

The Treatment Hypothesis of Yoga for Children with School Refusal, and Attempt to Building a Comprehensive Support Network Led by Family Doctors

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Abstract

School refusal is defined as child-motivated non-attendance related to emotional distress experienced in connection with academic or social situations in school or home. Even though school refusal is not a formal psychiatric diagnosis, children has several somatic and psychological problems such as abdominal pain, headache, nausea. In the case of school refusal, it is suggested that interpersonal problems (e.g., violence, bullying) that have occurred school or home are triggered chronic stress. Under the chronic stress condition, abnormal activity of hypothalamic-pituitary-adrenal axis, autonomic nervous, enteric nervous system, and increases in blood cortisol level were reported. These abnormality lead to abdominal pain, headache, nausea. The practice of yoga with a focus on the unification of the mind, body, and spirit through the practice of physical movements, meditation and breathing exercises. During yoga practices, it can also regulate physiological stress responses. Especially, yoga has beneficial effects on the autonomic nervous system and enteric nervous system though hormonal changes associated with stress in children with school refusal is suggested. It will be possible to work with relevant institutions to develop specific therapeutic programs for children whose health has improved.

Keywords: Yoga, school refusal, comprehensive support network, family doctors.

Introduction

School refusal is defined as child-motivated non-attendance related to emotional distress experienced in connection with academic or social situations in school or home (Havik et al., 2014; Yamada et al., 2020). Children with school refuse is not attend school, leave during the school day, present protests, or tantrums prior to school (King & Bernstein, 2001). School refusal is one of the serious emotional problems in children and youth that associated with significant short and long term sequelae (Fremont, 2003; Li et al., 2023). As short term sequelae, poor academic performance, family difficulties, and problems with peer relationships were reported (Hersov, 1972). As long term sequelae, previous studies (e.g., Bernstein et al., 2001; Flakierska-Praquin et al., 1997) indicated that the relationships between school refusal and academic underachievement, employment difficulties, risk for psychiatric illness. When considering children's future, school refusal is one of the issues that should be of concern.

Focused on another aspect on school refusal, previous review study (Li et al., 2021) also indicated that even though school refusal is not a formal psychiatric diagnosis, children has several somatic and psychological problems such as abdominal pain, headache, nausea, vomiting, muscular or joint ache, diarrhea,

dizziness, fatigue, palpitation, anxiety, and depression. Abdominal pain, headache, and nausea were account for a large percentage of somatic symptom in children with school refusal (Li et al., 2021). According to Li et al. (2021), these somatic symptoms in children with school refusal were always increasing in after weekend and holidays, morning before school, and during school time. And, these symptoms were decreasing if the children have stayed or returned home, or during weekends and holidays. Interestingly, these symptoms are not malingering, and the pathogenesis mechanism from bio/neurological perspective behind these is little unknown.

Children with school refusal is continue to increasing in Japan (Ministry of Education, Culture, Sports, Science and Technology, 2024). Approximately 3% of children are absent from school (Ministry of Education, Culture, Sports, Science and Technology, 2024). As well as neighboring state, several somatic symptoms are high percentage in these children (Ministry of Education, Culture, Sports, Science and Technology, 2024). The national and local governments have devised support measures, but they are not yet widespread.

Therefore, based on these, we discuss the pathogenesis mechanism of somatic symptoms in children with school refusal from bio/neurological perspective, and possibility of the effect of yoga for children with school refusal in this article. Finally, to create a society where all children can live comfortably, we argue about building a comprehensive longitudinal support network led by family doctors.

Chronic stress and several somatic symptoms in children with school refusal (Figure1)

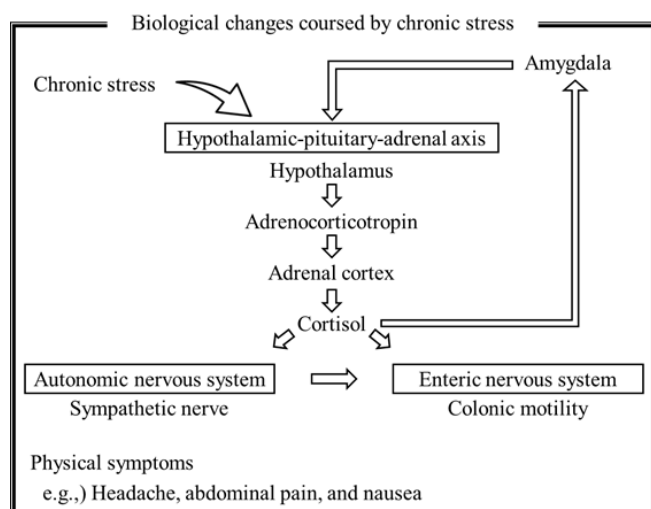


Figure 1: The affects of chronic stress for one's biological systems

There is well known things about the effects stress for one's physical condition. According to review articles (Gulliams & Edwards, 2010; Leigh et al., 2023; Ulrich-Lai & Herman, 2009), When brain has detected a disruption in homeostasis (a stressor), stress response system such as hypothalamic-pituitary-adrenal axis system, autonomic nervous system, and enteric nervous system were driven. According to Gulliams and Edwards (2010), when the activating in hypothalamus is triggered by a stressor, corticotropin-releasing hormone and arginine vasopressin are secreted, eliciting both the production of adrenocorticotropin hormone from the posterior pituitary and the activation of the noradrenergic neurons of the locus caeruleas/norepinephrine system in the brain. Adrenocorticotropin hormone drives the production of cortisol from the adrenal cortex. Autonomic nervous system also provides the most immediate response to stressor exposure via its sympathetic and parasympathetic arms that provoke rapid alterations in physiological states (Ulrich-Lai & Herman, 2009). Corticotropin-releasing hormone and sympathetic nerve activation both are induced by stress affect for enteric nervous system (Leigh et al., 2023). For example, corticotropin-releasing hormone is important modulators of enteric nervous system neuronal activity and motility through activation of corticotropin-releasing hormone receptors. Sympathetic nerve activation leads to the secretion of noradrenaline at peripheral site including gastrointestinal. Sympathetic noradrenergic fibers modulate intestinal motility. Under normal conditions, the production of corticotropin-releasing hormone and

adrenocorticotropin hormone fluctuate in a predictable circadian cycle and are inhibited by high levels of blood cortisol via a well-described negative feedback loop. Similarly, sympathetic nerve activity is suppressed and parasympathetic nerve activity is increased by circadian cycle. These changes alter the activity of enteric nervous system to return to normal.

Under the chronic stress condition, these systems have several abnormal activity. For example, chronic stress distrupts the negative feedback system of corticotropin-releasing hormone and adrenocorticotropin hormone, and it leads to hyperactivation of the hypothalamic-pituitary-adrenal axis system and maintains high level in blood cortisol (Gałdek-Michalska et al., 2013; Gong et al., 2015; Laryea et al., 2013; Teixeira et al., 2015). The chronically elevated blood cortisol level suppressed serotonin that is one of the neurotransmitters in the central nervous system and as a regulatory hormone controlling a broad range of physiological functions such as control of mood, sleep and anxiety and peripherally in the modulation of gastrointestinal motility (Jones et al., 2020; Tafet et al., 2001). The amygdala is a brain nucleus that is important for the integration of the body's neurophysiologic responses to stress, as well as modulating the perception is increasing activation by cortisol, and it leads to abnormal activity of hypothalamic-pituitary-adrenal axis (Greenwood-Van Meerveld & Johnson, 2018). There was also indicated that chronic stress condition induced autonomic nervous dysfunction such were hyperactivation in sympathetic nerve and hypoactivation in parasympathetic nerve (Fonkoue et al., 2021). This hyperactivation in sympathetic nerve is enhancing corticosterone production following chronic stress (Lowrance et al., 2016). Increased cortisol that induced by hyperactivity in both hypothalamic-pituitary-adrenal axis and sympathetic nerve in chronic stress is affected to one's enteric nervous system. For example, Blin et al. (2023) reported that stress-induced increases in colonic motility are dependent on glucocorticoid receptor signaling. According to previous evidences, both hyperactivation in sympathetic nerve and increased cortisol during chronic stress were related to abdominal pain, headache, and nausea (Puzanovova et al., 2009; Sowder et al., 2010; Peroutka, 2004; Venkatesan et al., 2010). In the case of school refusal, it is suggested that interpersonal problems (e.g., violence, bullying) that have occurred school or home are triggered chronic stress, regardless of whether the children participates in school or not. Their hypothalamic-pituitary-adrenal axis, autonomic nervous and enteric nervous system activities already might have changed. Refusal children experience emotional upset and unexplained physical symptoms such as abdominal pain, headache, and nausea, when they faced with the prospect of having to attend school (Berg, 1997). This may be symptoms caused by acute stress being added to hypothalamic-pituitary-adrenal axis, autonomic nervous and enteric nervous system which have been changed by chronic stress. If our hypothesis is correct, a hormone that normalizes the activities of hypothalamic-pituitary-adrenal axis, autonomic nervous and enteric nervous system, and intervention method that promote its production are needed.

The effects of oxytocin for headache, abdominal pain, and nausea

Oxytocin is a non a-peptide hormone containing nine amino acids, with one disulphide linkage between the 1st and 6th cysteine residue (Roopasree, 2019). Oxytocin is produced by magnocellular neurosecretory cells within the paraventricular nucleus and the supraoptic nucleus in the hypothalamus (Carter & Keverne, 2002; Gimpl & Fahrenholz, 2001; Quintana & Guastella, 2020). Oxytocin has both peripheral and central effects. As central effects of oxytocin, oxytocin acts as a neuromodulator, altering the activity of other neurons including the prefrontal cortex and basal areas of the limbic system (e.g., the hippocampus, amygdala and nucleus accumbens). As peripheral effects of oxytocin, oxytocin increases activity of parasympathetic nervous system (Kemp et al., 2012). Yeğen et al. (2010) also indicated that oxytocin restrain the activity within the hypothalamic-pituitary-adrenal axis system. According to Liu et al. (2024), oxytocin is involved with several physiological functions in the enteric nervous system, such as modulation of motility, gastric secretion, mucosal integrity, and colonic permeability. Focused on the relationships between oxytocin, and headache, abdominal pain and nausea these are caused by chronic stress, Kremsmayr et al. (2024) revealed that oral administration of oxytocin displayed significant analgesia in abdominal pain. Tzabazis et al. (2017) reported that oxytocin was significantly pain reduction in headache. Boulet et al. (2016) showed that oxytocin have decreased nausea. Therefore, it is suggested that oxytocin is one of the effective hormone for headache, abdominal pain, and nausea. Rather than oral administration, new interventions that promote producing oxytocin may be able to reduce and prevent headache, abdominal pain, and nausea. One of the key benefits of yoga is that it increases the levels of the oxytocin. In the next section, we will discuss about the treatment hypothesis of yoga for headache, abdominal pain, and nausea.

The effects of yoga, and tis treatment hypothesis (Figure 2)

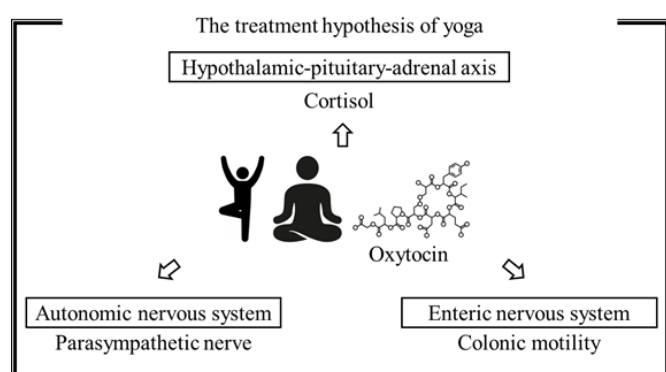


Figure 2 : The effects of yoga for one's biological systems

A 3000 year old tradition, yoga, is now regarded in the Western world as a holistic approach to health and is classified by the National Institutes of Health as a form of Complementary and Alternative Medicine (Williams et al., 2003). The practice of yoga with a focus on the unification of the mind, body, and spirit through the practice of physical movements, meditation and breathing exercises (Gothe et al., 2019). The physical

benefits of yoga include improved flexibility, mobility, core body strength and balance. During yoga practices, it can also regulate physiological stress responses. Especially, yoga has beneficial effects on the autonomic nervous system and enteric nervous system though hormonal changes associated with stress is suggested. For example, According to previous studies Höglström et al. (2021); Korterink et al. (2016) yoga have significantly reduced abdominal pain. Raghevendra et al. (2007) have reported that yoga intervention had significantly reduced frequency and intensity of nausea. Anheyer et al. (2019) showed that yoga have significantly improving frequency, duration, and intensity of the headache. As treatment mechanism of yoga for headache, abdominal pain, and nausea through one's oxytocin, our previous study (see review Shiota, 2024) suggested that asana points to specific physical postures that involve using the entire body especially cervical spine, thoracic spine, lumbar spine, and pelvis during yoga practice. For example, exercises of lumbar vertebrae T5–T12 stimulate the lateral nucleus of the sympathetic interstitium. It is input into the adrenal medulla via the greater and lesser splanchnic nerves, where enkephalins are produced. Enkephalins specifically bind to opioid receptors and affect analgesia, body temperature regulation, and feeding behavior. oxytocin is produced in the hypothalamus posterior pituitary, and this process is induced by enkephalin (Hirose et al., 1997). The pelvic floor muscles are located at the bottom of the pelvis between the coccyx and ischia. The pelvic floor muscles are involved in maintaining the organs in the pelvis, such as the bladder, uterus, and intestines, in the correct position (Bali et al., 2023), and are also involved in estrogen production (Ramadan et al., 2022). As well as the effects of asana, breathing technique of yoga is also increasing oxytocin levels (Bellosta-Batalla et al., 2020). Based on these, it is suggested that yoga improve symptoms of abdominal pain, nausea, and headache though changes in autonomic nervous system, enteric nervous system, and hormonal system. Focused on the effects of yoga for school refusal, previous studies (Amitani et al., 2022; Kawazu et al., 2024) indicated that yoga was one of the effective intervention for them. However, there is fully unknown about therapeutic mechanism of yoga for them. And, if school refusal is a state based on physical symptoms, it is recommended that yoga be performed at a medical institution. In the next section, we will about attempt to building a comprehensive support network by yoga for children with school refusal led by family doctors.

Attempts to Building a Comprehensive Support Network Led by Family Doctors

Family doctor is defined as a doctor who can be consulted on many matters, is well-versed in the latest medical information, can refer patients to specialized medical institutions when necessary, and has the comprehensive capabilities to provide local medical care, health, and welfare services that are close and reliable (Ministry of Health, Labour and Welfare, 2013). In addition to providing daily medical care, family doctors build relationships with local residents and actively participate in social and administrative activities surrounding local medical care, such as health consultations, maternal and child health, school health, and community health, as well as work in cooperation with health, nursing, and welfare professionals

(Ministry of Health, Labour and Welfare, 2013). Even though it is both child health and school health were activities of family doctors medical care for school refusal has not progressed in Japan (Mitsubishi UFJ Research and Consulting, 2025). The reason for this is shortage of child mental health specialists. And, there are few opportunities to connect with other organizations. It is not realistic to provide adequate care for each children with school refusal who has physical symptoms. So, one-to-many treatment is required instead of one-to-one treatment. It is also important to improve physical condition rather than focusing on past causes in children with school refusal. Yoga that suggested improve physical symptoms in children with school refusal can be practiced one-to-many. It is easy to perform and non-invasive. If an outside facility could be set up where yoga could be practiced and regular checkups could be conducted, the children's physical health will be managed. It will be possible to work with relevant institutions to develop specific therapeutic programs for children whose health has improved. The purpose of this initiative is to have family doctors take the lead in promoting health education. By attending yoga classes weekly and attending medical examinations at the same time, longitudinal data can be obtained. These data capture the changes that occur during an individual's recovery from stress, and can be used as a reference if a similar situation arises. This could also provide insight into the physical changes that underlie the state of school refusal.

Conclusion

In this article, we discuss about the biological mechanism of abdominal pain, nausea, and headache in children with school refusal. Then, we explain the treatment hypothesis of yoga for physical symptoms in children with school refusal, and attempt to building a comprehensive support network led by family doctors. Children who are not attending school are likely unable to do so because their physical symptoms persist or worsen. In Japan, medical and welfare facilities are still not able to intervene. Therefore, we intend to build a new support network and operate a system that will support individuals throughout their lives.

Running Head : Comprehensive support network using yoga and family doctors

Contributors

Wrote the manuscript: KK and SS. All authors have approved the final article.

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Conflict of Interest

The authors have no conflicts of interest to declare

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