

Child Maltreatment and Oxytocin as the Physiological Bases for Social Functioning and Stress Coping

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学位授与年度	令和4年度(2022年度)
学位授与番号	34506甲第122号
URL	http://id.nii.ac.jp/1260/00004566/

甲南大学 博士学位論文

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Physiological Bases for Social Functioning and Stress Coping

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2023年2月

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Chapter1: Introduction

Child Maltreatment, Social Functioning and Stress Coping

Child maltreatment, which includes abuse and neglect of children under the age of 18, has drawn increasing attention in Japanese society over the past two decades. The number of child maltreatment reports made to the Child Guidance Center, an organization responsible for child protection, quadrupled from approximately 57,000 cases in 2010 to over 200,000 in 2020 (Ministry of Health Labour and Welfare, 2021), and media coverage of children's deaths resulted from child maltreatment lead to heightened awareness of the Japanese public on this issue. While child maltreatment is known as one of the leading causes of children's death, long-term deleterious impact of experiencing harsh and/or disrupted parenting on various domains of psychological development of children, including impact on cognitive ability and mental health, has been well documented (Jenny & Isaac, 2006; Kessler et al., 1997; Nelson et al., 2007). In particular, social dysfunction has been frequently reported and addressed as one of the major sequelae of exposure to child maltreatment. In this study, I will explore the different ways in which maltreated children experience interpersonal problems and the mechanism by which they develop social dysfunction in relating to others and to the greater society.

Social Behavioral Problems

Social dysfunction among children and adolescents, such as social/interpersonal problems, are often manifested as aggressive behavior and difficulty getting along with others. Developing the ability to manage social interactions is critical for a successful transition into adulthood since social problems are related to psychological well-being as well as adaptation in various contexts including occupation, education, and family. Robust evidence that link behavioral problems and maltreatment experiences during childhood have been found (for systematic review, see Norman et al., 2012). Cicchetti and his colleagues

(Alink et al., 2012; Manly et al., 1994) used public records to identify children's maltreatment status and compared maltreated and non-maltreated groups of children in middle childhood, who attended a summer camp on the dimensions of psychological/behavioral functioning. After analyzing the data collected on children's social behaviors, the camp counselors' evaluation including observational coding and responses questionnaires, and children's peer nomination, they found that maltreated children exhibited more disruptive/aggressive behaviors (e.g., verbally abusiveness, hitting others, acting out against others, initiating a fight) compared to non-maltreated children.

Aggressive behaviors in maltreated children have been observed in early ages prior to their entering elementary school. Children who have undergone any of the four types of maltreatment—physical abuse, emotional abuse, sexual abuse, and neglect—from birth, based on public records, were found to have a 3-fold risk for aggressive behavior, such as bullying and physical aggressiveness at the age of five (Matheson et al., 2017). This result remained significant after ruling out of the effect of socioeconomic status of their family and parental psychiatric disorder. Similar results indicating associations between child maltreatment and variant aggressive characteristics, including getting into a serious fight and hurting others, were consistently reported by studies investigated across various types of child maltreatment (Bingenheimer et al., 2005; Dodge et al., 1995; Hussey et al., 2006; Weiss et al., 1992).

Social behavioral problems in some cases aggregated into delinquency and legal infraction. Adolescents who had been left alone and physically abused more than 10 times had a higher probability of having committed non-drug related crimes such as armed robbery, damaging property, and assault (Currie & Tekin, 2012). While this study relied on self-report, a similar association was also observed in the study by Widom (1989) which used public records. In this study, Widom followed a group of children with filed maltreatment records

and a matched control group without maltreatment history and compared their violent behaviors identified from official arrest records 10 to 20 years later. Compared to the control group, people who had been abused or neglected as children were found to have higher rates of arrests in their juvenile years (26 vs. 17%) and in adulthood (29 vs. 21%), higher numbers of arrests for violent offenses (11 vs. 8%), and had earlier age of first offense (16 vs. 17%) and had higher rates of repeated offense of more than four times (17 vs. 9%; Widom, 1989). These findings suggest that abused or neglected children were more likely to start committing crimes at a younger age and their offense continued into adulthood, leading to more frequent arrests by police in total. Also, the effect of the timing of child maltreatment on later violence and conduct issues has been reported. While child maltreatment experienced under the age of 12 increased the risks of a wide range of adult criminal activities indexed by police arrest, arrest conviction, offending frequency, incarceration status, conviction of violent offense or drug offense, maltreatment that was limited to the period of adolescence was not related to police arrest, violent offense and only predicted arrest conviction (Mersky et al., 2012). Earlier onset of maltreatment experiences seems to be related to more broad and grievous consequences.

Relational Issues

In addition to behavioral problems assessed by others' observations or behavioral outcomes in public records, people with child maltreatment history are aware that they struggle with interpersonal issues. Children in out-of-home care, who had been exposed to verbal aggression, were less likely to endorse their own social acceptance, such as feeling liked by other children or having many friends (Taussig & Culhane, 2010), indicating that they do recognize their own struggles with interpersonal relationships or that they possess poor social competencies as they continue to interact with others in maladaptive ways.

As children enter into adulthood, interpersonal problems are often manifested in

intimate relationships with their partners. Following a birth cohort of 267 pregnant women and their children, it was found that those who had been maltreated during childhood described their romantic relationships as less mutually concerned, intimate and loyal (Raby et al., 2019). Likewise, lower scores in marriage quality were correlated with emotional maltreatment histories among newly married couples (Perry et al., 2007). Even more damaging results related to relational problems, i.e., perpetration and victimization of relationship violence, were suggested to be possibly related to child maltreatment experiences based on self-reports of both male and female college students (Berzenski & Yates, 2010; Zurbriggen et al., 2010).

Maladaptive behaviors of maltreated people are not limited to aggression or violence. Overly sexualized behaviors are also indicated by the literature. Early initiation of sexual intercourse (Fergusson et al., 1997), higher number of sexual partners (Luster & Small, 1997), engaging in prostitution (Widom & Kuhns, 1996), are predicted by exposure to child sexual abuse and conceptualized as traumatic responses in those sexually abused as children (Finkelhor & Browne, 1985; Runtz, 1987). On the other hand, sexualized behaviors are also observed in people with other types of maltreatment (Merrick et al., 2008; Norman et al., 2012). The findings suggested that sexualized behaviors are not necessarily resulted from inappropriate sexual exposure per se, but from poor social and relational functioning which could be damaged by any type of maltreatment experiences.

Codependence is another type of maladaptive social behavior, defined as “a dysfunctional relationship pattern in which an individual is psychologically dependent on a person who has a pathological addiction (American Psychological Association, n.d.)” In such a relationship, people lose a clear sense of self and experience persistent relational imbalance (Bacon et al., 2020). Associations between child maltreatment and partner relationships characterized with codependent and unhealthy relational styles were observed in

college students (Paradis & Boucher, 2010; Reyome et al., 2010; Riggs, 2010). Unlike aggressive behaviors which commonly alienate others, sexualized behaviors and codependent relationships may be less obvious at first glance. Such behaviors could be misinterpreted and overlooked as “positive” social behaviors since it could be easily interpreted as signs of sociability and/or seeking intimate relationships with others. Nonetheless, in the long-run, maladaptive behaviors jeopardize healthy social functioning, leading to psychological distress, among individuals who had been maltreated in childhood.

Furthermore, the lack of positive social interactions, such as lower prosocial behaviors, withdrawal, being emotionally distant, fearful and anxious behaviors, and being non-assertive, are related to early life care (Alink et al., 2012; Davis & Petretic-Jackson, 2000; Dubowitz et al., 2002; Manly et al., 1994; Matheson et al., 2017; Noll & Grych, 2011; Paradis & Boucher, 2010). Thus, while maltreated people excessively seek attention and intimacy from others, they are also fearful of and avoid human interactions; this incongruence may account for their reports of social dissatisfaction and stress.

Impairment of Social Cognition

In the research on the link between child maltreatment and social dysfunction, social cognition has been identified to play a mediating role. Social cognition is “cognition in which people perceive, think about, interpret, categorize, and judge their own social behaviors and those of others (American Psychological Association, n.d.).” Pollak et al. (2000) examined if maltreated children have difficulty identifying and properly interpreting emotional cues exhibited by other children. Children hear 25 short vignettes in which the protagonist feels any of the following emotions: happiness, sadness, disgust, fear, and anger. They were then asked to identify which emotion the protagonist felt by choosing a photo with the closest facial expression. Compared to non-maltreated children, neglected children often showed greater difficulty in discriminating emotions based on the photos of facial expressions. On the

other hand, physically abused children tended to over-identify expression of anger at a much higher rate than the non-abused children. Greater sensitivity to angry faces was also reported in other studies (Pollak & Kistler, 2002; Pollak & Sinha, 2002).

Also, deviant social information processes were found to be related to physical abuse in children. Dodge, Bates, & Pettit (1990) presented vignettes to 5-year-old children and asked them to describe what happened in each vignette to assess their awareness of social cues. They were also asked to watch cartoon vignettes and explain the intentions behind people's behaviors in order to measure their attributional styles. Maltreated children paid less attention to social cues and tended to interpret people's behaviors as having a hostile intention (Dodge et al., 1990). Such deviant processes mediated the association between child maltreatment and aggression (Dodge et al., 1990; Dodge et al., 1995; Weiss et al., 1992).

The development of ability to presume others' emotions and internal states, called theory of mind (TOM), has been known to be arrested among maltreated children. Impaired ability to infer the other's state of mind, measured with using false belief tasks, was observed in maltreated children at ages 3 to 8 years old (Cicchetti et al., 2003). In addition to the cognitive TOM, which involves interpretation of thoughts, beliefs, and intentions of others, ability to infer emotional responses of others, i.e., affective TOM, was tested. Maltreated children in their middle childhood and adolescence showed lower performance on both types of TOM (Burack et al., 2006; Heleniak & McLaughlin, 2020). The damaging effect of maltreatment during childhood on their TOM ability was sustained into adulthood. In order to test the TOM ability in maltreated children, Germine, Dunn, McLaughlin, and Smoller (2015) used an on-line test called Reading Mind in the Eyes (Baron-Cohen et al., 2001), in which participants determine the mental state of the expressions presented with images of the eye regions of human faces. They found that childhood maltreatment, particularly physical abuse, was associated with poor TOM ability. Similar to deviant processing of social

information, experiences of harmful early life care undermine children's cognitive and affective ability to understand others' perspectives whose effects proceed into adulthood and impede the acquirement of adaptive social behaviors (Burack et al., 2006; Heleniak & McLaughlin, 2020).

Divergent Stress Coping

Stress coping mechanisms is suggested to be another pathway for understanding the relationship between early life care and later problems in social behavior. When confronting a stressful event, the hypothalamic-pituitary-adrenocortical (HPA) axis, which is a stress regulatory system in the human body, is stimulated and releases cortisol, a steroid hormone. This hormonal system is known to be differentially impacted depending on the quality of early life care. On the positive end, the buffering effect of receiving sensitive parental care on stress response of HPA axis has been reported in previous studies. For instance, toddlers' cortisol levels did not elevate in response to feeling afraid of an approaching person dressed as a clown, only if their parents helped them cope with the stimulus (Nachmias et al., 1996). Similarly, after being separated from their parents, infants' cortisol levels were maintained low if their baby sitter responded sensitively to the infants' needs (Gunnar et al., 1992).

The importance of sensitive parental care on stress coping was also indicated by studies showing differential hormonal production in children with poor early life care. Blunted cortisol output has been found in children under institutional or foster care (Bruce et al., 2009; Chernego et al., 2019) as well as sexually abused girls (De Bellis et al., 1994). On the other hand, higher baseline cortisol levels as well as elevated hormonal reactivity were found in maltreated children (Alink et al., 2012; Carrion et al., 2002; Fries et al., 2008; Gunnar et al., 2001; Heim et al., 2000). In accounting for this inconsistency in cortisol levels, the types of behavioral problems are suggested to be a contributing factor; it is conceptualized that externalizing problems suppresses cortisol levels in maltreated children

while internalizing problems elevates them (Tarullo & Gunnar, 2006).

The autonomic nervous system (ANS) is another type of stress regulating system which becomes activated in response to stress so that humans can manage stressful or threatening events (Young-Southward et al., 2020). Similar to the hormonal system, research has shown that a link exists between poor quality of early life care and vulnerability in the development of ANS. Children who had experienced various maltreatment, such as physical abuse, sexual abuse, and neglect, exhibited blunted ANS reactivity, characterized by slower heart rate, lower blood pressure, or reduced cardiac output, when facing a stressful situation (Carrey et al., 1995; Leitzke et al., 2015; McLaughlin et al., 2015; Pollak et al., 2005). In contrast, other studies found elevated ANS reactivity in children who had experienced child abuse or neglectful care (Heim et al., 2000; Koopman et al., 2004; Oosterman et al., 2010b; Ouellet-Morin et al., 2019). Parallel to the relationship between child maltreatment and HPA axis, the ways in which early life care quality impacted the development of ANS could vary according to the types of social behavior problems, i.e., aggression or social withdrawal, which maltreated people tend to present (Heleniak et al., 2016; McLaughlin et al., 2016).

The review of the research described above helped reveal a great deal of variance in abnormal social behaviors associated with child maltreatment and offers a more complex picture in the backdrop of the literature consistently pointing to social dysfunctions in people who have undergone maltreatment as children. It has been suggested that aggressive/disruptive behaviors, violent crimes, and sexualized behaviors signify active engagement with other through overriding other people's personal boundaries. Such behaviors may be the result of both conscious and unconscious motivations. It is also the case that people are sometimes aware that their relationships are problematic, which have manifested in their reports of 'not being liked by others,' 'unhappiness in their relationship,' and tendency of becoming codependent. Despite their conscious struggles, they choose to

remain in the relationships, which would appear that they are actively engaged in their relationships. On the other hand, the tendency to withdraw socially, such as becoming emotionally distant and exhibiting fearful behaviors, are also associated with unhealthy early life care. Social withdrawal denotes disengagement from interpersonal relationships. Although studies show that people who had been maltreated during their childhood may exhibit over-engagement and/or disengagement with others, it is not clear what determines which way an individual would go—in the direction of over-engagement or disengagement with others. Given the heterogeneity in maltreatment types used in the various studies, it can be hypothesized that each type of maltreatment may cause differential effects on social behaviors; For instance, physical abuse may lead to aggressive behaviors while emotional neglect accompanies social withdrawals. Also, idiosyncratic characteristics of each child, e.g. social cognitive ability and stress coping system, may influence how maltreatment impacts their social behavior. However, the problem was that the mechanisms—which take maltreatment types and individual characteristics of social cognition and/or stress coping into consideration and explain how opposite effects were derived in maltreated children—have not yet been investigated in a systematic way.

Interventions for Maltreated Children

To date, child protection by removing the child from their home and placing them in alternative care is one of the most commonly practiced interventions for child maltreatment. However, social dysfunction often continues even after removing the child from threatening and/or deprived family environments. Within the context of alternative care, care workers in residential care institutions and foster parents frequently struggle with the aggressive and challenging behaviors that maltreated children exhibit (Tomlinson et al., 2011). Simultaneously, the neglectful treatment of children has been one of the major concerns in residential care (Tomlinson et al., 2011). In daily care practices, care workers constantly face

situations in which they are required to weigh difficult decisions such as whether to pursue active engagement with the child or let children have their space, without theoretical models to guide them. Also, delinquency and legal infraction, which are more frequently committed by people with maltreatment history, incur further expenses to the cost of child protection and child welfare, by involving legal enforcement and/or judiciary systems (Currie & Tekin, 2012; Mersky et al., 2012). Social dysfunction as a sequela of child maltreatment is not only related to well-being and adaptation of victimized people, but can also be considered a serious social issue which has consequences for the broader society at large. Thus, in order to develop effective therapeutic interventions of maltreated children as well as to prevent later crimes, it is critical to continue investigating the ways in which child maltreatment effects social dysfunction.

As indicated by research on stress reactivity, physiological systems are a pathway which connects early life care and social functioning. Chronic exposure to stress can alter the HPA system which interferes with the development and activity of neurobiology involved in cognition and emotion, and consequently leads to social dysfunction (Lee & Hoaken, 2007). While stress responses are also influenced by other hormones, including arginine vasopressin, serotonin, oxytocin (Charmandari et al., 2005; Chrousos, 2009), early life experiences can be also related to activities of such systems (Cicchetti & Rogosch, 2012).

Child maltreatment is recognized as an accumulation of traumatic experiences and this perspective has led to the promotion of psychiatric/psychological interventions for children and adult survivors of childhood maltreatment. Neuro-physiological systems have been used in conceptualization of pharmacological research on treatment for PTSD symptoms which characterized exaggerated fear and stress responses. Serotonin reuptake inhibitors (SSRIs) has been approved and prescribed as the first-line pharmacological treatment of PTSD in the U.S (Stein et al., 2009). A number of research have been

investigating the effect of drugs which directly intervene with the HPA system (Yoon & Kim, 2019), oxytocin system (Flanagan & Mitchell, 2019) and other neurological receptors (Litz et al., 2012), and these was found to reduce PTSD symptoms, such as hypervigilance and avoidant behaviors. Physiological systems has been one of the primary targets of psychotherapy specifically designed to treat trauma. Such treatments include relaxation techniques, e.g., breathing techniques and muscle relaxation, to regulate the overly activated stress responses while working on affected cognitive and emotional processes such as distorted negative thoughts (Cohen et al., 2012; Foa, 2006). Since elevated stress coping systems induce fight-or-flight responses, which may cause significantly aggressive behaviors in or disengagement from social situations, understanding the impact of early life care on physiological mechanisms is crucial for mental health professionals helping people with child maltreatment history.

Among various hormones, oxytocin has been drawing increasing attention from scientists in the last few decades due to its association with social functioning and stress coping (Carter, 2014; Olf et al., 2013). Literature also points to the fact that the development of oxytocin system is also regulated by the quality of early life care (Gordon et al., 2011). As related to early life care encompassing various types of child maltreatment, social cognition, and stress coping, OT may possibly be a potential mediator or moderator that illuminates the link between child maltreatment and social dysfunction, which could modulate the direction of effects of various types of maltreatment on social behaviors, i.e., over-engagement vs disengagement. In other words, understanding the OT system may fill the gap in the literature on child maltreatment and social behavior, and may contribute to the development of therapeutic interventions specifically catered to maltreated children in alternative care. This will be particularly useful for mental health providers, so that inter-generational transmission of aggressive/maladaptive social behaviors (Dodge et al., 1990; Widom, 1989) could be

suppressed or stopped. Therefore, the current study aims to examine the effects of child maltreatment on the oxytocin system in more specified conditions to give greater clarity to the mechanism. First, I review the literature on the effect of child maltreatment and OT on social functioning and stress coping, in which the central focus is placed on the studies which have directly examined the association between child maltreatment and OT. Based on the gaps identified by the literature review, two empirical studies with a sample of adolescents who have been either living in a residential care institution or with their family in Japan are introduced. In order to test the influence of the specific experiences of child maltreatment on the child's OT system, it is necessary to have a validated assessment instrument available, which can simultaneously measure the severity of the maltreatment as well as the different types of maltreatment. Thus, in Empirical Study 1, the validity of the self-report instrument, the Japanese version of Childhood Trauma Questionnaire (CTQ-J), which can assess the different types and the severity of child maltreatment is tested. The participants' scores on CTQ-J are compared with their child welfare records. Then, Empirical Study 2 examined the association between five types of child maltreatment experiences, measured with CTQ-J, and the children's salivary OT levels. Empirical Study 2 may help understand how each type of child maltreatment distinctly influences the child's OT system which may account for the variability in social dysfunctions among people with maltreatment history.

Chapter 2: Literature Review

Child Maltreatment, Oxytocin, and the

Physiological Bases for Social Functioning and Stress Reactivity: A Literature Review

Child maltreatment impedes the psychological development of children and is well documented as a serious risk factor for the long-term psychiatric and physical illnesses (Edwards et al., 2003; Felitti et al., 1998; Norman et al., 2012). Maltreatment history has been associated with disruptive and aggressive behaviors (Alink et al., 2012; Paradis & Boucher, 2010). Also, higher exposure to childhood maltreatment was associated with lower ability to presume others' emotions or internal states (Germine et al., 2015; Heleniak & McLaughlin, 2019), and consequently those who had been maltreated frequently fail to build good relationships with others and experience more stress in interacting with them (Alink et al., 2012; Hager & Runtz, 2012; Hyman et al., 2007; Meinschmidt & Heim, 2007). Their higher stress levels have been linked to hormonal activities (De Bellis et al., 1994; Heim et al., 2000) and autonomic nervous system (Oosterman et al., 2010a).

One of the complicated aspects of maltreatment is that interpersonal problems, which develops over years, are not only manifested as aggression, but also as subtle dysfunctional behaviors such as codependency and sexualized behaviors, which may be misinterpreted as intimacy-seeking behaviors and thus could be overlooked as 'positive' characteristics (Merrick et al., 2008; Reyome et al., 2010; Senn & Carey, 2010). Thus, identifying the underlying mechanism of impaired social functioning and coping with interpersonal stress is crucial in treating people with maltreatment history.

Oxytocin (OT) can play a critical role in social functioning and stress coping among people with maltreatment history. OT has been originally known for its function in the process of lactation and uterine contraction (Ludwig, 1998). During the last several decades, OT has increasingly drawn public attention as a "love hormone," due to its highlighted effect

on human affiliation. Particularly, the link between parent-child affiliation and the development of OT system in children has been suggested (Gordon et al., 2011). OT's function is not limited to social behaviors; its significant involvement in stress coping and mental disorders has been also documented (Carter, 2014; Olf, 2012). Thus, the OT system may explain these three dysfunctions in social behaviors, stress coping, and mental health in people with maltreatment history, by laying down the physiological mechanism.

Based on these research findings, child maltreatment, OT system and social functioning are suggested to be inter-related in a triangular way, with possibly OT mediating between the maltreatment and social functioning. Similarly, the OT system and stress reactivity, too, can be considered to be in a triangular relationship where OT may mediate between stress reactivity and child maltreatment.

The purpose of this review is 1) to investigate the effects of OT and child maltreatment on social functioning, 2) to describe the inter-connectedness among OT, child maltreatment and stress reactivity, and 3) to identify the effects of child maltreatment on OT systems which are underlying mechanism of social functioning and stress reactivity. Due to the limited number of empirical studies examining relationships between OT concentrations and child maltreatment experiences to date, instead of conducting a meta-analysis, issues pertaining to methodologies were analyzed to explore potential factors contributing to some of the mixed findings between OT and child maltreatment. To this end, this review is presented in three parts. In the first part, I will review studies that have investigated the link between OT system, social functioning, and child maltreatment. In the second part, I will review the research that explored the link between OT system, stress reactivity, and child maltreatment. In the third and final section, I will review the studies that look directly at the link between child maltreatment and OT concentrations, since this association may be central to uncovering the underlying mechanism of the social functioning and stress reactivity. In this

third section, particular emphasis will be placed on divergent methodological issues. Thus, this review discusses the basic elements of OT's role in the link between child maltreatment and dysfunctions and how this understanding will be of use for mental health providers who share an interest in the OT system from a clinical perspective.

Child Maltreatment, OT and Social Functioning

OT and Social Functioning

Since maltreatment impacts both social functioning and OT system, it is important to consider how child maltreatment, social functioning and OT system are inter-related. Extended research indicates that OT system modulates the process of social functioning including social cognition and social behaviors in humans. Social cognition is the cognitive capacity to take another person's psychological perspective as well as the emotional ability to experience another's affective processes (Frith & Singer, 2008; Shamay-Tsoory, 2011). For instance, higher empathy was reported by people with higher OT levels (Barraza & Zak, 2009). Also, increased OT levels, by applying nasal spray of OT, elicited higher ability to understand others' emotions, (Baron-Cohen et al., 2001; Bartz et al., 2010; Domes, Heinrichs, Michel, et al., 2007) as well as social behaviors, such as cooperation (Declerck et al., 2010; Kosfeld et al., 2005; Zak et al., 2005) and generosity (Barraza & Zak, 2009). OT is considered to increase trust in people (Zak et al., 2005).

OT and Maltreatment Interaction

Although exogenous OT administration appeared to increase trust and prosocial behaviors in general, it did not always have the same positive effect. Parental care during early life was found to modify how OT administration increased the amount of donations; an interactional effect of early childcare and OT on social behavior was found. OT increased prosocial behavior (i.e., donations) only in people who scored low on parents' love withdrawal that is an insensitive parenting strategy of withholding affection when a child

misbehaves (e.g., parent not talking to the child when feeling displeased with the child). For those with high love withdrawal, no effect of OT administration on donation was observed (Van Ijzendoorn et al., 2011). Individual differences such as early life experiences may play a role in its social functioning.

Moreover, parenting quality also serves to moderate the association between OT and interpersonal relationships in parent-child dyads. Administering OT to the father increased the infant's gaze towards their father during the experiment which simulated "parental deprivation,"¹ only in the dyads with higher synchronized gaze between the father and the infant. (Weisman et al., 2013). Affectionate interactions such as physical proximity, affectionate touch, and social gaze among the mother, father and infant, were predicted by parental OT levels (Gordon et al., 2010). A link from parent-child relationship during childhood to relationship quality with partner and children in young adulthood via OT levels was suggested (Feldman et al., 2011; Gordon et al., 2008). The up-regulation cycle of the effect of endogenous OT and social engagement between parents and infant, i.e., the process where social engagement increased in response to the stimulus of elevated OT level, might have been set off by both mothers' and fathers' OT levels. Consequently, the up-regulation of OT could lead to more sensitive parenting and continue to influence infant's behaviors and his or her underlying OT system.

Gene and Maltreatment Interaction

Genotypes of oxytocin receptors (OXTR) are closely related to the function of OT system. OXTRs are found in the brain (Toepfer et al., 2017) and inner organs including mammary glands (Kimura & Ivell, 1999), uterus (Kimura et al., 1992), cardiovascular system (Gutkowska et al., 1997), and kidney (Schmidt et al., 1990) and OT is delivered to those organs through blood stream. Currently, two OXTR gene single nucleotide polymorphisms, rs2254298 and rs53576, have been studied for their association with social functioning. Each

genotype of OXTR consists of two alleles (i.e., adenine (A) and guanine (G)) and the combinations of these two alleles derive three genotypes: AA, AG, and GG (Bakermans-Kranenburg & van IJzendoorn, 2014).

While GG genotype were associated with sensitivity to others' affect, compared with A allele (Bakermans-Kranenburg & van IJzendoorn, 2008; Riem et al., 2011), child maltreatment experiences derive differential effects on social and relational functioning. In the GG genotype, people with higher childhood emotional abuse had more supportive relationship with their partner in midlife, whereas higher emotional abuse report was related to less report of supportive relationship compared in the AA genotype (Ebbert et al., 2019). Also, for GG carriers, childhood maltreatment was related to less perceived social support and more internalizing symptoms (Hostinar et al., 2014) and more emotional dysregulation and a disorganized attachment style (Bradley et al., 2011). The interaction between OXTR genotype and maltreatment experiences seems to play a role in social/relational functioning.

Child Maltreatment, OT and Stress Reactivity

OT and Stress Reactivity

In humans, increased OT levels are also linked to social/interpersonal stress. Higher OT levels were associated with higher reports of attachment/relationship anxiety (Feldman et al., 2011; Hoge et al., 2008; Marazziti et al., 2006; Taylor et al., 2010), Social Anxiety Disorder (Hoge et al., 2008), and distress in pair-bond relationships (Taylor et al., 2010). When released in response to social stress, OT suppressed the reactivity of hypothalamic-pituitary-adrenal (HPA) axis (Meinlschmidt & Heim, 2007) as well as cardiovascular reactivity (Kubzansky et al., 2012).

Stress Reactivity and Parental Care

The buffering effect of OT on stress reactivity appears not to be constant and to be affected by early life experiences. When early parental separation was reported, the reduction

of cortisol after OT administration was smaller, compared with those without such experiences (Meinlschmidt & Heim, 2007). The stress reactivity of maltreated participants remained elevated, which was indexed with blunted hormonal reactivity and deactivation in the limbic system, contrary to attenuated hormonal reactivity and limbic deactivation in healthy subjects (Grimm et al., 2014). The history of child maltreatment seems to play a key role in determining the direction of the OT spray effect, i.e., whether it enhances or reduces the physiological responses to social stress.

Mental Health and OT

Lower OT levels have been found to be associated with various psychiatric disorders, which interferes with emotional regulation and social functioning, including depression (Garcia et al., 2011), schizophrenia (Rubin et al., 2010), post-traumatic stress disorder (PTSD; Reijnen et al., 2017) and suicide (Jokinen et al., 2012).

Promising findings of OT administration studies on psychiatric treatment have been reported. Feifel et al. (2010) found that OT reduced positive and negative symptoms of schizophrenia. Similarly, reduction of PTSD symptoms (van Zuiden et al., 2017; Yatzkar & Klein, 2010), decreased physiological reactivity to trauma-related stimuli (Pitman et al., 1993) have been reported. Since problems with the process of fear extinction are prevalent among PTSD patients (Milad et al., 2008), the OT spray may help attenuate exaggerated fear responses which impedes fear extinction (Koch et al., 2014).

These findings suggest psychiatric disorders involving impairment with social cognition and disrupted interpersonal relationships have been connected with dysregulation of the OT system. There, higher OT levels caused by OT spray may contribute to alleviating patients' suffering by reducing their fear leading to improving their symptoms. However, these studies failed to examine the effect of child maltreatment experiences. As indicated in the section of social behavior and stress reactivity, early life experiences appear to influence the effect of

OXTR genes or the effect of OT concentrations. Particularly, elevated stress reactivity after OT administration warrants careful investigation on the interaction between OT system and child maltreatment history in terms of OT application to mental health treatment. Hence, future studies need to analyze differential effects of OT administration on psychiatric symptoms according to the participants' child maltreatment history.

Maltreatment and OT Concentrations

In understanding the dysfunctions in people who have experienced child maltreatment, it is important to elucidate how child maltreatment influences OT release in humans.

Concentrations of OT in various bodily fluids, i.e., plasma, saliva, urine and cerebrospinal fluid, have been measured as an index of OT release in the brain and the values were examined to be related to the presence of child maltreatment experiences in 10 studies (Table 1).

Table 1 Studies that have examined the association between child maltreatment experiences and oxytocin concentrations

Correlation	Authors	Year	Sample size	Sample age (years)	Sex	Maltreatment type	Maltreatment severity	Maltreatment assessment	Maltreatment variable	OT sample
-	Heim, Young, Newport, et al.	2009	total = 22	$M = 31.3$ $SD = 7.8$	F	EA, PA, EN, any, n of types	moderate-severe	CTQ	dichotomous	CSF
-	Opacka-Juffry & Mohiyeddini	2012	total = 98	$M = 27.7$ $SD = 7.9$	M	EA, PA, EN, PN	N/A	ELSI	continuous	plasma
-	Wisner Fries, Ziegler, Kurian, et al.	2005	CM = 18 CO = 21	$M = 53.7^*$ $M = 54.2^*$ N/A	12 F 12 F	neglect	N/A	adoption records	dichotomous	urine
-	Suzuki, Fujisawa, Sakakibara, et al.	2020	CM = 21 TD = 29	$M = 5.5$ $SD = 0.4$ $M = 4.8$ $SD = 0.3$	11 M 12 M	any	N/A	CPS records, ACE	dichotomous	saliva
-	Bertsch, Schmidinger, Neumann, et al.	2013	total = 74 (BPD = 34, CO = 40)	$M = 24.4$ $SD = 4.7$	F	EA, PA, SA, EN, PN, any	N/A	CTQ	continuous	plasma
-	Muller, Bertsch, Bulau, et al.	2019	total = 121	$M = 23.38$ $SD = 4.4$	61 F 60 M	EN	N/A	CTQ	continuous	plasma
+	Bhandari, Bakermans-Kraneburg, van der Veen, et al.	2014	total = 102	$M = 19.86$ $SD = 1.42$	F	EA+EN	N/A	CTQ	continuous	saliva
+	Mizuki & Fujiwara	2015	total = 81	$M = 36.2$ $SD = 3.4$	50 F 31 M	EA, PA, SA, EN, PN, n of types	low-moderate	CTQ	dichotomous	urine
+	Seltzer, Ziegler, Connolly, et al.	2014	CM = 37 CO = 36	$M = 9.0$ $SD = 1.2$ $M = 9.4$ $SD = 1.2$	21 F 18 F	any	N/A	CPS records, CTS	dichotomous	urine
+	Mizushima, Fujisawa, Takiguchi, et al.	2015	CM (unsettled) = 15 CM (settled) = 23 = 26	$M = 13.1$ $SD = 2.1$ $M = 12.2$ $SD = 2.9$ $SD = 2.2$	9 F 10 F 14 F	any	N/A	CPS records, ACE	dichotomous	saliva

Note. + : Positive association, - : Negative association, OT: Oxytocin, CM: Child Maltreatment, CO: Control, TD: Typical Development, BPD: Borderline Personality Disorder, F: Female, M: Male, CTQ: Childhood Trauma Questionnaire, ELSI: Early Live Stress Inventory, CPS: Child Protective Services, CTS: Parent-Child Conflict Tactics Scale, EA: Emotional abuse, PA: Physical abuse, SA: Sexual abuse, EN: Emotional neglect, PN: Physical neglect, Any: Any maltreatment, CSF: Cerebrospinal fluid, *in months.

Negative associations between OT concentrations and experiences of child maltreatment were found in six studies (Bertsch et al., 2013; Heim et al., 2009; Müller et al., 2019; Opacka-Juffry & Mohiyeddini, 2012; Suzuki et al., 2020; Wismer Fries et al., 2005). OT concentrations of those with higher report of child maltreatment experiences were lower in these studies. The suppressing effect of child maltreatment on OT suggests that people tend to reduce the release of OT in the brain when they have been repeatedly exposed to maltreatment during early life.

In contrast, opposite results regarding the associations between OT concentrations and maltreatment have also been reported. In four studies, people who have a history of child maltreatment exhibited higher OT concentrations (Bhandari et al., 2014; Mizuki & Fujiwara, 2015; Mizushima et al., 2015; Seltzer et al., 2014). The positive associations indicate that being maltreated during childhood is likely to incite the release of OT.

Furthermore, it was found that the relationship between child maltreatment and social cognition (i.e., higher positive ratings of infant faces) was moderated by OT (Bhandari et al., 2014). This implies the development of up-regulation of OT or an increased OT response to social stress, indicating a contrary effect of child maltreatment to previous findings.

These inconsistent findings suggest the need for further research to explore the complex factors behind these varying results. It is especially critical to elucidate the mechanism in which maltreatment experiences have resulted in the opposite directions of associations with OT. Reviewing the methodologies employed in the above-mentioned studies may a starting point to build valid evidence for the effect of child maltreatment on the development of the OT system. Thus, the various methodologies will be evaluated from three perspectives: maltreatment type, levels of severity, and accumulated effects.

Effects of Maltreatment Types on OT

The operational definition of child maltreatment is critical when we compare and interpret findings from multiple studies. Child maltreatment is defined as an act or a failure to act by a parent or other adult legally responsible for the care of a child under 18 years of age, resulting in imminent or potential harm to a child including death, serious physical and emotional damage, sexual abuse or exploitation (World Health Organization, 2014). Based on this somewhat broad definition, a number of specific behaviors have been identified as types of child maltreatment, including physical abuse, psychological abuse, sexual abuse, physical neglect, emotional neglect, and educational neglect (Herrenkohl, 2005). While some studies operationalize maltreatment based on the presence of any child maltreatment included above, others have utilized definitions that include exposure to different types of abuse, and/or maltreatment history. In fact, the type and definition of maltreatment adopted in each study seemed rather arbitrary and heterogeneous.

Self-report measures are one way of assessing people's maltreatment experiences during childhood. In the study of Heim et al. (2009), a self-report measure Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) which taps into exposure to five maltreatment types (i.e., emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect) to assess child maltreatment history in 22 healthy women aged 18-45. The presence of any one of the five types was employed for the comparison between maltreated and non-maltreated groups and they found lower OT in the maltreated group. When comparing the presence or absence of each maltreatment type, significant negative associations were found between OT and emotional abuse, physical abuse, and emotional neglect respectively. Bertsch et al. (2013) and Müller et al. (2019) also used CTQ for maltreatment assessment. Bertsch et al. (2013) found particularly higher negative correlations with OT for emotional neglect and emotional abuse among 74 women, aged 18-36 years, with and without borderline personality disorder. In this study, OT was also found to mediate the association

between child maltreatment, which was measured by CTQ total score, and the symptoms of borderline personality disorder. Müller et al. (2019) focused on emotional neglect in a population-based adult sample, aged 18-41 years, and found that higher score of emotional neglect was related to lower plasma OT, after ruling out of the effects of other maltreatment types. Another self-report measure, Early Life Stress Inventory (ELSI) with 30 items, to which 90 male participants between the age of 18 and 45 years responded with yes (= 1) or no (= 0), was used to assess stressful/traumatic experiences during childhood in the study of Opacka-Juffry and Mohiyeddini (2012). The scale inquired a broader range of stressful/traumatic experiences, such as victimization in crime, loss of significant people, and changes of school, in addition to experiences of child abuse and neglect. The ELSI score was negatively correlated with OT.

Court records and records of child welfare system were used as endorsement of child maltreatment history in other studies. Wismer Fries et al. (2005) defined the membership of 18 child participants with a mean age of 53.7 months to a maltreated group based on their history of being raised in neglectful institutions abroad during early childhood and living with their adoptive families at the time of the study. The exposure to various maltreatment types, such as physical and emotional abuse, remained unknown. In the study of Suzuki et al. (2020), the participants' exposures to four types of child maltreatment (i.e., physical abuse: 19%, emotional abuse: 48%, sexual abuse: 0% and neglect: 76%) in 21 maltreated and 29 control children were assessed with the Adverse Childhood Experience (ACE) questionnaire (Felitti et al., 1998). However, the association of each type with OT was not analyzed since OT was compared between maltreated and non-maltreated group.

Thus, it is clear that the definitions of child maltreatment in these studies varied, even among the studies which used the same CTQ measure. In terms of the ELS inventory, since experiences other than child abuse and neglect were included in the scale, lower OT may not

be attributed to child maltreatment, but to other uncontrollable stressful events such as long-term illness or changes in schools. Nonetheless, they showed congruent results of a negative association between child maltreatment and OT.

Several studies, however, have concluded opposite results where a positive association was found between child maltreatment and OT. In two studies that used the CTQ, Bhandari et al. (2014) created a composite of emotional maltreatment by combining scores of emotional abuse and emotional neglect and found a positive association with OT. Mizuki and Fujiwara (2015) found that only physical abuse was positively associated with urinary OT. These two studies were consistent, showing a positive relationship between child maltreatment with OT even though the types of maltreatment analyzed were different. Two other studies relied on the records of public services for maltreatment assessment and resulted in positive association with OT. Seltzer et al. (2014) defined physical abuse as maltreatment while Mizushima et al. (2015) categorized maltreated children according to the relevant records and did not specify the types of maltreatment children had experienced.

Findings by Bhandari et al. (2014) that investigated a sample of 102 healthy female college students were contradictory to the other studies using emotional maltreatment as described above. On the other hand, physical abuse was positively associated in two studies, one by Mizuki & Fujiwara (2015) with a community sample of 81 adults with a mean age of 36.2 who were raising children at the time, and the other by Seltzer and colleagues (2014) whose sample included 73 children, aged 8-11.5 years, with or without physical abuse history; people experienced physical abuse during childhood tended to have higher OT. The finding of a positive relationship in the study of Mizushima et al. (2015) with 79 preadolescent and adolescent children, could also reflect the effect of physical abuse, although the distributions of specific maltreatment types were assessed, but not reported.

These results implied that the effect of maltreatment might differ depending on what types of maltreatment were experienced by the child.

Heterogeneity in operational definitions of child maltreatment may be inevitable as the life experiences of each sample vary from study to study while any one of the above behaviors could be regarded as child maltreatment. Therefore, inconsistent findings regarding the effect of child maltreatment on OT might be in part attributed to the heterogeneity in the assessment of types of childhood maltreatment. So, it becomes all the more crucial that researchers continue to investigate how each type of maltreatment influence OT levels by being more conscious and deliberate about which operational definition they are adopting.

Assessment of Maltreatment Severity

In addition to identifying the different types of maltreatment, different levels of severity in maltreatment have also been identified and included in OT research. Some of the above-mentioned studies that used the CTQ, included the severity of maltreatment experiences of their participants in the analysis. CTQ identifies cutoff scores for each of the five maltreatment types, and experiences of these maltreatment types can be categorized into “none,” “low,” “moderate,” or “severe” (Bernstein & Fink, 1998). For instance, Heim et al. (2009) used the cutoff scores for emotional abuse (>12), physical abuse (>9), sexual abuse (>7), emotional neglect (>14), and physical neglect (>9). Scores higher than these cutoffs were categorized as moderate-severe level exposure to respective maltreatment type which was defined as the presence of maltreatment. In other words, participants who scored below the cutoff points above were classified into the non-maltreated group regardless of their endorsement of some maltreatment experiences. Also, in the study of Bertsch et al. (2013) correlational analysis between OT and the scores of each maltreatment type indicated that OT levels were negatively correlated correspondingly to the severity of the respective type. Most of the participants with borderline personality disorder had experienced moderate to severe

maltreatment, based on the distributions of the scores of each type. Also, in the study of Müller et al. (2019), despite none or low-level emotional neglect reported by the majority of the participants based on the score distribution, the higher score of emotional maltreatment was associated with lower OT concentrations. This means that even within the less severe range, as severity of emotional maltreatment increased, OT levels decreased. Although the cutoff scores were not used in these studies, the effect of severity of different types supported the results of Heim et al. (2009).

Based on these studies with CTQ, when severity levels of maltreatment were greater, which considered to be in the moderate to severe category, OT levels were more suppressed (Bertsch et al., 2013; Heim et al., 2009; Müller et al., 2019). Suppressed OT levels were negatively associated with exposure to stressful/adverse experiences measure with ESLI or ACE questionnaire (Opacka-Juffry & Mohiyeddini, 2012; Suzuki et al., 2020). However, neither ESLI nor ACE questionnaire probed into the frequency or degree of these experiences in terms of severity. The studies of Opacka-Juffry and Mohiyeddini (2012) and Suzuki et al. (2020) could be considered to be aligned with this conceptualization, if most of the stressful/adverse events which the participants had endorsed on the ELSI or ACE questionnaire fell into moderate-severe levels. On the other hand, low severity levels of maltreatment were reported by the majority of participants in the study of Müller et al. (2019). Since Muller's findings also indicated a negative association with OT, the possibility that higher severity could account for the suppressed OT concentrations was not supported.

Conversely, less severe maltreatment was positively associated with OT in two studies. In a study by Bhandari et al. (2014), almost all participants experienced none to moderate emotional maltreatment. Positive correlation results indicated that the more severe emotional maltreatment the participants experienced, the higher the salivary OT concentrations were. Mizuki and Fujiwara (2015) used CTQ and included five maltreatment types at low and

moderate level in analysis, using the cutoff score. Less severe physical abuse was positively associated with urinary OT. A dose-response relation was also found between the number of less severe maltreatment types and OT, showing a consistent incremental effect of less severe form of maltreatment, on OT concentrations.

Other studies (see Mizushima et al., 2015; Seltzer et al., 2014; Wismer Fries et al., 2005) used history of placement in orphanage, court and CPS records as the criterion for child maltreatment. For the record regarding the history in an orphanage, the severity of maltreatment, particularly physical and emotional neglect, was assumed to be fairly significant, based on the description of institutional care abroad (Human Rights Watch, 1998). Such severe neglect could explain the result of lower OT levels. Similarly, given the difficulty in investigating and substantiating child maltreatment, the cases substantiated by CPS were usually accepted as maltreatment with greater severity (Cicchetti & Barnett, 1991). Nevertheless, the efforts invested into substantiating each case may vary depending on factors other than the nature of the maltreatment, but practical factors such as the caseload of the case worker in charge (Cicchetti & Barnett, 1991). Thus, based on the lack of consistent measurement of maltreatment severity regardless of assessment methods such as self-report or use of existing records, as well as the contradictory link between child maltreatment and OT, it is critical that the severity of each maltreatment type be assessed with valid instruments in future studies, which would allow the comparison of findings across various studies that will allow researcher to understand the complex nature of OT and maltreatment.

Accumulated Effect of Multiple Types of Child Maltreatment

Co-occurrence of multiple types of maltreatment is commonly observed in research on early life experiences, and extant research documented that the accumulation of different types of maltreatment have long-term impact on human health, including serious medical illnesses and mental disorders (Felitti et al., 1998; Finkelhor et al., 2011; Richmond et al.,

2009). With regard to the measurement of severity of maltreatment, some studies did explore the cumulative effect of different types of maltreatment on OT concentrations.

Several studies examined the association between the total number of maltreatment types and OT concentrations. Heim et al. (2009) created a composite variable (i.e., 0, 1, 2, and 3 or more types) based on the number of moderate-severe maltreatment which the participants reported on CTQ. OT concentrations were compared among the groups defined by this composite. As the total number of types increased from 0 to 2, and to 3 or more, OT levels significantly declined. A cumulative suppressing effect of stressful life events on OT was also found in Opacka-Juffry and Mohiyeddini (2012); as the number of types of stressful experiences increased, OT levels decreased. The opposite direction of the effect of accumulated maltreatment types was reported. Mizuki and Fujiwara (2015) created a composite in which the count of types of less severe maltreatment was grouped into 0, 1, 2, and 3 or more. An incremental trend was found; as the count increased from 0 to 3 or more, OT levels also increased.

The findings suggest that when children are victimized with different types of maltreatment, the development of OT system may be immensely disrupted. However, contradictory associations between the number of maltreatment types and OT concentrations revealed in these studies suggest necessity of further investigations on the accumulative effects of different types of maltreatment, which integrates other dimensions such as the levels of maltreatment severity.

Conclusion

This paper reviewed studies that investigated the interactional effects of OT and child maltreatment on social functioning and stress reactivity. Also, the studies investigated the association between OT and child maltreatment were analyzed. Particularly, the operational definitions of child maltreatment in these studies have also been explored to identify

inconsistency in maltreatment type, severity and accumulated effect employed in their analysis. Then, numerous studies from non-clinical empirical investigations to clinical treatments for psychiatric disorders have been presented, expanding our understanding of the role OT plays in various contexts where social behavior and stress reactivity arise.

Social functioning, i.e., social cognition and social behavior, has been proven to be related to higher OT levels. Improvement in empathic understanding and cooperative behaviors following OT administration provides further support for the effect of OT on prosocial functioning. The formation of long-lasting affiliations, encompassing emotional interaction, social cognition, empathy, trust, and cooperation, starts even before birth. Taking an evolutionary perspective, social bonding is likely to be programmed in human genes through natural selection which maximized the survival of in-group members. In this process, OT plays a critical role in physiology and contributes to parent-child social interactions by facilitating sensitive and affectionate parenting.

Research on polymorphism of OXTR suggests a genetic effect on psychological functioning, which also interacts with early life experiences. While OT suppresses reactivity to social stress by modulating hormonal, i.e., HPA axis, and autonomic nervous system, alleviation of stress reactivity interacts with early life experiences; OT may exert opposite effects on stress reactivity depending on whether people have undergone child maltreatment during early life. Hence, OT seems to be involved in the human processes of social affiliation, by interfering with various neural and hormonal systems, such as HPA axis and autonomic nervous system. The regulation of those physiological systems is considered to modulate social functioning and reactivity to social stresses in humans.

Parenting practices during early childhood continues to impact us even in our adulthood, demonstrated by the link between peripheral OT levels and maltreatment history. Down-regulation of OT, i.e., the process where the OT release—in response to social interactions—

is suppressed, may result from chronic exposure to uncertain or unsafe conditions and consequently, those with maltreatment history remained less socially engaging or proficient. Down-regulation may be applied to lower OT in people with psychiatric disorders, many of which are characterized with social dysfunctions. On the other hand, higher OT found in people with maltreatment history may be accounted for by OT's agonistic effect which leads to its up-regulation to cope with stress as described previously. Consequently, potential use of OT in treating mental illnesses is suggested.

Given the interactional effects of OT and child maltreatment on social functioning and stress reactivity, 10 studies which examined the association between OT concentrations and experiences of child maltreatment were reviewed in order to understand the physiological basis of how people with maltreatment history adapt socially. The findings of effect of child maltreatment on OT concentrations have been inconsistent; some resulted in a negative association between the presence of child maltreatment and OT concentrations while others showed a positive association. Detailed review of each study revealed that some studies did not assess types of maltreatment, and even when they did, different types were used for the definition of maltreatment. Similar inconsistencies were also found for levels of severity of each maltreatment type. In addition to comparing the presence and absence of child maltreatment, accumulated effect of different types of maltreatment on OT concentrations was examined in some studies. Moreover, the characteristics of samples, such as age, sex, intimate relationship status, and parenting experiences, varied significantly in the studies presented in this review; replications with similar samples could allow comparison of the results, which helps elucidate other contributing factors to the inconsistent findings. Given the difficulty to capture samples with high child maltreatment histories and sensitive nature of child maltreatment assessment, continuous attempt to collect more data with various

available samples is feasible nonetheless, more studies with congruent operational definition of child maltreatment, regarding type and severity level, should be conducted.

Thus, future research, firstly needs to identify the distribution of baseline OT levels to determine the range in which people's psycho-social functioning remains healthy. Secondly, research continues to investigate what types and severity of child maltreatment is associated with OT concentrations as well as identify a pattern of such associations, such as down-regulation of OT system. Thirdly, taking into consideration the possible interaction between genetics and environment, research should also assess the genotype of OXTR and experiences of early life care when examining the association between OT levels and social/psychological functioning. Also, the effect of OT spray must be evaluated on contingent with early life experiences, especially child maltreatment, and OXTR genotypes, to help clarify to whom OT spray should be prescribed in order to stabilize its positive effects. Hopefully, it may also expand the treatment strategies, for instance, by treating issues associated with early life care before prescribing OT. In any case, based on the research described in this review, the mechanism of OT system in humans has not been fully understood and need to be further studied. Particularly, the assessment of OT level, genetics may be crucial in future research on the effect of child maltreatment with social behaviors and stress regulation in relation to OT.

¹ A stressful situation is deliberately created using the "still face" paradigm. For a review, see Adamson & Frick (2003).

Chapter 3: Empirical Study 1 (Summary)

Validation of the Japanese Version of the Childhood Trauma Questionnaire—Short Form (CTQ–J)

Detrimental and prolonged impacts of childhood maltreatment on both physical and mental health have been the focus of public health research over the past few decades (for review, see Norman et al., 2012). The social cost of child maltreatment in Japan was estimated at 1.6 trillion yen (approximately US\$15 billion) in 2012, excluding costs of services such as medical and mental health care through adulthood (Wada & Igarashi, 2014). In Japan, the number of child maltreatment reports has increased fourfold in the last decade and reached over 130,000 cases during the fiscal year of 2017 (Ministry of Health Labour and Welfare, 2019).

The Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein & Fink, 1998; Bernstein et al., 2003) is one of the most commonly used self-report instruments in research on childhood maltreatment history (Burgermeister, 2007; Norman et al., 2012). However, the CTQ translated into Japanese has yet to be validated. Thus, the current study aimed to examine the Japanese version of the CTQ–SF (CTQ–J) by comparing CTQ–J scores among three groups: (a) institutionalized children with documented maltreatment, (b) institutionalized children without documented maltreatment, and (c) the community group (i.e., children without institutionalization and documented maltreatment). We also examined the cutoff scores of CTQ–J for predicting different types of documented maltreatment.

Method

Participants

The institutionalized group consisted of 31 children between 13 and 19 years old from a residential care institution located in the greater Tokyo area. All of them were placed in the institution before the age of 18.

The community group consisted of 46 children, in the same age range, also from the greater Tokyo area, who were recruited via snowball sampling. A researcher visited the institution or the child's home and explained the study and either the director of the institution or the parent provided consent for each adolescent. Then, the participants completed a questionnaire packet.

Measures

CTQ-SF. The CTQ-SF is a self-report questionnaire composed of 28 items to assess childhood maltreatment history (Bernstein & Fink, 1998; Bernstein et al., 2003). The CTQ-SF was developed to measure five dimensions of child maltreatment as subscales: emotional abuse, physical abuse, sexual abuse, physical neglect, and emotional neglect. Respondents retrospectively answered questions with answer keys based on a 5-point Likert scale regarding their experiences of maltreatment in childhood. The CTQ-SF was translated by Goto and Sato (2006) into Japanese and the current study adopted Goto's CTQ as the Japanese version of the CTQ-SF (CTQ-J), with the author's permission.

Documented child maltreatment. The researchers visited the institution and coded the presence of maltreatment history that was documented in child welfare records for each participant. The coding of maltreatment histories was designated into five types, which corresponded to the CTQ–J’s five dimensions.

Analysis

First, the internal consistency for the total CTQ–J score and five subscale scores was examined using Cronbach’s alpha statistic. Second, One-way analysis of variance (ANOVA) was performed to compare the mean scores of the five subscales as well as the total score of CTQ–J among the three groups: (a) institutionalized children with documented maltreatment, (b) institutionalized children without documented maltreatment, and (c) the community group. Post hoc tests using the Bonferroni method were also conducted. Third, receiver operating characteristics (ROC) analysis was performed, and sensitivity, specificity, and the area under the curve (AUC) of the CTQ–J were calculated to determine the capacity of CTQ–J score, as well as the CTQ–J scores to predict documented maltreatment.

Results

Internal consistency was “good” to “acceptable” in both the total scores and scores for each subscale (Cronbach’s alpha 0.74–0.94). In each maltreatment type, the institutionalized group with documented maltreatment experiences showed significantly higher CTQ–J scores

than did the other groups. The area under the curve showed higher discrimination for the total score of the CTQ–J (0.95) and each subscale (0.98 –0.86).

Significant differences among the three groups, based on the documentation of maltreatment and institutionalization, were observed in CTQ–J emotional abuse score, $F(2, 74) 37.72, p < .0001$; physical abuse score, $F(2, 74) 36.66, p < .0001$; sexual abuse score, $F(2, 74) 87.44, p < .0001$; emotional neglect score, $F(2, 74) 32.78, p < .0001$; physical neglect score, $F(2, 74) 29.31, p < .0001$; and the total score, $F(2, 74) 48.51, p < .0001$.

Multiple comparisons showed that, in each of the subscales and the total score, the institutionalized group with documented maltreatment (emotional abuse: $M=16.4, SD=5.76$; physical abuse: $M=15.2, SD=6.54$; sexual abuse: $M=17.0, SD=6.48$; emotional neglect: $M=20.6, SD=3.21$; physical neglect: $M=13.2, SD=4.02$; and total score: $M=64.5, SD=18.92$) had a significantly higher score than did either the institutionalized group without documented maltreatment (emotional abuse: $M=9.7, SD=4.73$; physical abuse: $M=8.8, SD=6.23$; sexual abuse: $M=6.3, SD=2.3$; emotional neglect: $M=15.9, SD=5.93$; physical neglect: $M=9.0, SD=3.37$; total score: $M=44.7, SD=27.43$) or the community group (emotional abuse: $M=6.6, SD=1.86$; physical abuse: $M=5.5, SD=1.49$; sexual abuse: $M=5.0, SD=0.29$; emotional neglect: $M=9.4, SD=3.16$; physical neglect: $M=6.8, SD=2.41$; total score: $M=33.3, SD=6.28$).

The area under the curve showed higher discrimination for the total score of the CTQ–J (0.95), emotional abuse (0.92), physical abuse (0.92), sexual abuse (0.99), emotional

neglect (0.91), and physical neglect (0.86).

Discussion

The good and acceptable levels of internal consistency for the Japanese version (CTQ-J) supported the reliability of the scale while the results of the mean score comparisons and ROC analyses suggested its validity. Also, the cutoff scores based on the specificity and sensitivity analyses could be a convenient and useful guide to identify the presence of child maltreatment. Sampling bias, measurement issues, including recall bias and underestimation of maltreatment due to outcome variable selection, lack of validation for the cutoff scores of severity based on Japanese samples, and issues with the coding procedure were addressed as the study's limitations.

The current findings imply that the measure could be used in clinical settings as a supplemental tool in assessing the child maltreatment history of Japanese adolescents, because it predicts the child maltreatment cases that are severe enough to involve removing the child from home. Future research should utilize a larger representative sample and an additional self-report measure that enables further examination of validity, including factor analysis.

Chapter 4: Empirical Study 2

Association Between Accumulation of Child Maltreatment and Salivary Oxytocin Level Among Japanese Adolescents

Child maltreatment is related to a neuropeptide, called oxytocin (OT). Adverse experiences of early life care, such as child abuse and neglect, disrupt the OT system development in children. Early studies on child maltreatment and OT have found negative associations between childhood maltreatment history and OT levels. Heim et al. (2009) examined the association between OT levels in the cerebrospinal fluid and the history of moderate–severe childhood maltreatment in healthy adult women. The OT concentrations of women exposed to any type of childhood maltreatment were lower than those without such exposures. A study that investigated children who had been raised in a neglectful orphanage in the first few years of life found their tendency to have lower urinary OT levels compared with controls after interacting with their mothers (Wisner Fries et al., 2005). Similarly, early life stress prior to the age of 13, including maltreatment and loss, was found to reduce plasma OT in healthy adult men (Opacka-Juffry & Mohiyeddini, 2012). Negative associations between childhood emotional maltreatment and plasma OT levels were reported for female adult patients with borderline personality disorder (Bertsch et al., 2013) and a population-based adult sample (Müller et al., 2019). These findings suggest that the OT system development may be hindered by maltreatment experiences during childhood, and peripheral OT could be subsequently maintained at lower levels.

In contrast, several studies indicated differential associations between OT concentrations and maltreatment. Higher reports of maltreatment were positively associated with OT levels in women (Bhandari et al., 2014), in a community adult sample raising children (Mizuki & Fujiwara, 2015) and girls with a physical abuse history (Seltzer et al., 2014). No difference in the OT levels between maltreated children and controls was also

found (Mizushima et al., 2015). Such inconsistent findings might be attributed to the heterogeneity in the assessment of the associated childhood maltreatment. Various types of childhood maltreatment (i.e., neglect in general, emotional abuse, emotional neglect, physical abuse, and any maltreatment) have been utilized in research on the OT system. In two studies, maltreatment was not assessed with a self-report instrument and defined by the alternative care placement (i.e., living in a residential care institution or with a foster family). Selecting the type and the definition of maltreatment included in each study seemed rather arbitrary and heterogeneous. Thus, the impact of each maltreatment type on the OT level must be identified. Particularly, multiple forms of maltreatment often happen together, and the detrimental impact of accumulated maltreatment on psychological distress has been brought to societal attention (Felitti et al., 1998; Finkelhor et al., 2011; Richmond et al., 2009). In addition to the effect of each maltreatment type on OT, the accumulated experiences of multiple types of maltreatment might differentially affect the OT system.

OT is also linked to social functioning. Enhanced social cognition (Barraza & Zak, 2009; Bartz et al., 2010; Domes, Heinrichs, Michel, et al., 2007; Theodoridou et al., 2009) and affiliative behaviors (Andari et al., 2010; Auyeung et al., 2015; Kosfeld et al., 2005; Van Ijzendoorn et al., 2011; Zak et al., 2005) were repeatedly reported to be associated with higher OT levels. People with a childhood maltreatment history often suffer from poor social functioning (Cicchetti & Toth, 2016; Widom, 2014), such as disruptive behaviors and relational difficulties from early childhood to adulthood (Manly et al., 2001; Matheson et al., 2017; Raby et al., 2019; Salzinger et al., 1993), as well as impairment with social cognition (Heleniak & McLaughlin, 2020; O'Reilly & Peterson, 2015; Teisl & Cicchetti, 2008). The lower OT levels derived from maltreatment victimization may explain maltreated children's poor social functioning accompanied with the difficulty of developing and maintaining healthy relationships with others.

Thus, understanding how experiences of child maltreatment impact the development of OT system may further elucidate the underlying mechanisms of poor social functioning and psychiatric symptoms. Hence, this study aims to examine the association between the accumulation of moderate–severe childhood maltreatment and the salivary OT levels in Japanese adolescents living in a residential care institution and those living with their parents in the community.

Materials and Methods

Participants

Our participants were 31 adolescents (i.e., 19 boys and 12 girls) aged between 13 and 19 years old and living in a residential care institution and 46 adolescents (i.e., 25 boys and 21 girls) in the same age range and living with their two biological parents in the community. A sufficient amount of saliva could not be collected from the two adolescents in the institutionalized group; thus, only 75 adolescents were included in the final analysis. In order to examine the effect of various types of severe maltreatment experiences, it was necessary to approach children who have been institutionalized in residential care mostly due to maltreatment committed by their parents. However, these children, especially adolescents, could be so vulnerable and unstable that obtaining the permissions from residential institutions for research could be usually unfeasible or extremely strenuous. Thus, the current sample was rather rare and valuable. Provided the difficulty associated with recruitment of participants with severe maltreatment experiences, we chose a case-control design and recruited adolescents from the community sufficiently enough to make a comparison with the institutional group.

Procedure

The participants comprising the institutionalized group were recruited from a residential care institution located in the greater Tokyo area. The research team explained the

study to each eligible adolescent at the institution following an agreement with the head of the institution. Although 32 adolescents were approached, and most of them agreed to participate in the study, one child expressed his lack of interest and did not participate, giving us a response rate of 96.9%. The head of the institution signed an informed consent individually for each child, considering each child's emotional and behavioral state.

As for the community sample, snowball sampling, online recruitment, flyers, and word of mouth were used to recruit the participants who were living with their two biological parents. These participants were between the age of 13 and 19 and do not have a history of removal from their family by the Child Guidance Center (similar to the Child Protective Services in the US). Interested parents contacted the research team and provided contact information. Forty-six adolescents from the greater Tokyo area were included in the community group.

For the data collection, a staff of the research team visited the participants' institution or home between 2:00 and 5:00 p.m. These hours were selected to avoid a diurnal fluctuation of the OT values due to food intake, as well as the relative stability of OT in the afternoon and evening hours, as suggested by Forsling et al. (Forsling et al., 1998). The participants were asked not to eat or drink anything other than water 1 h before the researcher's visit. During the data collection session, the researcher first introduced their study and described the consent procedure to the participants. The participants then signed on assent. The saliva samples were collected after a 15min introduction. Subsequently, the participants filled out a questionnaire packet on the child maltreatment history, mental status, etc., in the environment where the participant can be alone with the researcher. A face sheet, including demographic information, family environment, and involvement with child welfare services, and a questionnaire on the child's behavioral problems were completed by the participant's care worker or a parent.

Measurements

Childhood Maltreatment

The childhood maltreatment the participants experienced was measured with the Japanese version of the Childhood Trauma Questionnaire (CTQ-J; Mizuki & Fujiwara, 2021). The original version of the CTQ is one of the most widely used self-report scales comprising 25 items and assessing the victimization of five types of maltreatment (i.e., emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect) during childhood (Bernstein & Fink, 1998; Bernstein et al., 2003). Each question asks the frequency of the respondent's experience of the indicated event, such as "I had to wear dirty clothes." The respondents answer questions with a five-point Likert scale: 1 = "never true"; 2 = "rarely true"; 3 = "sometimes true"; 4 = "often true"; and 5 = "very often true." Five questions compose each type with a score range from five to 25. The severity of each type is defined as "none," "low," "moderate," or "severe" using respective cutoff scores (Bernstein & Fink, 1998). Moderate to severe forms of maltreatment (emotional abuse > 12, physical abuse > 9, sexual abuse > 7, emotional neglect > 14, and physical neglect > 9) were used herein. The internal consistency for the total and each type is as follows: 0.95 for total, 0.87 for emotional abuse, 0.90 for physical abuse, 0.90 for sexual abuse, 0.89 for emotional neglect, and 0.74 for physical neglect. The CTQ-J validity was supported (Mizuki & Fujiwara, 2021).

Salivary Oxytocin Level

The saliva samples were collected using Salivatte (Sarstedt, Rommelsdorf, Germany). The participants were asked to chew a roll of cotton for approximately 40 s until it became saturated. Salivattes were kept at -20°C and sent to the laboratory, where they were thawed and centrifuged at 4°C at $1,500 \times g$ for 15min. The liquid samples were concentrated by three or four times by lyophilization for a night and kept in -80°C until assayed. The dry

samples were reconstructed with an assay buffer right before the analysis. The assay was performed with a 96-plate commercial oxytocin ELISA kit (Assay Design, MI, USA). The assay procedure was consistent with that in a previous research (Carter, 2007; Feldman et al., 2013; Feldman et al., 2007). Measurements were performed in duplicate following kit instructions. The optical density of the samples and the oxytocin standards were measured by a microplate reader (Bio-Rad, Richmond, CA, USA) at 405 and 590 nm wavelengths according the relevant standard curves. The intra-assay and inter-assay coefficients were <12.4 and 14.5%, respectively.

Ethics

We obtained a written assent from each participant before the data collection phase in addition to the written consent from the head of the institution or the parent. Oral approval from their caseworker at the Child Guidance Center was obtained for each participant in the institutionalized group. The institutional review board at the National Center for Child Health and Development approved this study.

Statistical Analysis

First, Spearman correlation analyses were conducted for the scores of five childhood maltreatment types and demographic variables, including sex, age, and duration of alternative care placement. Second, we categorized the cases into the moderate–severe group for each of the five maltreatment types according to the cutoff scores defined by Bernstein and Fink (1998) to test the impact of moderate–severe childhood maltreatment: emotional abuse 13 or more, physical abuse 10 or more, sexual abuse 8 or more, emotional neglect 15 or more, and physical neglect 10 or more. The OT values were log-transformed because their distribution did not meet the assumption of normality. The associations between OT and moderate–severe child maltreatment types were examined with bivariate and multiple regression analyses with and without demographic variable adjustment. Third, multiple regression analyses of OT and

the number of maltreatment types were performed to test the cumulative effect of various types of child maltreatment. Multiple regression analysis including a square term was performed to test a quadratic trend, and R squared was compared for goodness of fit for the models with or without a square term. All statistical analyses were conducted with STATA (version 14.2; Stata Corp College Station, TX, United States). The statistical significance level was set at $p < 0.05$ (two-tailed).

Results

The mean age of the institutionalized group was 15.9 ($SD = 1.74$), and 18 (62.1%) participants were boys. The mean age of the community group was 15.6 ($SD = 1.84$), and 25 (54.4%) participants were boys (Table 1). These two groups did not significantly differ in age and sex. For the institutionalized group, the mean duration of their placement in the current residential care institution was 16.4 months ($SD = 15.47$), ranging from 1 to 59 months. The mean of the total duration of alternative care placement was 4.3 years ($SD = 5.24$), ranging from 1 month to 18 years. Many of these adolescents had lived under alternative care in either another institution or with a foster family before moving to their current institution. On average, they have spent almost one-fourth of their lives separated from their parent/s and family. A child with 18 years in alternative care means that he/she has no experience living with his/her family at home. While no difference in height was observed in total and boys, the girls in the institutionalized group weighed significantly heavier than those in the community group.

Table1 *Sample Characteristics*

		Institutionalized (n=29)			Community (n=46)			t-test/chi-square	p-value
		N/Mean	%/SD	Range	N/Mean	%/SD	Range		
Age (years)		15.9	1.74	13, 19	15.6	1.84	13, 19	0.67	0.50
Sex	Boys	18	62.1		25	54.4		0.43	0.51
Alternative care duration (years)		4.3	5.237	0.1, 18					
Current placement duration (months)		16.4	15.467	1, 59					
Height (cm)	All	163.3	8.81	148.5, 176.5	162.3	9.5	140.9, 180	0.44	0.66
	Boys	167.4	7.01	148.5, 176.5	167.7	8.4	140.9, 180	-0.12	0.90
	Girls	156.5	7.21	149.5, 171.5	155.9	6.2	143, 168.4	0.24	0.81
Weight (Kg)	All	55.8	9.7	39.2, 77.8	51.9	10.1	35, 82	1.65	0.10
	Boys	58.9	10.8	39.2, 77.8	56.7	10.5	36.8, 82	0.67	0.51
	Girls	50.7	4.4	41, 57.4	46.2	5.8	35, 57	2.25	0.03
Childhood Maltreatment (continuous)									
	Emotional abuse	12.5	6.1	5,25	6.6	1.9	5,14	6.16	<.0001
	Physical abuse	13.2	7.1	5,25	5.5	1.5	5,13	7.13	<.0001
	Sexual abuse	9.0	6.1	5,25	5.0	0.3	5,7	4.37	<.0001
	Emotional neglect	17.6	5.4	5,25	9.4	3.2	5,16	8.21	<.0001
	Physical neglect	11.8	4.1	5,19	6.8	2.4	5,14	6.67	<.0001
Moderate-Severe maltreatment (dichotomous)									
	Emotional abuse	13	44.8		1	2.2		21.31	<.001
	Physical abuse	16	55.2		1	2.2		28.50	<.001
	Sexual abuse	12	41.4		0	0.0		22.66	<.001
	Emotional neglect	23	79.3		3	6.5		41.61	<.001
	Physical neglect	20	69.0		7	15.2		22.30	<.001
Moderate-Severe maltreatment count									
	0	2	6.9		36	78.3		49.74	<.001
	1	4	13.8		8	17.4			
	2	5	17.2		2	4.4			
	3	7	24.1		0	0			
	4	6	20.7		0	0			
	5	5	17.2		0	0			
Oxytocin (pg/mol)									
	Total	24.5	10.41	10.06 12.57, 51.92	23.8	10.54	10.10, 62.02	0.163*	0.87

*Z for Wilcoxon Ranksum test

The mean CTQ scores of the five maltreatment types in the institutionalized group were almost double that of the community group (Table 1). The ratio of the adolescents categorized into having moderate–severe maltreatment experiences ranged from 41.4% in sexual abuse to 79.3% in emotional neglect for the institutional group, whereas significantly lower percentages ranging from 0 to 15.2 of the community group reported moderate–severe child maltreatment. Correspondingly, the institutionalized adolescents reported having experienced significantly higher numbers of moderate–severe maltreatment types compared to the community group ($\chi^2 = 49.74, p < .001$). More than one in four of the institutionalized group experienced three types of moderate–severe maltreatment and approximately one-third had undergone four or five types. Contrarily, no one in the community group reported having experienced more than two types of moderate–severe maltreatment. No significant difference was found in the raw OT values between the institutionalized ($M = 24.5$ pg/ml; $SD = 12.57$; range: 12.57–51.92) and community ($M = 23.8$ pg/ml; $SD = 10.54$; range 10.10–62.02) groups.

Table 2 presents the results of the Spearman correlation analyses of five types of maltreatment, age, sex, and alternative care duration. The five types of maltreatment showed weak to strong correlations. Strong correlations were observed in emotional abuse with physical abuse ($r_s = 0.68, p < .0001$), emotional neglect ($r_s = 0.72, p < .0001$), and physical neglect ($r_s = 0.60, p < .0001$). Emotional neglect was also strongly correlated with physical neglect ($r_s = 0.75, p < .0001$). Moderate correlations were found in physical abuse with emotional neglect ($r_s = 0.52, p < .0001$) and physical neglect ($r_s = 0.54, p < .0001$), as well as in sexual abuse with physical abuse ($r_s = 0.47, p < .0001$), emotional neglect ($r_s = 0.47, p < .0001$), and physical neglect ($r_s = 0.41, p < .0005$). The correlation between emotional and sexual abuse was weak ($r_s = 0.35, p < .005$). The results indicated considerable overlapping occurrences of five different types of maltreatment, particularly among the four maltreatment

types other than sexual abuse. The total duration of alternative care was significantly correlated with the five maltreatment types, but not with age or sex, suggesting that alternative care placement was implemented based on adolescents' maltreatment victimization, regardless of their age or sex.

Table 2 Spearman correlation coefficients of maltreatment types

	1	2	3	4	5	6	7
1 Emotional abuse	1.00						
2 Physical abuse	0.68	1.00					
3 Sexual abuse	0.35	0.47	1.00				
4 Emotional neglect	0.72	0.52	0.47	1.00			
5 Physical Neglect	0.60	0.54	0.41	0.75	1.00		
6 Age	0.02	-0.07	0.15	0.12	0.08	1.00	
7 Sex	0.15	-0.05	0.21	-0.10	-0.07	-0.11	1.00
8 Placement duration	0.48	0.62	0.59	0.64	0.55	0.11	-0.14

Note. p<.05 in bold

Table 3 presents the associations between the log-transformed salivary OT concentrations and the five types of moderate–severe maltreatment. None of the bivariate regression analyses between the log-transformed OT values and any of the five maltreatment types resulted in statistically significant. We simultaneously conducted a multiple regression, including the five types, based on the correlations among the five maltreatment types. The results showed that moderate–severe physical abuse ($b = 0.395, p < .020$) was significantly associated with OT. People who reported a history of physical abuse at moderate to severe levels had significantly higher salivary OT concentrations independent of the effects of the other maltreatment types. The positive association between OT and moderate–severe physical abuse remained significant in the model adjusted for sex and age ($b = 0.357, p = .034$) and in the model adjusted for sex, age, and alternative care duration ($b = 0.345, p = .04$). On the contrary, moderate–severe emotional neglect’s association with OT was negative and marginally significant in the multiple regression model ($b = -0.261, p = .064$), as well as in the model adjusted for sex and age ($b = -0.270, p = .053$). This negative association of moderate–severe emotional neglect reached a statistical significance ($b = -0.303, p = .033$) when adjusted for sex, age, and alternative care duration. OT was not significantly associated with the other three maltreatment types. These results suggest that child maltreatment may not affect the salivary OT levels in a uniform manner, but would rather derive opposite effects depending on what type of maltreatment a child might have been exposed to.

Table 3 Regression coefficients of moderate – severe maltreatment types on oxytocin

Moderate–severe maltreatment type	Oxytocin concentration (pg/ml)		Bivariate		Multiple		Sex and age adjust.		Sex, age, alternative care duration adjusted	
	Mean	SD	B	p	B	p	B	p	B	p
Emotional abuse (-)	24	10.4								
(+)	24.7	11.1	0.016	0.89	-0.168	0.314	-0.133	0.426	-0.098	0.56
Physical abuse (-)	23.4	10.5								
(+)	26.6	10.1	0.138	0.194	0.395	0.02	0.357	0.034	0.345	0.04
Sexual abuse (-)	24.3	11.1								
(+)	23.1	6.1	0.0004	0.997	0.014	0.921	0.081	0.562	0.014	0.927
Emotional neglect (-)	24.3	9.9								
(+)	23.7	11.5	-0.071	0.45	-0.261	0.064	-0.270	0.053	-0.303	0.033
Physical Neglect (-)	24.1	10.4								
(+)	24.2	10.6	-0.009	0.923	0.072	0.545	0.057	0.631	0.045	0.705

Note: $p < 0.05$ in bold. The oxytocin values in regression analyses were log transformed.

The cumulative effects of different types of maltreatment on the salivary OT concentration were analyzed using the regression analyses of the number of moderate–severe maltreatment types on the OT concentrations. As in Figure 1, which adjusted for sex, age, and alternative care duration, the group with one type resulted in a statistically significant association ($b = -0.26, p = .042$), indicating that salivary OT concentration decreased to the lowest, as the number of moderate–severe maltreatment types increased from none to one. When the number of maltreatment types increased to two or three types, the OT concentration slightly increased from that of the group with one type, which was still lower than that of the group without maltreatment experiences ($b = -0.24, p = .078$). This association was marginally significant. When the maltreatment types reached four or five, the OT level increased and showed no difference from that of the group without maltreatment experiences ($b = 0.04, p = .789$). However, the OT concentration of the group with four or five types resulted in higher values than either the group with one type ($b = 0.29, p = .076$) or the group with two or three types ($b = 0.27, p = .091$), showing an incremental trend in OT as maltreatment type increased from one to four or five. While the trend analysis derived a non-significant result (number of types: $b = -0.02, p = .631; R^2 = 0.07$) denoting a non-linear relationship, a square term reached statistical significance (number of types: $b = -0.390, p$

= .011; *square term*: $b = 0.13$, $p = .012$; $R^2 = .15$) when added to the multiple regression,

indicating a U-shaped association between the number of maltreatment types and OT.

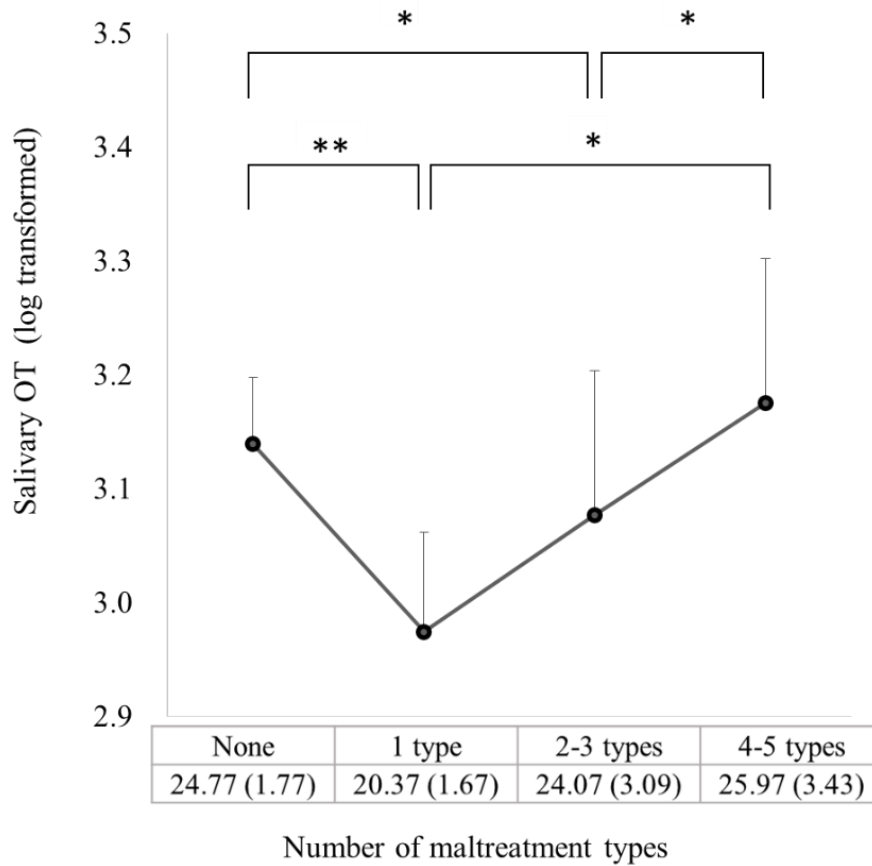


Figure 1. Salivary OT for number of maltreatment types (* $P < .10$, ** $P < .05$). The mean (SD) of the raw OT values for each category of maltreatment type number is presented for graph interpretation.

Discussion

The current study was the first to identify the differential effects of five types of maltreatment on salivary OT concentrations as well as a U-shape pattern of relationship between the accumulation of maltreatment types experienced and OT concentrations in Japanese adolescents. A significant elevation of the OT levels was associated with the presence of moderate–severe physical abuse independent of the effects of the other maltreatment types. On the contrary, moderate–severe emotional neglect significantly decreased the OT levels. Also, regarding the number of maltreatment types, the OT concentrations initially declined to the lowest and then gradually increased as the number of moderate–severe maltreatment types increased. The quadratic relationship between the number of maltreatment types and OT concentrations resulted in statistical significance. The pattern reached the lowest OT levels with one type of maltreatment and increased from one type to two or three types, and to four or five types which reached to the level of no-maltreatment group. The association formed a U-shape.

The higher salivary OT levels among adolescents who experienced moderate–severe physical abuse were consistent with those in the studies reporting higher urinary OT levels in people with a physical abuse history (Mizuki & Fujiwara, 2015; Seltzer et al., 2014). When children suffer from the aggression and violence of their caregivers, they may use a tend-and-befriend response (Taylor, 2006). This is a strategy of maintaining social engagement with

them to tame down their caregivers' anger instead of escaping from or fighting back against their caregivers (i.e., fight-or-flight response). In this way, children have a chance to consequently avoid being physically hurt without losing the protection and provision from their caregivers. Increased OT levels may facilitate such a response by reducing the reactivity of the cardiovascular system, which allows choosing a response, called a challenge response, that differs from a fight-or-flight response (Kubzansky et al., 2012). This consequently could lay the basis of the autonomic nervous system to exhibit tend-or-befriend responses at a greater frequency. At the same time, higher OT levels may also be attributed to their higher reactivity in the OT system to interpersonal stress. College students who had undergone physical abuse or interpersonal harms exhibited a greater increase in OT levels after social stress compared with those without such experiences (Seltzer et al., 2014; Tabak et al., 2011). OT reduces the activity of the amygdala after exposure to threatening stimuli (Kirsch et al., 2005), particularly to social stimuli, such as emotional expression (Domes, Heinrichs, Gläscher, et al., 2007). As a result of early-life physical abuse, the salivary OT levels may reflect an altered OT system that comes with hyper sensitivity to interpersonal situations. Enhanced OT levels can trigger individuals to strive to maintain social connections by controlling others through aggressive or manipulative behaviors which could lead them to be rejected by their peers and result in further interpersonal distress.

Conversely, adolescents reporting moderate–severe emotional neglect showed lower OT concentrations after controlling the effects of the other maltreatment types. This is consistent with the result of some previous studies with negative associations between OT levels and emotional maltreatment that encompassed emotional neglect and abuse. The experience of repeated exposure to harsh statements and verbal aggression, as well as the lack of emotional bonding in and support from their family could engender a fearful response of withdrawal of affiliative behaviors, such as children’s approaching behaviors toward and communication with their care givers, which is likely to lead to the downregulation of the OT system. This hypothesis is supported by the lack of OT increase in children, who had undergone severe neglect in an orphanage during early life, even after physical contact with their adoptive mothers (Wisner Fries et al., 2005). This could explain the interpersonal difficulty of engaging and maintaining relationships with others, which has often been found in people with a maltreatment history (Manly et al., 1994; Matheson et al., 2017; Raby et al., 2019). A contradicting finding that higher reports of emotional maltreatment are associated with higher OT levels has been reported in women (Bhandari et al., 2014). This study solely focused on emotional neglect and did not examine the effect of the other types of maltreatment on OT. Thus, the finding may have resulted from muddling up the up-regulating effect of physical abuse, provided the co-occurrence of four maltreatment types (i.e., emotional and physical abuse and emotional and physical neglect) identified in our findings. Therefore,

simultaneously entering different types of maltreatment may be necessary in examining how each type of maltreatment affects the OT system development in children.

The decrease in the salivary OT levels with the number of maltreatment types was inconsistent with the result obtained by Mizuki and Fujiwara (2015), who identified a positive linear association between the number of less severe maltreatment types and urinary OT. This may be attributed to the difference in the severity of maltreatment. A less severe form of maltreatment might not have been regarded as a threat and might not have provoked a withdrawal response unlike the type of moderate–severe maltreatment used in this study. In reverse, the decreased OT levels associated with the number of maltreatment types were somewhat similar with those in the previous research of Heim et al. (2009), in which a negative relationship was found. Nonetheless, this association showed a linear form and differed from the curvilinear pattern of the current study, in which the OT levels first declined and then gradually increased as the number of experienced maltreatment types increased. This could be attributed to the following reason: people with only one maltreatment type might have experienced emotional maltreatment, which was more frequently experienced (Meston et al., 1999) and known to suppress salivary OT concentrations, as previously described. In the current study, 26 (34.7%) adolescents reported experiencing emotional neglect, the percentage of which is similar to that of physical neglect (36%) and this number is much higher than that of emotional (18.7%), physical (22.7%) and sexual (16%) abuses.

Physical abuse would not usually occur as the sole form of maltreatment, but it would concur with emotional maltreatment (Claussen & Crittenden, 1991). Cases with one type of maltreatment were less likely to have an experience of physical abuse and would rather have one of the other four types that tend to exhibit a lower OT. Thus, as the count of maltreatment types increased, people were more likely to experience physical abuse, and the effect of physical abuse enhancing the OT concentration would be manifested. The positive effect of physical abuse could eventually surpass the cumulated negative effects of the other types. Consequently, OT and maltreatment formed a U-shaped association.

Furthermore, the genetics associated with the OT system was likely to affect the current findings of the OT levels. The polymorphism of the oxytocin receptor (OXTR), particularly risk alleles, is associated with phenotypic characteristics, such as reduced plasma OT concentrations and poor parenting qualities (Feldman et al., 2012). The OXTR genotypes are regarded as a function of the OT system and show their differential effects according to early life care on social and emotional functioning (Bradley et al., 2011; Cicchetti & Rogosch, 2012) and salivary OT levels (Fujiwara et al., 2019). Therefore, the interaction effect between the maltreatment and OXTR genes might have partially accounted for the non-linear, U-shape association of the current results, provided the high prevalence of the maltreatment history in the current study sample.

The current study has several limitations to address. First, the study participants of both institutionalized and community groups were convenience samples. Particularly, the parents who may have committed moderate-severe abuse are less likely to have their children participate in the study; adolescents with moderate-severe abuse from community may be underrepresented. Careful interpretation and generalization are necessary because the samples did not represent the general population, and the results could be biased by unmeasured confounding factors. Second, the salivary OT analysis process might not be appropriate. While some studies measured the central OT level using the central spinal fluid, the peripheral OT levels were evaluated from the blood, urine, and saliva samples in many others. The use of salivary OT as a proxy of the central OT was suggested by Martin et al. (2018) in a study showing modest to strong correlations between salivary and cerebrospinal fluid OT. Meanwhile, the plasma OT was weakly correlated with the central spinal fluid OT. Furthermore, the pre-assay procedure lacking extraction might have affected the results. The comparison between the enzyme immunoassay with and without extraction revealed a much higher plasma OT concentration without extraction (Szeto et al., 2011), implying the possibility of the overestimated OT concentrations of our sample. However, the comparison between the enzyme immunoassay of the samples with and without extraction revealed that the influence of extraction may be much smaller on the salivary sample unlike on the plasma sample (Martin et al., 2018). The optimal pre-assay procedure still awaits a conclusive

evidence. Furthermore, single measurement of salivary OT is pointed as lacking the methodological validity due to instability of OT concentrations within an individual across time (Martins et al., 2020). Although the stability of peripheral OT levels over 6 months has been reported for parents with infants (Feldman et al., 2013), single adults, and adults who have a romantic partner (Schneiderman et al., 2012), due to the methodological issues in these studies, the stability peripheral OT is unconvincing. Also, OT system of the adolescent sample in current study is still actively developing which might have been contributing to fluctuation of OT levels. Given uncertainty associated with OT measurements, repeated measurements to detect reliable OT values should be employed to strengthen the validity in the future studies. Third, the OT level could be a result of prenatal exposure to a stressful environment, which could have modified the OT system before exposure to maltreatment in early life and/or social stress derived from the current environment that could enhance the OT levels as coping. These variables must be measured in the future research because we failed to measure them in this study. Fourth, the OT concentrations may reflect the levels of other experiences on the day of the measurement, since OT system is known to be sensitive to interpersonal events, including sexual stimulation, physical contact, or social stress (de Jong et al., 2015; Matthiesen et al., 2001; Turner et al., 1999). The assessment of these social factors will be necessary in future research, to identify the baseline OT levels associated with maltreatment, independent of the effects of social events in the participants' current life.

Fifth, the menstrual cycle of female participants were not assessed. Female sex hormones influence the OT system (Engel et al., 2019); thus, future studies must identify and include the menstrual cycle of female participants into the analysis.

Despite the abovementioned limitations, some noteworthy findings were identified in the current study. The opposite effects of moderate–severe maltreatment on OT depending on the maltreatment type were revealed. Physical abuse increased the salivary OT concentrations, while emotional neglect decreased them. The cumulative effect of the maltreatment types also yielded a U-shaped pattern. The OT levels were the lowest with one type of maltreatment, and OT increased as the number of maltreatment types increased. Further studies need to replicate the current results with a population-based sample and address the effects of genetics, female hormonal cycle, and stresses in the prenatal and current environments to elucidate how childhood maltreatment affects the OT system development in children.

Chapter 5: Discussion

Impaired social functioning has been identified as one of the major difficulties people with child maltreated history face throughout their lives. While their lower social functioning—which manifests as aggressive and/or disruptive behaviors—impedes quality of life during early stages of life, and its negative impact gradually pervades through various domains of their lives including work and family life. Furthermore, such lower social functioning often prevents these individuals from seeking treatment for their distress which results in delayed or non-implementation of social and psychological interventions which could potentially facilitate their recovery. In addition to the findings that attest to the existence of social dysfunction among people with child maltreatment history at the cognitive, emotional, and behavioral levels, understanding the effect of child maltreatment experiences on their physiological systems, i.e., the underlying mechanism for social functioning and stress coping, may be relevant and useful in developing effective interventions. Therefore, in this research, I first reviewed the existing literature broadly on child maltreatment, social functioning, and oxytocin (OT) systems and then conducted two empirical studies (Empirical Study 1 and Empirical Study 2) to test the relationships between these variables.

Specifically, the literature review focused on oxytocin (OT) system as the key factor which links the physiological system, early life experiences, social functioning, and stress

coping and analyzed the methodological issues in studies on the association between OT system and child maltreatment. As described in Chapter 2, the literature review addressed four points that would be beneficial for conducting future research on child maltreatment and OT: 1) establishing the normal range for OT distribution, 2) incorporating the types and severity of child maltreatment into the research on OT, 3) considering the interaction between child maltreatment and genetic factors, 4) examining the maltreatment-genetics interaction effect on the use of the OT spray. Among these issues, this research chose to focus on issues of inconsistencies in the relationships between child maltreatment and OT levels as well as the heterogeneity in the operational definitions of child maltreatment experiences since they are critical in figuring out how child maltreatment impacts the OT system which plays a major role in modulation of social functioning.

Thus, based on the literature review, the first empirical study (Empirical Study 1, see Chapter 3) examined the validity of the Japanese version of the Childhood Trauma Questionnaire (CTQ-J), a self-report scale for child maltreatment experiences, which could assess five different types of maltreatment as well as the severity of each type. Study 1 demonstrated that the CTQ-J successfully predicted the presence of five types of maltreatment documented by the child welfare system: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical abuse. By identifying some of the maltreatment experiences which had not been previously documented by the child welfare system, the

study was able to confirm that the CTQ-J was able to detect child maltreatment cases with greater sensitivity. When targeting adolescents, for example, the CTQ-J—because of its self-administered form—could expedite the assessment processes of identifying the types and severity of their child maltreatment experiences with the recognition that these inquiries are often difficult for the adolescents and call for careful considerations by the administrator.

The second empirical study (Empirical Study 2, see Chapter 4) examined the effect of child maltreatment and oxytocin system. Study 2 used this validated CTQ-J and analysis revealed that child maltreatment at moderate-severe levels was associated with salivary OT concentrations as indicated by previous literature. Findings revealed that the effects on OT concentrations were not exhibited in the same direction, but varied depending on the type of child maltreatment. In addition, the relationship between the accumulation of different types of child maltreatment on OT resulted in a U-shaped pattern. From this, it can be concluded that the investigation of types and severity of maltreatment enhances our understanding of the physiological basis of social functioning and stress coping that involve interactions of early life care and the oxytocin system. I will now discuss the findings from the two empirical studies and their contributions, implications, limitations, and directions for future research.

Usefulness of the Childhood Trauma Questionnaire-J for Improved Assessment

The reliability and validity of CTQ-J have been demonstrated in Empirical Study 1 (see Chapter 3). Good levels of internal consistency of CTQ-J were found for all types of

maltreatment except for physical neglect whose Cronbach alpha score suggested an acceptable level. Also, because the higher CTQ-J scores of the five sub-scales and the total score corresponded to the child welfare records on maltreatment, the validity of the scale was supported. Thus, using the CTQ-J enabled the identification of five types of child maltreatment and the severity among adolescents. At the same time, for emotional abuse and emotional neglect, the CTQ-J scores of institutionalized children without records of emotional abuse and neglect were significantly higher than that of un-institutionalized children. This was in line with research findings that report that the use of public records tend to underestimate child maltreatment cases (Gilbert et al., 2009). This implies that the availability of a self-report questionnaire may complement face-to-face interviews by being able to capture children's maltreatment experiences which may never have been disclosed to the staff at the Child Guidance Center or corroborated by other informants.

CTQ-J is relatively concise and is able to identify five types of maltreatment as well as the severity of maltreatment; it is comprised of 25 items and adolescents can usually complete the questionnaire within five to 15 minutes. Also, compared to face-to-face interviews developed for child maltreatment assessment, e.g., Child Maltreatment Interview (Burgermeister, 2007), a paper-and-pencil questionnaire has the benefit of ensuring an increased sense of confidentiality and anonymity on behalf of the participants. Although detailed and thorough information can be obtained through direct interviewing methods (Fry

et al., 1996), disclosing child maltreatment experiences face-to-face to an adult can be and are often extremely difficult and taxing for adolescents. The difficulty associated with face-to-face interview has been reported by a study (DiLillo et al., 2006), in which participants who had undergone a face-to-face interview on child maltreatment experiences did not evaluate an interview as favorably compared to other means of assessment such as a paper-and-pencil questionnaire or computer-administered interview. Administering questionnaires also has the advantage of efficiency with data collection since it does not require interviewer training nor individual administration on the part of researchers. However, the face-to-face interview method also has its strengths: being able to provide emotional support and validation to the participants through sensitive inquiring and listening. Women who had taken part in research that used such methods evaluated their experiences of the trauma-focused interview positively and reported personal gains (Newman et al., 1999). Thus, the assessment procedure should not solely rely on any single source whether it be public records, self-report questionnaire, or face-to-face interview, but should rely instead on a combination of multiple sources such as questionnaires and interviews, if developmentally appropriate. By adopting such process, it can lead to increased accuracy in the assessment of maltreatment cases while ensuring the alleviation of emotional distress derived from recalling negative memories. Such improved assessment is a crucial component of research design involving vulnerable populations, such as maltreated children.

Furthermore, findings based on the ROC analyses can offer guiding points for clinical work. AUC values over 0.86 of ROC analyses supported good sensitivity and specificity to detect the presence of the five maltreatment types and the total score of maltreatment. Suggested cutoff scores are 8_9 for emotional abuse, 6_7 for physical abuse, 8_9 for sexual abuse, 16 for emotional neglect, and 9_10 for physical neglect. These scores are indices for the presence of the respective types or the presence of any type of maltreatment, and can be used as a guiding and complementary tool for interviews during the process of child maltreatment substantiation. Also, helping professionals, who work with maltreated children in providing everyday care and treatment for mental and behavioral problems, can use these scores to understand that children have not necessarily disclosed all of their adverse experiences even though strongly prompted by child welfare workers, and thus can work toward creating a safe environment that allows children time to decide when to share their difficult experiences.

Knowledge of the Connection between Child Maltreatment and OT Concentration as Expanding Options of Treatment Strategies

Upon examining the association between CTQ scores and salivary OT concentrations, an association was found in Empirical Study 2 (see Chapter 4) as indicated in previous research. However, the analysis of the current study uncovered differential effects of the five types of maltreatment on salivary OT concentrations. Moderate-severe physical abuse

elevated OT concentrations independent of the effects of other types, while moderate-severe emotional neglect decreased OT levels as described in chapter 4. Also, a U-shaped pattern of relationship between the accumulation of maltreatment types and OT concentrations in Japanese adolescents was identified. As the number of types increased from none to one, OT declined to the lowest, and then gradually increased as the number of moderate-severe maltreatment types increased. The quadratic relationship between the number of maltreatment types and OT concentrations reached statistical significance.

These findings point to the importance of identifying individuals' maltreatment histories by assessing the presence and absence of each type as well as the severity of the maltreatment because different stress coping strategies may be activated depending on their experience under parental care. Higher OT concentrations observed with physical abuse in this study is hypothesized to reflect tend-or-befriend response in children (Taylor, 2006). Fight-or-flight responses are not realistic responses for most children. They are likely to be overwhelmed by the physical strength or the power of adults if they choose to fight, and thus their survival becomes immediately at risk should they choose to flee (flight). Faced by this conundrum, children often attempt to avoid pain inflicted by parental violence by socially engaging with their parents, such as talking to or apologizing to the anger-exhibiting parents, so that they are able to deflect the abusive behavior and continue receiving the protection and care from their parents. Higher OT concentrations may generate a challenge response by

reducing stress reactivity in the physiological system, where tend-or-befriend response could become an option. At the physiological level, this response can induce up-regulation of OT. The up-regulation may stimulate hypersensitivity towards social stress and account for the unceasing efforts of children to seek attention and acceptance from others in a maladaptive manner, including codependency, sexualized behaviors and aggressive behaviors. Any of these behaviors signifies their motive to control socially stressful situations; they often take strategies of over-engagement, including tend-and-befriend response, not to lose social connections with others. Although some of those over-engagement strategies may work well for managing their parents' anger or violent behavior or maintaining interaction with them momentarily, they may not necessarily lead to positive nor healthy relationships and run the risk of being rejected or ostracized by others in the long-run. By taking OT levels into consideration, clinical interventions can support the maltreated children's social intention and focus on redirecting their efforts toward developing more adaptive behaviors, instead of simply penalizing them for their problem behaviors.

On the other hand, lower OT levels were associated with a history of moderate-severe emotional neglect, suggesting strong dumping effects of emotional unavailability on OT levels. Repeated exposure to a lack of emotional support in the face of threat or distress was likely to induce a fight-or-flight response, i.e., fearful response, where children disengaged from social interactions with their parents, which could lead to down-regulation of OT. If a

fight-or-flight response is used more frequently by maltreated children, this could be manifested as hyper-vigilance and social withdrawal, and thus utilizing exercises to regulate ANS, especially to facilitate parasympathetic nervous system activation, such as relaxation technique, are useful psychological interventions and have been adopted elsewhere (Cohen et al., 2012; Foa, 2006). Cognitive therapy which aims to revise elevated sensitivity to threat, including hostile attribution and distorted beliefs (e.g., black or white thoughts) can also be useful (Cohen et al., 2012; Foa, 2006). In order to learn new behavioral patterns, it is crucial to first deactivate excessively alerted stress coping system.

The findings of the current research on OT concentrations suggested the importance of assessing the types and severity of child maltreatment in order to understand the complexity and nuances in the way social problems manifest in people with child maltreatment history. Many of the maltreated children experience multiple types of maltreatment, each of which has a different effect on OT, which may have resulted in a curvilinear association between OT and the number of types of moderate-severe maltreatment. Since elevated and reduced OT concentrations engender opposite social behaviors, i.e., over-engagement and withdrawal, those with experiences of multiple types of maltreatment may be likely to use mixed behavioral strategies according to their assessment of the levels and appraisal of stressful events. Also, social cognition is the ability to process social cues and interpret others' intentions and emotions, and it was found that OT levels

influence social behaviors via social cognition. Hence, it is important to identify whether or not children with certain maltreatment types are using fight-or-flight responses or tend-or-befriend/challenge responses to socially stressful events, and using physiological measures or self-report, can be a key. Since helping professionals, especially those who are in charge of children's daily care, often are unable to help navigate the complex work of providing interventions customized for each individual child each with their own histories and situations. Possessing knowledge of the OT system in the formulation of dysfunctional behaviors of maltreated children could expand the range of treatment strategies and increase the flexibility available for them, that could assist children in building social skills and social competence.

Implications for Clinical Settings

These above-mentioned interventions, despite good intentions of helping professionals, cannot be fully utilized if children exhibit fearful responses at the severe levels. This is the dilemma which is often observed in alternative care systems. Since lower OT concentrations are related to reduced ability to catch social cues and engage in social interactions, it may be necessary for helping professional to proactively strive to elicit social interactions with neglected children, regardless of the children's flimsy or lack of reactions, in order to stimulate the OT system itself. Instilling motivation for engaging in treatment is one of the hardest elements within the course of recovery in children who have been hurt by

adults.

To tackle this problem, incorporating attachment theory can offer a helpful perspective for creating/developing interventions. Attachment theory is a major concept in understanding early life care and measuring social and relational functioning (Bowlby, 1969). Attachment style is a children's coping strategy to stressful situations, such as feeling hungry or threatened. Children begin to develop an attachment relationship with their caregiver at birth and their attachment style, which has been found to be impacted by caregivers' parenting sensitivity, becomes measurable as early as 18 months of age. Children who have been exposed to maltreatment have received unresponsive and/or threatening care and are more likely to develop an insecure attachment style, particularly disorganized attachment (Lyons - Ruth & Spielman, 2004). Insecure children avoid resorting to caregivers for help (avoidant style), are overly dependent on and resistant to caregivers (ambivalent style), or are confused about what to do in the face of stress (disorganized style). In other words, insecure children are unable to use their caregiver as a "safe haven" and "secure base" where they are supposed to obtain a sense of safety and restore their emotional security. Consequently, some of them fail to engage in social interactions (i.e. reactive attachment disorder), while others exhibit indiscriminately social behaviors that correspond to disinhibited attachment disorder (American Psychiatric Association, 2013). Children with disinhibited type attachment tend to use either hostile or caring behaviors to control stressful situations which are maladaptive

(American Psychiatric Association, 2000). They struggle with difficulty by coping with stress and regulating their own emotions in a socially and developmentally maladaptive manner and have social behavioral problems during their preschool years (Troy & Sroufe, 1987), their elementary school years (Sroufe et al., 1990), in adolescence (Carlson, 1998), and in adulthood (Shi et al., 2012).

Maltreated children in alternative care or in treatment often have difficulty trusting adults and/or relying on adults in order to alleviate their distress since they often have experienced that their signals for help have been rejected and/or responded with inconsistency in their family of origin. Study on attachment (Erickson et al., 1985) suggests that children's behavioral problems may improve through changing the attachment style in children if helping professionals, particularly in daily care, can be supportive, communicating clear expectations, and acting in a consistent manner in their interactions with the children. To practice sensitive care, it is important for helping professionals to have an awareness of children's dysfunctional behaviors, particularly caring behaviors toward adults, not as a purely social and friendly, but as a learned response to physically abusive caregivers. Helping professionals need to regulate their own emotions and clearly communicate with the children that they are not angry or aggressive and that "tend-or-befriend" responses are not necessarily useful in the new relationships with helping professionals.

Moreover, higher prevalence of insecure attachment style in maltreated children is

congruent with research on OT. OT's relationship to attachment style has been indicated by previous research. Mothers' and fathers' plasma and salivary OT was found to be related to the attachment relationship to their own parents, partner, and child, and urinary OT was correlated with attachment anxiety (Feldman et al., 2010). Elevated OT levels induced by a 2-week application of intranasal OT spray reduced attachment avoidance and increased attachment to peers (Bernaerts et al., 2017). Similarly, application of OT spray was associated with increased attachment security (Buchheim et al., 2009). If down-regulation of OT partially contributes to lower social functioning, attempt to fix behavior problems, such as stopping aggressive behaviors or social withdrawal, may not be as effective. Interventions which could physiologically promote OT production, e.g., massage (Morhenn et al., 2012) and food intake (Onaka & Takayanagi, 2019), can be utilized in combination with psychological interventions which focus on attachment relationship, e.g., Circle of Security (Marvin et al., 2002), or directly teach social skills, affect identification, and theory of mind to improve social cognition. As indicated previously, it is suggested that OT levels are related to attachment style through promoting healthy social information processing and a sense of trust or empathy (Feldman, 2017; Quintana et al., 2015). In this manner, synergistic effects of clinical use of oxytocin and social and psychological interventions which may accelerate children's engagement in therapeutic interventions could be a promising possibility for promoting healthy physiological system and attachment style, although further evidence is

still needed from scientific research on child maltreatment, OT system, stress coping and social functioning.

Therefore, Study 2 was able to make a contribution to the existing research on child maltreatment and social functioning as well as stress coping by revealing differential associations between child maltreatment experiences and OT concentrations. Physical abuse was associated with higher OT concentrations while emotional neglect was associated with lower concentrations. Accordingly, the accumulated effect of maltreatment types on OT was not linear, but u-shaped. Thus, it can be suggested that identifying the exposure to each type of maltreatment is critical in understanding social functioning and stress coping through physiological system of OT in adolescents with child maltreatment history.

Limitations

Several limitations of the research in this dissertation need to be addressed. First, the participants in the two empirical studies were comprised of convenient samples. Since the institutionalized group was recruited from a residential care institution in Tokyo, the current findings of these children may simply reflect the characteristics unique to the institution, such as its child care practices and placement selection practices. Similarly, the community group was also a convenience sample, which comes with selection biases. Thus, the generalizability of the current findings is limited and the interpretation calls for careful considerations.

Especially, the current findings may be unique to Tokyo, provided that policies relevant to

child protection and welfare have large variance from prefecture to prefecture. Also, the study failed to assess social factors, such as socioeconomic status of the participants' family and community characteristics of their residential area. Such factors could be attributed to the oxytocin system of the participants.

Second, limitations relevant to the measurement method can be identified.

Retrospective report of CTQ-J has the risk of recall bias. Children may feel hesitant to disclose their maltreatment experiences due to a sense of loyalty to their parents and/or social desirability. Also, there is the likelihood that the experience of mental health issues, including depression and dissociation, which resulted from exposure to maltreatment resulted in the reduced accuracy in memory retrieval. In addition, the participants may have actively avoided accessing their memory which can trigger negative emotions. With regards to the coding of child welfare records, a coding system used by past research was not adopted, e.g., (Barnett et al., 1993), nor multiple coders were utilized.

Third, several analytical issues should be noted. The factor structure and cut-off scores for severity of the CTQ-J were not examined with the Japanese samples. They need to be examined by confirmatory factor analysis and testing association with a variable which marks four categories of severity.

A fourth limitation was that extraction was not used for the OT measurement, which may indicate that OT concentrations could have been higher than if extraction was used.

Also, the collection of saliva was conducted at one time and multiple collections were not used. In girls, menstrual cycles were not assessed although female hormones are known to influence OT secretion.

Fifth, genetic factors were not measured. In particular, OXTR genotypes and their interaction with child maltreatment may account for mixed effects of various maltreatment types and their accumulated effects. Even though the genetics, i.e., OXTR genotypes, was recognized by the literature review in Chapter 2 as a key factor, it could be integrated into the current research due to the issues of study feasibility.

Sixth and finally, as indicated by the literature review in Chapter 2, neither the OT range of healthy social functioning nor the effect of OT sprays on maltreated children were tested in the current research. Specific obstacles included difficulties in the need to collect a much larger sample as well as some ethical/legal issues associated with gaining access to children in alternative care. Thus, in order to resolve these issues, future research designs should incorporate these gaps and conduct these analyses in future studies.

Future Directions

Due to the limitations associated with sampling, the findings from the two empirical studies need to be replicated using recruitment at multiple sites in Japan and a larger population-based sampling in order to enhance the representation of Japanese adolescent population and increase the generalizability of the findings to the national level of Japan. It is

also necessary to conduct a confirmatory factor analysis to identify whether CTQ-J supports the factor structure indicated by the original CTQ, so that how specific behaviors of maltreatment described by each item occur in the Japanese context can be analyzed. Furthermore, social factors such as socioeconomic status, school district, and cultural or ethnic background, should be included in the measurement and sampling method. For instance, sampling of the community group from the same school district as that of the institutionalized group can rule out the effects of educational quality of the current residential area, which may indirectly affect social functioning or social stress. Entering these social factors to the regression analyses can rule out the effects of those factors and allow the less confounded examination of the link between child maltreatment and OT concentrations.

The selections of measures need careful consideration in future research. The use of another self-report instrument of measurement to test criterion- or convergent validity of CTQ-J should be considered. If maltreatment is assessed based on public records, multiple coders and systematic coding system should be utilized. Since literature indicates that public records of child maltreatment tend to underestimate the prevalence of maltreatment, another paper-and-pencil questionnaire or a structured interview should be used if feasible and appropriate. In this way, the gap could be minimized between the outcome variable and CTQ-J, which could be derived from the respondents' loyalty to their family, concerns for the potential consequences of their disclosure to the Child Guidance Center, or lack of

corroboration by other informants. Aside from the purpose of measurement of child maltreatment experiences, as previously described, administration of a face-to-face interview could be a useful tool to build rapport between the researcher and the study participant, which might foster honest responses on the part of participants. Also, interviews can result in positive emotional states in the participant such as a sense of personal gain when the interviewer provides emotional support and validation. Taking into account the invasive nature of inquiring about child maltreatment experiences, this is especially meaningful with regard to research ethics as well as cooperation of participants. Furthermore, measures which can be used to analyze the cutoff scores for four levels severity and the validity of the cutoff scores originally established (Bernstein & Fink, 1998) needs to be examined if the scores are to be applied to the Japanese population. Further analyses to establish construct validity of CTQ-J should also be conducted.

The assessment of OT concentration requires investigation on valid methods. Research which examines the validity of biological sample types (cerebrospinal fluid, saliva, plasma, and urine), the frequency of sample collection (single or multiple times), pre-assay processes (with or without extraction), and assay methodology (radio-immunoassay and enzyme-immunoassay) must be reviewed and the latest methodological data should be integrated into the research design. Moreover, genetics of OXTR should be included in future research, provided its interaction with child maltreatment and social functioning. Specifically,

research involving administration of exogenous OT administration or measuring OT concentrations in maltreated children needs to investigate differential effects of psychological or social treatment effects according to OXTR genotypes.

Finally, OT concentrations can be used as indices for the effect of treatment. For example, when we wish to know if an intervention, in which maltreated children and caregivers in alternative care give massages to each other in order to reinforce their bond, actually promotes OT production in these participants, we can test the change in salivary OT concentrations before and after the intervention. Likewise, salivary OT concentrations can be used as a physiological index to examine the efficacy of psychological interventions for improved social cognition, such as social skills training, or for facilitating attachment relationships. Unlike plasma or cerebrospinal fluid, collection of saliva is not invasive and can be safely conducted repeatedly even to vulnerable children. Thus, in addition to the participants' report of their own psychological and behavioral changes relevant to social functioning, salivary OT measurement can provide an objective index for the effects of specific interventions over the course of therapy.

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Appendices

Appendix A: Published Papers

Mizuki, R. (2022). Child Maltreatment, Oxytocin, and the Physiological Bases for Social

Functioning and Stress Reactivity: A Literature Review. *The journal of Konan*

University. Faculty of Letters., 172, 173-185.

Mizuki, R., & Fujiwara, T. (2021). Validation of the Japanese version of the Childhood

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Mizuki, R., & Fujiwara, T. (2021). Association between accumulation of child maltreatment

and saliva oxytocin level among Japanese adolescents. *Frontiers in pediatrics*, 1230.

Appendix B: Study Description and Informed Consent/Assent for Institutionalized Group

10代のころとからだ調査



子どものころの経験は10代の若者（中高生）にどのように影響しているのでしょうか？ 私たちは、小さいころの体験が、からだやころにどんな変化を及ぼしているかを調査しています。中高生のみなさんをお願いしています。健康診断には約45分、調査には追加で約15分ほどかかります。この調査によって、児童養護施設において必要な健康診断の項目がわかります。

ご協力いただきたい内容は...

健康診断の検査内容は...

① 尿検査

② 医師診察

③ 歯科診察

追加の内容は...

① 心拍測定（5分間人差し指で測ります）

② 血圧測定

③ 唾液の採取約15分のアンケート

やく ぶん アンケートの中には、ふかい かん 不快に感じたり、むかし おも 昔のことを思いだしてしま
う質問があるかもしれません。こた しまん むり こた 答えたくない質問には無理して答えなくて
いいです。つらい きもち になり さんか がつづけられないと思ったら、けんこうしんだん き
ている ちょうさいん でも、がくえん しょくいん でも、だれ 誰でもいいので、おとな つた
えてください。

この ちょうさ への さんか は じゆう であり、いつでも止めることができます。さんかどうい
を ちじつ と け 後日取り消ししたくなったら、がくえん えいせいだんとう つた 学園の衛生担当に伝えてください。

アンケートにはあなたの なまえ か 名前を書きませんので、こじん しきべつ 個人を識別できるような
こじんじょうほう はふくまれません。ちょうさいん かいとう 調査員にもあなたの回答はわかりません。ま
た、かいしゅう 回収したすべての じょうほう 情報はインターネットにつながっていないパソコンに
おいて ばんごう 番号で管理します。

健康診断の結果はあなたに返却しますが、ちようさけっか 唾液とアンケートの調査結果をあ
なたに へんきやく 返却することはありません。

けっか こじん 結果は個人がわからないような かたち 形でまとめて、がくじゅつがっかい がくじゅつざっし
ほうこくしょ 報告書に はっぴょう 発表します。

また、唾やアンケートなど ちょうさ あつ 調査で集めたものは ちょうさしゅうりょうご は き 調査終了後破棄します。

あなたと がくえん 学園に ちょうさひよう 調査費用の ぶたん いっさい 負担は一切ありません。

わからないこと、^{しつもん}質問などありましたら^{がくえん えいせいだんとう}学園の衛生担当まで^{れんらく}ご連絡して下さい。

^{きょうりょく}ご協力、^{まこと}誠にありがとうございます。



^{ちょうさせきにんしゃ}調査責任者：(独)^{こくりつせいいくいりょうけんきゅう}国立成育医療研究センター^{けんきゅうじょ}研究所

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どういしょ
同意書

どくりつぎょうせいほうじんこくりつせいいくりょうけんきゅうせんだー
独立行政法人国立成育医療研究センター 総長 五十嵐 隆 殿

わたしは「10代のころとからだ調査」について、以下の項目について十分説明を受
けました。

かきこうもくなかりかい
下記の項目の中で理解できたものにチェックして下さい。

- 1.調査の背景
- 2.調査の目的
- 3.ご協力をお願いするみなさま
- 4.ご協力いただきたい内容
- 5. この研究に参加することのメリット・デメリット
- 6. この研究への参加と同意・同意撤回について
- 7.個人情報保護について
- 8.検査結果のお知らせについて
- 9.研究成果の取扱いについて
- 10.試料・情報の保存について
- 11.費用について
- 12.研究責任者および問い合わせ先

じょうき
上記のすべての説明事項について理解したうえで、健康診断（問診、小児科
診察、身長・体重測定、血圧測定、一般検尿、歯科診察）、心拍測定、血圧
測定、唾液の採取およびアンケート調査に協力することに同意いたします。

へいせい
平成 年 月 日

なまえ
お名前

同意書

独立行政法人国立成育医療研究センター 総長 五十嵐 隆 殿

私は「10代のころとからだ調査」について、以下の項目について十分説明を受けました。

下記の項目の中で理解できたものにチェックして下さい。

- 1.研究の背景
- 2.研究の目的
- 3.ご協力をお願いするみなさま
- 4.ご協力いただきたい内容
- 5. この研究に参加することのメリット・デメリット
- 6. この研究への参加と同意・同意撤回について
- 7.個人情報の保護について
- 8.検査結果のお知らせについて
- 9.研究成果の取扱いについて
- 10.試料・情報の保存について
- 11.費用について
- 12. 研究責任者および問い合わせ先

上記のすべての説明事項について理解したうえで、下記の子どもが、健康診断（問診、小児科診察、身長・体重測定、血圧測定、一般検尿、歯科診察）、心拍測定、血圧測定、唾液の採取およびアンケート調査に協力することに同意いたします。

平成 年 月 日

施設名 _____

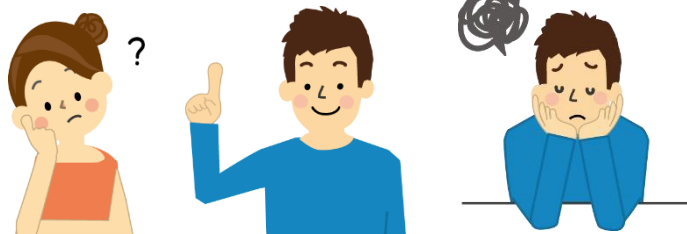
お子さんのお名前 _____

施設長のご署名 _____

ご連絡先 _____

Appendix C: Recruitment Flyer for Community Group

10代のころとからだ調査



10代の若者（中高生）はどのように成長しているのでしょうか？どんな気持ちを感じ、何を考え、それはからだとどうつながっているのでしょうか？子どもから大人に近づく大切な時期のそんな疑問に答えるために「10代のころとからだ調査」を実施することになりました。

ご協力いただきたいのは、中学生と高校生のみなさんです。

ご協力いただきたい内容は...

中学生・高校生

- ① 心拍変動測定（人差し指でピピーッと測ります）
- ② 血圧測定
- ③ 唾液検体の採取
- ③ 約15分のアンケート

家での生活、どんなふうに育てられたか、学校での生活、こころの状態等

保護者

- ① 約15分のアンケート

約15分のアンケートの中には、不快に感じたり、昔のことを思いだしてしまう質問があるかもしれません。答えたくない質問には無理して答えなくていいです。つらい気持ちになり参加が続けられないと思ったら調査員に伝えてください。

この調査への参加は自由であり、いつでも止めることができます。参加同意を後日取り消したくなったら、下記の調査責任者へ伝えてください。

アンケートにはあなたの名前を書きませんので、個人を識別できるような個人情報はいくつかありません。調査員にもあなたの回答はわかりません。また、回収したすべての情報はインターネットにつながらないパソコンにおいて番号で管理します。

調査結果をあなたに返却することはありません。

結果は個人がわからないような形でまとめて、学会・学術雑誌、報告書に発表します。

また、唾やアンケートなど調査で集めたものは調査終了後破棄します。

あなたに調査費用の負担は一切ありません。

わからないこと、質問などありましたら調査員か研究責任者までご連絡して下さい。

ご参加頂いた方には薄謝を進呈いたします。この調査への参加にご興味がある方は、保護者の方にこのチラシをお見せして、添付の「研究参加同意書」に保護者の署名をもらってきてください。よろしくお願いたします。



調査責任者：(独) 国立成育医療研究センター研究所
社会医学研究部 藤原武男
電話: 03-3417-2647

Appendix D: Study Description, Informed Consent/Assent for Community Group

10代のころとからだ調査



子どものころの経験は10代の若者（中高生）にどのように影響しているのでしょうか？

私たちは、小さいころの体験が、からだやころにどんな変化を及ぼしているかを調査しています。

中高生のみなさんにお願いしています。調査には約30分ほどかかります。

ご協力いただきたい内容は...

保護者の方は...

中高生のみなさんは...

③ 約15分のアンケート

④ 心拍測定（5分間人差し指で測ります）

⑤ 血圧測定

⑥ 唾液の採取

⑦ 約15分のアンケート

（家での生活、どんなふう^{そだ}に育てられたか、
学校での生活、ころの^{じょうたい}状態等）

やく15ぶん あんけーと なか ふかい かん むかし おも しつ
約15分のアンケートの中には、不快に感じたり、昔のことを思いだしてしまう質

もん があるかもしれません。こた 答えたくない質問には無理してこた 答えなくていいです。つ

らい 気持ちになり参加がつけられないと思ったら、ちようさいん つた 調査員に伝えてください、必要

であればちようさ 調査はいつでもちゆうし 中止できます。

このちようさ 調査へのさんか 参加はじゆう 自由であり、いつでもや 止めることができます。さんかどうい 同意をこじつ 後日

と け 取り消ししたくなったら、か き 下記のちようさせきにんしゃ 調査責任者にご連絡ください。

アンケートにはあなたのなまえ か 名前を書きませんので、こじん しきべつ 個人を識別できるような個人

じょうほう 情報はふくまれません。また、かいしゅう 回収したすべてのじょうほう 情報はインターネットにつなが

っていないパソコンにおいてばんごう 番号でかんり 管理します。

ちようさけっか 調査結果をあなたにへんきゃく 返却することはありません。

けっか こじん 結果は個人がわからないようなかたち 形でまとめて、がくじゅつがっかい 学術学会・がくじゅつざっし 学術雑誌、ほうこくしょ 報告書に

はっぴょう 発表します。

また、だえき 唾液やアンケートなどちようさ あつ 調査で集めたものはちようさしゅうりょうご は き 調査終了後破棄します。

あなたとあなたのほごしゃ 保護者にちようさひよう 調査費用のふたん 負担は一切ありません。

わからないこと、しつもん 質問などありましたらちようさいん か き 調査員か下記のちようさせきにんしゃ 調査責任者までご連絡して

下さい。

ごきょうりょく 協力、まこと 誠にありがとうございます。



ちようさせきにんしゃ 調査責任者：(独) 国立成育医療研究センター研究所

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ふじわらたけお 藤原武男

Tel: 03-3417-2663

どういしょ
同意書

どくりつぎょうせいほうじんこくりつせいいくりょうけんきゅうせんたー
独立行政法人国立成育医療研究センター 総長 五十嵐 隆 殿

わたしは「10代のころとからだ調査」について、以下の項目について十分説明を受けました。

下記の項目の中で理解できたものに☑チェックして下さい。

- 1. 調査の背景
- 2. 調査の目的
- 3. ご協力をお願いするみなさま
- 4. ご協力いただきたい内容
- 5. この研究に参加することのメリット・デメリット
- 6. この研究への参加と同意・同意撤回について
- 7. 個人情報保護について
- 8. 検査結果のお知らせについて
- 9. 研究成果の取扱いについて
- 10. 試料・情報の保存について
- 11. 費用について
- 12. 研究責任者および問い合わせ先

上記のすべての説明事項について理解したうえで、健康診断（問診、小児科診察、身長・体重測定、血圧測定、一般検尿、歯科診察）、心拍測定、血圧測定、唾液の採取およびアンケート調査に協力することに同意いたします。

平成 年 月 日

なまえ
お名前

同 意 書

独立行政法人国立成育医療研究センター 総長 五十嵐 隆 殿

私は「10代のころとからだ調査」について、以下の項目について十分説明を受けました。

下記の項目の中で理解できたものに☑チェックして下さい。

- 1.研究の背景
- 2.研究の目的
- 3.ご協力をお願いするみなさま
- 4.ご協力いただきたい内容
- 5. この研究に参加することのメリット・デメリット
- 6. この研究への参加と同意・同意撤回について
- 7.個人情報の保護について
- 8.検査結果のお知らせについて
- 9.研究成果の取扱いについて
- 10.試料・情報の保存について
- 11.費用について
- 12. 研究責任者および問い合わせ先

上記のすべての説明事項について理解したうえで、心拍測定、血圧測定、唾液の採取およびアンケート調査に協力することに同意いたします。

平成 年 月 日

お子さんのお名前 _____

保護者のご署名 _____ (続柄： _____)

お子さんのご署名 _____ (年齢： _____ 才)

Appendix E: Child Questionnaire for Institutionalized group

だい ちょう さ
10代のころとからだ 調査しつもん し
質問紙こ き にゆうよう
～子ども記入用～

き にゆう ぶんてい ど きょうりよく なにとぞ
記入には15分程度かかりますが、ご協力のほど、何卒よろしくお
ねが
願いします。

まず、あなたのことについて伺います。

ねんれい 年齢 _____ さい 才 せいべつ 性別 おとこ 男 ・ おんな 女

かあ お母さんのねんれい 年齢 _____ さい 才 とう お父さんのねんれい 年齢 _____ さい 才

これまでの人生の体験についてお尋ねします。質問は個人的な内容を含んでいますが、できるだけ正直に答えて下さい。それぞれの質問について、あなたが最も適していると感じる選択肢に○を付けてください。

		全 く 当 て は ま ら な い	ほ と んど 当 て は ま ら な い	と き ど き 当 て は ま る る	よ く 当 て は ま る る	と ち も よ く 当 て は ま る る
1	た 物の じゅうぶん な 食べ物 が 十分に 無かった	1	2	3	4	5
2	めんどう 面倒 を みて くれたり、まもって だれ 守って くれる 誰か が いると し 知っていた	1	2	3	4	5
3	かぞく ひと わたし 家族 の 人は、私 の ことを「ばか」とか「なまけも の」とか「ぶさいく」などと 呼んだ	1	2	3	4	5
4	りょうしん さけ まやく す 両親 は、お酒 あるいは 麻薬 を やり 過ぎて 家族 の めんどう みる でき 面倒 を 見る ことが 出来 なかった	1	2	3	4	5
5	じぶん たいせつ とくべつ ほんざい おも 自分 は 大切 で 特別な 存在 だと思わ せて くれる 人 かぞく が 家族 に いた	1	2	3	4	5
6	よご ようぶく き 汚れた 洋服 を 着 なければ なら なかった	1	2	3	4	5
7	あい 愛 されて いると 感じて いた	1	2	3	4	5
8	わたし う りょうしん のぞ 私 が 生まれる ことを 両親 は 望ん で いな かつ たと思 った	1	2	3	4	5
9	かぞく だれ な ぐ いしゃ み 家族 の 誰か に ひどく 殴 られて、医者 に 診て もら っ たり、病 院 に 行 った	1	2	3	4	5
10	かぞく か なに 家族 について 変えたい ことは 何も なかった	1	2	3	4	5

		全 ^{まった} く ^あ ま ^あ は ^あ ま ^あ ら ^あ な ^あ い	ほ ^あ と ^あ と ^あ ま ^あ は ^あ ま ^あ ら ^あ な ^あ い	じ ^あ じ ^あ ま ^あ は ^あ ま ^あ ら ^あ な ^あ い	よ ^あ く ^あ ま ^あ は ^あ ま ^あ ら ^あ な ^あ い	よ ^あ く ^あ ま ^あ は ^あ ま ^あ ら ^あ な ^あ い
11	かぞく だれ なく 家族の誰かに殴られて、その傷跡が残った	1	2	3	4	5
12	ベルト、棒、ひも、あるいは何か硬い物などで罰せられた	1	2	3	4	5
13	かぞく ひと 家族の人たちは、互いの面倒を見た	1	2	3	4	5
14	かぞく ひと 家族の人たちは、私を傷つけたり、侮辱するこ とを言った	1	2	3	4	5
15	しんたいきぎやくたい う おも 身体的虐待を受けたと思っている	1	2	3	4	5
16	かんべき こ じだい 完璧な子ども時代だった	1	2	3	4	5
17	はげ なく たた 激しく殴ったり叩かれたりして、その傷跡を先生 や近所の人あるいはお医者さんに気付かれた	1	2	3	4	5
18	かぞく だれ にく 家族の誰かに憎まれていると感じていた	1	2	3	4	5
19	かぞく ひと 家族の人たちは互いに親しみを感じていた	1	2	3	4	5
20	だれ せいてき わたし ふ わたし だれ 誰かが、性的に私に触れようとしたり、私が誰 かを性的に触るようにし向けたりした	1	2	3	4	5
21	せいてき こうい わたし きす わたし 性的な行為をしないなら、私を傷つけたり、私 についてのうそを触れ回ったりすると脅された	1	2	3	4	5
22	わたし かぞく せかいいち 私の家族は世界一だった	1	2	3	4	5

		全 ま あ	ほ あ	じ あ	よ あ	よ あ
23	だれ せいとき こうい 誰かに性的な行為をするように、あるいは性的な ことを見るようにし向けられた	1	2	3	4	5
24	せいとき いたすら 性的な悪戯をされた	1	2	3	4	5
25	しんりてき ぎゃくたい おも 心理的に虐待されたと思っている	1	2	3	4	5
26	ひつよう とき だれ いしゃ つ い 必要な時には、誰かが医者に連れて行ってくれた	1	2	3	4	5
27	せいとき ぎゃくたい おも 性的に虐待されたと思っている	1	2	3	4	5
28	か そく ちから みなもと わたし ささ 家族は力の源であり、私を支えてくれた	1	2	3	4	5

Appendix F: Caregiver Questionnaire for Institutionalized Group**10代のころとからだ調査****質問紙
～大人記入用～**

この度はご協力ありがとうございます。

IDのお子さまとそのご家族の状況について、ご記入ください。記入には15分程度かかりますが、ご協力のほど、何卒よろしく申し上げます。

IDのお子さんがご家族と離れて、社会的養護で過ごした期間についてお伺いします。
それはいつで、どういった場所で暮らしていましたか。

例) 子どもが(0)歳 ~ (2)歳のとき(生活場所: 乳児院)
 子どもが(2)歳 ~ (10)歳のとき(生活場所: 児童養護施設)
 子どもが(13)歳 ~ (現在)歳のとき(生活場所: 児童養護施設)
 子どもが()歳 ~ ()歳のとき(生活場所:)

- ① 子どもが()歳 ~ ()歳のとき(生活場所:)
 ② 子どもが()歳 ~ ()歳のとき(生活場所:)
 ③ 子どもが()歳 ~ ()歳のとき(生活場所:)
 ④ 子どもが()歳 ~ ()歳のとき(生活場所:)

C. IDのお子さんが施設に入所した理由は何ですか。

()

D.IDのお子さんの出生地はどこですか。

_____都・道・県・府 _____市・区

E.IDのお子さんが施設に来る前に養育者と住んでいた地域はどこですか。

_____都・道・県・府 _____市・区

以上です。ご協力、誠にありがとうございました。

Appendix G: Caregiver Questionnaire for Community Group

10代のころとからだ調査

質問紙 ～大人記入用～

この度はご協力ありがとうございます。

お子さまとご家族の状況について、ご記入ください。記入には 15 分程度かかりますが、ご協力のほど、何卒よろしく申し上げます。

Acknowledgements

Undertaking this doctoral dissertation has been a daunting process for me academically and personally and its completion would not have been possible without the help, guidance, and encouragement that I received from many individuals throughout this process.

I would like to acknowledge and sincerely thank my dissertation committee for your dedication to furthering my education. I would first like to thank my advisor, Dr. Shigeyuki Mori, without whom I would not have been able to complete this dissertation. Your incredible depth and insight in psychology always inspired me to connect my experiences to theoretical concepts, which helped me develop as a scholar. You have always been positive and supportive of me even when I almost gave up on my research project, and taught me the importance to continue pursuing what I interested in and passionate about, which is to understand those who have been hurt and marginalized in society.

I would also like to thank Dr. Megumi Kitagawa, who despite her enormously demanding schedule read the drafts and offered constructive and encouraging feedback. I have been grateful and honored by your support for my research on attachment theory, and I learned so much about the application of theoretical concepts and psychological instruments to clinical contexts.

Thank you, Dr. Kentaro Nakatani, for agreeing to be on my dissertation committee member and providing your insightful and critical comments which made me aware of the importance of the fundamentals of research. Also, I appreciated greatly Dr. Tomoko Ikegami who had joined the committee at a late stage of the dissertation process. Your genuine and pertinent feedback helped me recapture my research with a new viewpoint and helped deepen my understanding of my own research.

I would like to express my sincere gratitude to Dr. Takeo Fujiwara for allowing me to use his dataset, which I helped collect as a part of his child maltreatment research project, for

my doctoral dissertation. You worked with me intensively and the rigorous training on empirical research you extended me ever since we met in Hawaii, has been a source of major motivation for me to continue working on my research. Without your support, this dissertation was not possible.

I am heartily thankful to Dr. Makiko Okuyama and Professor Satoru Nishizawa who have provided advice on my career and introduced Dr. Mori to me. My doctoral studies started with Dr. Okuyama's strong encouragement to me to pursue a doctorate degree. Professor Nishizawa, you have been the key person to my career changing encounters with Dr. Fujiwara and Dr. Mori. Working with you two taught me how important it was to have a team of other professionals who share the same passion and support each other.

I would like to express my special appreciation to Dr. Makiko Deguchi who generously spent numerous hours reading my drafts at short notice and provided critical feedback. Also, your warm but strong encouragement to me to keep writing the manuscript everyday despite my own doubts enabled to keep me on track and complete the dissertation. Makiko, thank you for supporting me especially at the most difficult stage of my writing process.

I am so grateful to my friend, Mika Nitta who, despite the distance and time lag between us, has always been there to be an excellent sounding board for me and made me realize what my next steps ought to be. Your insightful comments as a clinical psychologist on my clinical work as well as your enthusiasm in sharing each other's views have been essential for me to move forward.

My special thanks to all of my friends, Q-sama, Wakamatsu-san, Hisayo-san, Maiko-san, and Sawaki-san, who communicated with me in so many different ways that I could finish the dissertation.

I would like to thank boys and girls as well as their caregivers who have participated

in my research. Thank you for your time and cooperation. Especially, to the boys and girls in alternative care, your patience and open-mindedness inspired me to embark on this research project and you taught me a lot about the meaning of life.

To my sister, Yoshie, thank you for being there and encouraging me to challenge. I could not have made it to this point of having completed my dissertation without your tough love and unwavering support.