
Attachment Anxiety dimension	0.96	-0.04	4.05	1	0.04
Sexual orientation	0.34	-1.07	0.24	1	0.63
Attachment anxiety dimension * Sexual orientation	1.02	0.02	0.43	1	0.51

[1] 1 – Activated; 2 - Deactivated

4. DISCUSSION

In this work we applied caregiving system theory to understand the psychophysiological response of adult men. Specifically, we analyzed homosexual and heterosexual men psychophysiological reactivity (HR and RSA) to a video with non-distressed infant cries and how individual characteristics are related to men's responses. Most of previous studies focused on physiological reactivity to infant cries; however, we intended to know if there is a relation between non-father socio-demographic and psychological variables (sexual orientation, attachment anxiety or avoidance dimensions and anxiety state) and physiological reactivity. Studies reported that attachment patterns contribute significantly to emotional regulation (Mikulincer & Shaver, 2005) and physiological response (Diamond & Hicks, 2005) to infant cries (Riem et al., 2012). On the other hand, little is known about how sexual orientation affects psychophysiological reactivity. Studies reveal that gay men tend to use suppression as a strategy of emotional regulation (Simon, 2012), increasing physiological reactivity (Gross, 2002).

Globally, we obtained two different patterns of non-fathers psychophysiological response to infant cries and assessed that there is no association with sexual orientation. Also, results highlighted that there is a relation between clusters and attachment dimensions, with a significant correlation with attachment anxiety.

Our results revealed that we can identify two clusters of psychophysiological response to infant cry stimulus among non-fathers. Some non-fathers had an HR deceleration with an increase in RSA. Previous studies (Frodi and Lamb, 1978) found this pattern of psychophysiological reactivity and, although physiological findings remain ambiguous (Donovan & Leavitt, 1985), HR deceleration is generally interpreted as an attentive or orienting behavior (Wisenfeld & Klorman, 1978). In the case of non-fathers, once there is not a history of paternal care, the psychophysiological deactivation is not followed by an action-oriented HR acceleration (Furedy et al., 1989). However, infants' cries could also be interpreted as an aversive stimuli, in the way they become intolerable are activated behaviors as avoidance or aggression (Frodi, 1985), implying an improved cardiac deceleration in presence of threatening cues, reflexively enhancing orienting response.

On the other profile non-father presented HR acceleration with RSA withdrawal. The decrease in RSA values can be interpreted as an approach-oriented response (Porges, 1995). Furthermore, it could be linked to sympathetic system activation, which could also explain the HR acceleration found in this group (Berntson et al., 1994). Once these men are sympathetically activated by infant stimuli, physiological support of vagal withdrawal is required to regulate their arousal. This psychophysiological pattern of response to infant cry is substantially different from those potential abusers (Pruitt & Erickson, 1985).

Our findings on this group of men were not an "expected" profile for non-fathers. One might argue, according to the physiological data from highly sensitive parents (Joosen et al., 2012), that those men had higher attentional or "engagement" level necessary to respond appropriately to infant cries (Del Vecchio et al, 2009). However, these proposals need to be analyzed carefully, considering previous studies and the results of our study. Thereby, was not expected that participants have an action-oriented response once they had no paternal experience and, physiological reactivity to non-distressed infants' cries may appear as a result of an attempting to reduce self distress caused by the stimuli (Bell & Ainsworth, 1972) providing less responsive caregiving behaviors. Thus, men with a pattern of sympathetic activation to non-distressed infant cries could be those more irritable to this kind of stimuli and have not adequate cognitive strategies to reduce arousal experienced.

Crying is the principle way for infants express negative emotions and is an indicator of need for parental care that helps establish and maintain parent-child bond (Nelson, 1998; Chóliz, Fernández-Abascal & Martínez-Sánchez, 2012); thus, activating the attachment system (Nelson, 2005; Zeifman, 2001a; Zeifman, 2001b; Donovan & Leavitt, 1985) will

provoke different caregiving behaviors (Out et al., 2010). Attachment pattern affects psychophysiological responses to infant stimuli (infant distress and non-distress vocalizations) (Groh & Roisman, 2009; Groh, 2012), showing direct implications on emotional experiences. Also, shape the regulation of negative emotions (Diamond & Hicks, 2005) and influence neural, emotional and behavioral responses to infant cry (Riem et al, 2012). Diamond and Fagundes (2010) reinforce that anxiety and avoidance seem to be associated to heightened hypothalamic—pituitary—adrenocortical and autonomic nervous system reactivity to stress and that physiological reactivity is heightened among avoidant individuals. On the other hand, anxiety triggers an activation of autonomous nervous system leading individuals to perceive stressful situations as threatening or dangerous and react to such situations with more frequent and intense elevations of anxiety state (Spielberger & Sydeman, 1994). Attachment behaviors can also be perceived as self-protective strategies, used to protect from danger and isolation (McKinsey-Crittenden, 2000).

Beside we hypothesized gay men will reveal a distinct pattern of response to infant cries comparatively to heterosexual, our results showed there is no association between sexual orientation and psychophysiological clusters, being both distributed on Activated and Deactivated clusters. These results may be in line with caregiving studies that point homosexual and heterosexual men, as fathers, responding the same way to infant cues in virtue of living in a heterosexist society (Herek et al., 2009). However this is hypothetically and need to be study.

Our findings that Attachment Anxiety dimension provides the best predictor for Activated non-fathers are in line with previous research, showing that men sympathetically activated, as highly emotional reactive, evidence less effective behavioral coping strategies in response to stress and difficult in emotional regulation (Diamond & Hicks, 2005; Diamond & Fagundes, 2010). These may indicate that the way those men respond to infants' cries conveys some self emotional dysregulation leading to behave with the intention to interrupt self distress in order to suppress their needs and attain a satisfying sense of attachment security (Shaver & Mikulincer, 2007). Moreover, internal representations are significant once caregiving system is maintained and corrected by mental representations of parents and based on previous attachment experiences (George & Solomon, 2008; Figueiredo, 2013).

This study presents some limitations as the non-longitudinal design. Several studies about infants' cries report differences between parents and non-parents response (Out et al., 2010), so, future studies may investigate the psychophysiological clusters in men after being fathers

in order to evaluate possible differences before and after fatherhood and the quality of parenting. Another limitation is that results are exclusively based in men, although sex gender differences as been less consensual and generally not found (Groh & Roisman, 2009; Frodi & Lamb, 1980) future studies may include women. Also, sample has a small size compared to other studies with non-parents which led to a relatively low power for generalization among non-father men. In addition, although we didn't considered hormonal differences, in future studies this may be examined. Studies indicate that non-fathers with lower testosterone levels show higher sympathy and/or need to respond to infants' cries than fathers with higher testosterone levels (Fleming, Corter, Stallings, Steiner, 2002), suggesting important role of hormones in response to the infant cues.

In conclusion, our study highlighted the importance that individual characteristics have in psychophysiological response to infant crying. Also, reinforce the importance that attachment and caregiving system plays in responding to infant cry stimulus, emphasizing a high relation between physiological reactivity and men relational dimensions.

Future research should consider other psychological and relational variables in order to explore their interaction with sexual orientation and physiological reactivity.

5. REFERENCES

Andreassi, J. (2000). *Psychophysiology: Human Behavior & Physiological Response.* Fourth edition. Psychology Press.

Baron, R. & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 51(6). 1173-1182. http://dx.doi.org/10.1037/0022-3514.51.6.1173

Bell, S. & Ainsworth, M. (1972). Infant crying and maternal responsiveness. *Child Development*. 43(4). 1171-1190.

Berntson, G., Cacioppo, J., Quigley, K. & Fabro, V. (1994). Autonomic space and psychophysiological response. *Psychophysiology, 31*, 44-61. http://dx.doi.org/ 10.1111/j.1469-8986.1994.tb01024.x

Boukidys, Z. & Burgess, R. (1982). Adult Physiological Response to Infant Cries: Effects of Temperament of Infant, Parental Status, and Gender. *Child Development* 53(5). 1291-1298.

Boukydis, C. (1985). Perception of Infant Crying as an Interpersonal Event. In Lester, B. & Boukydis, C. (Eds). *Infant Crying* (pp. 187-215). New York: Springer. .

Brennan, K., Clark, C. & Shaver, P. (1998) Self-Report Measurement of Adult Attachment: An Integrative Overview. In Simpson, J & Rholes, W. (Eds). *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.

Brewster, A., Nelson, J., McCane, T., Lucas, D. & Milner, J. (1998). Gender differences in physiological reactivity to infant cries and smiles in military families. *Child Abuse & Neglect*, 22 (8). 775–788. http://dx.doi.org/10.1016/S0145-2134(98)00055-6

Cassidy, J. (2008). The Nature of the Child's Ties. In Cassidy, J. & Shaver, P. (Eds). *Handbook of Attachment: theory, research and clinical applications* (2nd ed., pp. 3-22). New York: Guilford Press.

Chóliz, M., Fernández-Abascal, E. & Martinez-Sánchez (2012). Infant Crying: Pattern of Wepping, Recognition of Emotion and Affective Reactions. In Observers. *The Spanish Journal of Psychology*. 15 (3). 978-988.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.*Routledge.

Crowe, H. & Zeskind, P. (1992). Psychophysiological and perceptual responses to infant cries varying in pitch: Comparison of adults with low and high scores on the child abuse potential inventory. *Child Abuse & Neglect* 16 (1).19–29. http://dx.doi.org/10.1016/0145-2134(92)90005-C

de Geus, E., Willemsen, G., Klaver, C. & van Doornen, L. (1995). Ambulatory measurement of respiratory sinus arrhythmia and respiration rate. *Biological Psychology*. 41(3). 205-227. http://dx.doi.org/10.1016/0301-0511(95)05137-6

Del Vecchio, T., Walter, A. & O'Leary, S. (2009). Affective and physiological factors predicting maternal response to infant crying. *Infant Behavior and Development*. 32(1). 117.122. http://dx.doi.org/10.1016/j.infbeh.2008.10.005

Diamond, L. & Fagundes, C. (2010). Psychobiological research on attachment. *Journal of Social and Personal Relationships.* 27(2). http://dx.doi.org/10.1177/0265407509360906

Diamond, L. & Hicks, A. (2005). Attachment style, current relationship security, and negative emotions: The mediation role of physiological regulation. *Journal of Social and Persnal Relationships*. 22 (4). 499-518. http://dx.doi.org/ 10.1177/0265407505054520

Diamond, L. (2003). What Does Sexual Orientation Orient? A Biobehavioral Model Distinguishing Romantic Love and Sexual Desire. *Psychological Review*. 110(1). 173-192. http://dx.doi.org/10.1037/0033-295X.110.1.173

Donovan, W. & Leavitt, L. (1985). Physiology and Behavior. Parent's Response to the Infant Cry. In Lester, B. & Boukydis, C. (Eds). *Infant Crying* (pp. 241-261). Springer-Verlag.

Figueiredo, B. (2013). *Mães e Pais. Envolvimento emocional com o bebé*. Braga: Psquilibrios Edições.

Fleming, A., Corter, C., Stallings, J. & Steiner, M. (2002). Testosterone and Prolactin Are Associated with Emotional Regulation to Infant Cries in New Fathers. *Hormones and Behavior*. 42(4). 399-413. http://dx.doi.org/10.1006/hbeh.2002.1840

Fraley, R. & Shaver, P. (2000). Adult Romantic Attachment: Theoretical Developments, Emerging Controversies and Unanswered Questions. *Review of General Psychology*. 4 (2). 132-154. http://dx.doi.org/10.1037//1089-2680.4.2.132

Frodi, A. & Lamb, M. (1978). Sex Differences in Responsiveness to Infants: A Developmental Study of Psychophysiological and Behavioral Responses. *Child Development* 49 (4). 1182-1188.

Frodi, A. & Lamb, M. (1980). Child Abusers' Responses to Infant Smiles and Cries. *Child Development* 51(1). 238-241.

Frodi, A. (1985). When Empathy Fails. Aversive Infant Crying and Child Abuse. In Lester, B. & Boukydis, C. (Eds). *Infant Crying* (pp. 263-277). New York: Springer. http://dx.doi.org/ 10.1007/978-1-4613-2381-5_12

Frodi, A., Lamb, M., Leavitt, L., Donovan, W., Neff, C. & Dennis, S. (1978). Fathers' and mothers' responses to the faces and cries of normal and premature infants. *Developmental Psychology*. 14(5). 490-498. http://dx.doi.org/10.1037/0012-1649.14.5.490

Furedy, J., Fleming, A., Ruble, D., Scher, H., Daly, J., Day, D. et al (1989). Sex differences in small-magnitude heart-rate responses to sexual and infant-related stimuli: a psychophysiological approach. *Physiology & Behavior*. 46(5). 903-905. http://dx.doi.org/10.1016/0031-9384(89)90056-5

George, C. & Solomon, J. (2008). The Caregiving System: A Behavioral Systems Approach to Parenting. In Cassidy, J. & Shaver, P. (Eds). *Handbook of Attachment: theory, research and clinical applications* (2nd ed., pp. 833-856). New York: Guilford Press.

Giardino, J., Gonzalez, A., Steiner, M & Fleming, A. (2008). Effects of motherhood on physiological and subjective response to infant cries in teenage mothers: A comparison with non-mothers and adult mothers. *Hormones and Behavior*. 53(1). 149-158. http://dx.doi.org/10.1016/j.yhbeh.2007.09.010

Gottman, J. & Levenson, R. (1988). The social psychophysiology of marriage. In Noller, F. & Fitzpatrick (Eds). *Perspectives on marital interaction*. England: Multilingual Matters Ltd.

Groh, A (2012). Electrophysiological, observed, and subjective emotional responses to infant vocalizations: the role of adult attachment. PhD Dissertation: University of Illinois at Urbana-Champaign.

Groh, A. & Roisman, G. (2009). Adults' autonomic and subjective emotional responses to infant vocalizations: The role of secure base script knowledge. *Developmental Psychology*. 45 (3). 889-893. http://dx.doi.org/10.1037/a0014943

Gross, J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology*. 39. 281-291. http://dx.doi.org/10.1017.S0048577201393198

Gustafson, G. & Harris, K. (1990). Women's Responses to Young Infants' Cries. *Developmental Psychology*. 26(1). 144-152. http://dx.doi.org/10.1037/0012-1649.26.1.144

Gustafson, G., Wood, R. & Green, J. (2000). Can we hear the causes of infants' crying. In Barr, R., Hopkins, B & Green, J. (Eds). *Crying as a Sign, a Symptom, and a Signal*. London: Mac Keith Press.

Hair, J., Anderson, R., Tatham, R. & Black, W. (1998). *Multivariate data analysis*.

Irwin, J. (2003). Parent and nonparent perception of the multimodal infant cry. *Infancy* 4 (4). 503-516. http://dx.doi.org/ 10.1207/S15327078IN0404_06

Joosen, K., Mesman, J., Bakermans-Kranenburg, M., Pieper, S., Zeskind, P. & van IJzendoorn, M. (2012). Physiological Reactivity to Infant Crying and Observed Maternal Sensitivity. *Infancy*. 18(3). 414-431. http://dx.doi.org/10.1111/j.1532-7078.2012.00122.x

Josephson, G. (2003). Using an Attachment-Based Intervention with Same-Sex Couples. In Johnson, S. & Whiffen, V.. *Attachment Processes in Couple and Family Therapy*. (pp. 300-317) New York: Guilford Press.

Kendall, P. (1978). Anxiety: States, Traits – Situations. *Journal of Consulting and Clinical Psychology*. 46(2). 280-287. http://dx.doi.org/10.1037/0022-006X.46.2.280

Kovar, M. (2011). Gender Differences of Multimodal Responses to Child and Non-Child Stressores. Master Thesis of Department of Psychology: University of North Florida.

Kreibig, S. (2010). Autonomic nervous system activity in emotion: A review. *Biological Psychology*. 84(3). 394-421. http://dx.doi.org/10.1016/j.biopsycho.2010.03.010

Lummaa, V., Vuorisalo, T., Bard, R. & Lehtonen, L. (1998). Why cry?: Adaptive significance of intensive crying in human infants. *Evolution and Human Behavior*, 19(3) 193–202. http://dx.doi.org/10.1016/S1090-5138(98)00014-2

Maroco, J. (2007). *Análise Estatística com utilização do SPSS*. 3ª ed. Lisboa: Edições Sílabo.

McKinsey-Crittenden, P. (2000). Introduction. In. McKinsey-Crittenden, P. & Claussen, A. (eds.). *The organization of attachment relationships*. (pp. 1-10). Cambridge: Cambridge University Press.

Mikulincer, M. & Shaver, P. (2005). Attachment theory and emotions in close relationships: Exploring the attachment-related dynamics of emotional reactions to relational events. *Personal Relationships*. 12. 149–168. http://dx.doi.org/ 10.1111/j.1350-4126.2005.00108.x

Mikulincer, M. (1998). Adult attachment style and individual differences in functional versus dysfunctional experiences of anger. *Journal of Personality and Social Psychology.* 74(2). http://dx.doi.org/10.1037/0022-3514.74.2.513

Murray, A. (1979). Infant crying as an elicitor of parental behavior: An examination of two models. *Psychological Bulletin*. 86(1). 191-215. http://dx.doi.org/10.1037/0033-2909.86.1.191

Murray, A. (1985). Aversiveness is in the Mind of the Beholder. Perception of Infant Crying by Adults. In Lester, B. & Boukydis, C. (Eds). *Infant Crying* (pp. 217-239). New York: Springer. http://dx.doi.org/10.1007/978-1-4613-2381-5_10

Mustanski, B., Chivers, M. & Bailey, J. (2002). A Critical Review of Recent Biological Research on Human Sexual Orientation. *Annual Review of Sex Research*. 13. 89-140.

Nelson, J. (1998). The Meaning of Crying Based on Attachment Theory. *Clinical Social Work Journal*. 26(1). 9-22. http://dx.doi.org/ 10.1023/A:1022841427355

Nelson, J. (2005). The Circle of Tears. Attachment, Loss, Crying, Caregiving, and Reattachment. In Nelson, J. (Ed*). Seeing Trough Tears: Crying and Attachment.* New York: Brunner-Routledge.

Norman, B. & McNeilly, M. (1991). Age, Gender, and Ethnicity as Variables in Psychophysiological Assessment: Sociodemographics in Context. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*. 3(3). 376-384. http://dx.doi.org/10.1037/1040-3590.3.3.376

Nunes-Costa, R., Figueiredo, B., & Moya-Albiol, L. (2013). Sexual orientation and male psychophysiological responses to infant stimuli. Simpósio Nacional de Investigação em Psicologia VIII, Aveiro, Portugal.

Out, D., Pieper, S., Bakermans-Kranenburg, M. & van IJzendoorn, M. (2010). Physiological reactivity to infant crying: a behavioral genetic study. *Genes, Brain and Behavior*. 9. 868-876. http://dx.doi.org/ 10.1111/j.1601-183X.2010.00624.x

Owings, D. & Zeifman, D. (2004). Human Infant Crying as an Animal Communication System: Insights from an Assessment/Management Approach. In Oller, D. & Griebel, U. (Eds). *Evolution of Communication Systems: A Comparative Approach* (pp 151-170). Cambridge: Massachusetts Institute of Technology.

Paiva, C. & Figueiredo, B. (2010). Versão portuguesa da escala "Experiences in Close Relationships" (ECR) [Experiences in Close Relationships Questionnaire (ECR) Portuguese version]. In Avaliação Psicológica (Vol. IV): Instrumentos validados para a população portuguesa (pp. 81 – 102). Porto: Almedina.

Pederson, F., Huffman, L., del Carmen, R. & Bryan, Y. (1996). Prenatal Maternal Reactivity to Infant Cries Predicts Postnatal Perceptions of Infant Temperament and Marriage Appraisal. *Child Development*. 67(5). 2541-1552. http://dx.doi.org/10.1111/j.1467-8624.1996.tb01873.x

Porges, S. (1995). Orienting in a defensive world: Mammalian modifications of our evolutionary heritage. A Polyvagal Theory. *Psychophysiology*. 32(4). 301-318. http://dx.doi.org/10.1111/j.1469-8986.1995.tb01213.x

Pruitt, D. & Erickson, M. (1985). The Child Abuse Potential Inventory: A study of concurrent validity. *Journal of Clinical Psychology*, 41, 104–111. http://dx.doi.org/10.1002/1097-4679(198501)41:1<104::AID-JCLP2270410119>3.0.CO;2-V

Reynolds, G. & Richards, J. (2008). Infant Heart Rate. A Developmental Psychophysiological Perspective. In Schmidt, L. & Segalowitz, S. (Eds) *Developmental Psychophysiology. Theory, Systems, and Methods*. New York: Cambridge University Press.

Ridge, S. & Feeney, J. (1998). Relationship History and Relationship Attitudes in Gay Males and Lesbians: Attachment Style and Gender Differences. *Australian & New Zealand Journal of Psychiatry*. 32(6). 848-859. http://dx.doi.org/10.3109/00048679809073875

Riem, M., Bakermans-Kranenburg, M., van IJzendoorn, M., Out, D. & Rombouts, S. (2012). Attachment in the brain: adult attachment representations predict amygdale and behavioral responses to infant crying. *Attachment & Human Development*. 14 (6). 533-551. http://dx.doi.org/10.1080/14616734.2012.727252

Robinson, M. & Brewster, M. (2013). Motivations for Fatherhood: Examining Internalized Heterosexism and Gender-Role Conflict With Childless Gay and Bisexual Men. *Psychology of Men & Masculinity*. Advance online publication. http://dx.doi.org/10.1037/a0031142

Sarafino, E. (2008). *Health Psychology: Biopsychosocial Interactions*. 6th edition. (pp.357-416). Wiley.

Shaver, P. & Mikulincer, M. (2007). Adult Attachment Strategies and the Regulation of Emotion. In Gross, J. (Ed.). *Handbook of emotion regulation* (pp. 446-466). New York: Guilford Press.

Silva, D. (2003). O inventário do estado-traço de ansiedade. In Gonçalves. M., Almeida, L., Machado, C. & Simões, M. (2006). *Avaliação Psicológica – Instrumentos Validados para a População Portuguesa (vol. 1)*. Coimbra: Quarteto Editora.

Simon, T. (2012). *Emotional Reactivity across the Gender and Identity Spectrum: Experience, Expression, & Physiology*. Doctoral dissertation: Georgetown University.

Spielberger, C. & Sydeman, S (1994). State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In Maruish, M. (Ed).*The Use of psychological tests for treatment planning and outcome assessment*. Hillsdale, NJ: Erlbaum.

Spielberger, C., Gorsuch, R., Lushene, R., Vagg, P. & Jacobs, G. (1983). *Manual for the State-Trait Anxiety Inventory:STAI (Form Y). Self-Evaluation Questionaire*. Palo Alto: Consulting Psychologists Press, Inc.

Stallings, J., Fleming, A., Corter, C., Worthman, C & Steiner, M. (2001). The Effects on Infant Cries and Odors on Sympathy, Cortisol, and Autonomic Responses in New Mothers and Nonpostpartum Women. *Parenting: Science and Practice*. 1(1-2). 71-100. http://dx.doi.org/ 10.1080/15295192.2001.9681212

Venuti, P., Caria, A., Esposito, G., De Pisapia, N., Bornstein, M. & de Falco, S. (2012). Differential brain responses to cries of infants with acoustic disorder and typical development: an fMRI study. *Research in Developmental Disabilities*. 33(6). 2255-2264. http://dx.doi.org/10.1016/j.ridd.2012.06.011

Vrijkotte, T., van Doornen, L & de Geus, E. (2004). Overcommintment to Work is Associated With Changes in Cardiac Sympathetic Regulation. *Psychosomatic Medicine. Journal of Behavioral Medicine.* 66(5). 656-663. http://dx.doi.org/10.1097/ 01.psy.0000138283.65547.78

Wiesenfeld, A. & Klorman, R. (1978). The mother's psychophysiological reactions to contrasting affective expressions by her own and an unfamiliar infant. *Developmental Psychology*. 14(3). 294-304. http://dx.doir.org/10.1037/0012-1649.14.3.294

Willemsen, G., de Geus, E., Klaver, C., van Doornen, L. & Carrofl, D. (1996). Ambulatory monitoring of the impedance cardiogram. *Psychophyiology*. 33(2). 184-193. http://dx.doi.org/10.1111/j.1469-8986.1996.tb02122.x

Wood, R. & Gustafson, G. (2001). Infant Crying and Adults' Antecipated Caregiving Responses: Acoustic and Contextual Influences. *Child Development* 72(5). 1287-1300. http://dx.doi.org/10.1111/1467-8624.00348

Zeifman, D. (2001a). Developmental Aspects of Crying: Infancy, Childhood, and Beyond. In. Vingerhoets, J. & Cornelius, R (Eds). *Adult Crying: A Biopsychosocial Approach*. (pp 37-53). Brunner-Routledge.

Zeifman, D. (2001b). An Ethological Analysis of Human Infant Crying: Answering Tinbergen's Four Questions. *Developmental Psychobiology.* 39(4). 265-285. http://dx.doi.org/ 10.1002/dev.1005

Zeskind, P (1987). Adult heart-rate responses to infant cry sounds. *British Journal of Developmental Psychology*. 5(1). 73-79. http://dx.doi.org/10.1111/j.2044-835X.1987.tb01043.x

Zeskind, P. & Lester, B. (1978). Acoustic Features and Auditory Perception of the Cries of Newborns with Prenatal and Perinatal Complications. *Child Development*. 49(3). 580-589.