Welcome to the fourth volume of *Inkblot*!

We could not be more pleased to bring you this year’s edition of original undergraduate work from the Department of Psychology at the University of Toronto. This has been a tumultuous school year with a few months of uncertainty due to the strike; however, we are proud of our editorial board, authors, and advisory boards for keeping strong.

We feel that this year’s work was exceptional. Being chosen for publication is no easy task and this year, we received over 80 submissions. For the first time, we not only received submissions from the St. George campus, but also received a large amount from the Scarborough and Mississauga campuses. The enthusiasm from our undergraduate body speaks to the passion and dedication that is characteristic of the psychology discipline.

In this volume of *Inkblot*, we aimed to showcase a variety of topics which represent different subfields of psychology, including social, abnormal and developmental psychology, and cognitive neuroscience.

We had an amazing time as editors-in-chief and could not have asked for a more dedicated team to work with. We would also like to especially thank Dr. Suzanne Ferber and the Department of Psychology for their continued support throughout the years.

We hope you enjoy this journal as much as we did making it.

Best Regards,

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Behavioural Cues for the Perception of Victim Vulnerability

Nivetha Prabaharan

Abstract
Research suggests that there are specific nonverbal behaviours, which could be perceived as vulnerable, that make the individual more susceptible to physical or sexual attack. In particular, gait, body language, and facial expressions are major components in the perception of an individual’s vulnerability to victimization. Findings pertaining to gait indicate that individuals who walk with shorter strides, lateral weight shifts, constrained arm swings, and walk at a slower pace are perceived as more vulnerable to attack by potential perpetrators. The literature on body language has identified individuals who use more hand and foot gestures, rather than arm and leg movements while conversing as more susceptible to an assault. Research on facial expressions has found that individuals with neutral, sad, fearful or shameful facial emotions are perceived as more vulnerable and weak. Furthermore, social predators are more inclined to use specific behavioural criteria when selecting potential victims. Individuals scoring high on the Self-Report Psychopathy Scale: Version III and the Psychopathy Checklist-Revised have increased accuracy at identifying potentially vulnerable victims based on the victim’s appearance and behaviour. This review highlights the relationship between non-verbal behaviours and the perception of vulnerability, implying the role of awareness as a preventative measure against victimization.
tums could be exhibiting vulnerability by the length of their strides or the gestures they use while conversing with others.

This paper will examine the literature to determine which nonverbal behaviours expressed by potential victims make them distinct and susceptible to assault. Specifically, the present paper will focus on how nonverbal behaviours such as, gait, body posture, gait, and age. The inmates who scored higher on measures of psychopathic traits primarily used gait to make their assumptions. This research suggests that the inmates attributed particular aspects of nonverbal behaviour, such as gait and body posture, to the individual’s internal traits. Specifically, the researchers suggested that the inmates were associating these aspects with a vulnerable and weak personality. Social predators rely on these revealing nonverbal cues when selecting their prey (Wheeler et al., 2009). The findings also suggest that the cunning traits of a psychopath make them more attuned to handpicking easy-to-attack victims. Their lack of empathy and remorse (Hare, 1993) allows them to focus their attention on nonverbal cues, such as gait, to facilitate deception and exploitation of others.

On the other hand, research investigating the kinematics of gait suggests that the vulnerable gait of a victim can be summed up into a simple algorithm of its various aspects (Gunns et al., 2002; Johnston, Hudson, Gunns, & Garner, 2004; Sakaguchi & Hasegawa, 2006). This implies that anyone, not just psychopaths, can select easy-to-attack victims by simply observing a potential victim’s gait and applying the algorithm. To determine what the algorithm encompasses, a study was conducted to examine the specific characteristics of gait, which result in the perception of victim vulnerability. Gunns et al. (2002) asked 30 non-criminal men and 30 non-criminal women to rate the ease-of-attack of people walking. The results demonstrated that females were considered easier to rob or rape if their gait was characterized by shifting their weight laterally or forward and back, lifting their feet, displaying limited arm swing, having low energy and high constraint, a slow pace, and short strides. Men were considered easier to physically attack when they walked with shorter strides, decreased energy, increased constraint, and if they had lower weight. In general, individuals do not pay attention to the length of their strides or the speed at which they walk. However, these aspects are easily observable to anyone seeking out a potential victim. Self-awareness of these nonverbal cues could save an individual from physical attack. Altering aspects of walking style can decrease ease-of-

**Gait**

Gait, a person’s manner of walking, can be characterized by speed, hip sway, stride length, arm swing, knee bend, and bounce (Gunns et al., 2002). Variations of these aspects can give a social perceiver a plethora of information regarding the individual’s personality, age, energy, and vulnerability to victimization (Book et al., 2013). Rapists and murderers, such as Ted Bundy, rely on this information when selecting potential victims. Ted Bundy was one of the most notorious serial killers in American history. Although he confessed to committing thirty homicides within the span of four years, his former attorney later claimed that Bundy had confided in him that his total list of victims exceeded one hundred (Epstein, 2012). Bundy was known for his charming personality, paucity of remorse, and most importantly, his unsettling and upfront appetite for murder. During an interview, he claimed, he could “tell a victim by the way she walked down the street, the tilt of her head, [and] the manner in which she carried herself” (Holmes & Holmes, pp. 221). This idea that Ted Bundy was able to determine a woman’s vulnerability by observing nonverbal behaviours such as gait is compelling, and could quite possibly have been his greatest asset when selecting potential victims.

To test whether there was any truth to Bundy’s claim, a study on a sample of inmates in a maximum-security prison in Ontario attempted to decode the behaviours that identified individuals as potential victims (Book et al. 2013). The inmates in the study were asked to provide a rating of vulnerability after having watched a video clip of an individual walking. In addition to this, the inmates were asked to indicate the specific criteria used to make their evaluations. These criteria included, but were not limited to, the person’s fitness, body type, body posture, gait, and age. The inmates who scored higher on measures of psychopathic traits primarily used gait to make their assumptions. This research suggests that the inmates attributed particular aspects of nonverbal behaviour, such as gait and body posture, to the individual’s internal traits. Specifically, the researchers suggested that the inmates were associating these aspects with a vulnerable and weak personality.
help to pinpoint possible victims. The dominance or submissiveness exuded by a woman in a social situation plays an integral role in the perception of her vulnerability (Hareli, Shomrat, & Hess, 2009; Richards, Rollerson, & Phillips, 1991). In particular, research has found that submissive women are more likely to be sexually attacked in comparison to dominant women (Richards et al., 1991). While socially dominant women often implicitly project assertiveness and powerfulness through nonverbal behaviours (Murzynski & Degelman, 1996), socially submissive women tend to project passivity and other implicit behaviours that express conformity to authority (Hareli et al., 2009). Perpetrators can visually distinguish between dominant and submissive women based on these nonverbal behaviours, including the body language they express. Research has shown that dominant women tend to use larger limb movements and shift their weight more often while standing, whereas submissive women use smaller hand movements, foot movements, and hold postures for longer periods of time (Richards et al., 1991). These results suggest that social perceivers easily interpret nonverbal cues and associate aspects of behaviour to the subject’s personality and vulnerability.

Body Language
Body language encompasses the fluidity of limb movements, the degree to which arm and hand gestures are used, leg movements, and shifts in weight. Variations in body language can convey different meanings and internal traits to social perceivers. In a study investigating the aspects of body language, which elicit vulnerability to victimization, researchers asked 53 inmates in a minimum-security prison to view videotapes of people walking on the sidewalk (Grayson & Stein, 1981). The inmates were instructed to evaluate the person’s body language, and provide a rating of their vulnerability to assault. The findings indicated that there are three specific components of body language that suggest the potential victim’s vulnerability, which include body weight shifts, type of walk, and specific body-limb movements. In terms of body weight shifts, an individual was more likely to be perceived as a victim if they shifted their body in a lateral, diagonal, or up and down direction, rather than forward and back. Also, a perceived victim is more likely to walk gesturally (activate the entire body) rather than posturally (activate only part of the body). In regards to body-limb movements, unilateral movements rather than contralateral movements are indicative of being perceived as a victim. Unilateral body-limb movements are classified as moving one side of the body, whereas contralateral movements are classified as moving both sides of the body (right arm and left leg, or left arm and right leg). Furthermore, non-victims’ movements were characterized as smooth and organized, whereas the body language expressed by victims was described as awkward and disjointed. Body language characterized by reduced synchronization and fluidity in a person’s movements often lead to the perception that the individual is more vulnerable to victimization (Murzynski & Degelman, 1996). Therefore, in accordance with gait, body language can also help to pinpoint possible victims.

Facial Expression
Facial expressions are external displays of what people are feeling internally; they serve as an excellent tool for social perceivers to decipher an individual’s emotions. In many cases, perpetrators select their victims by first examining their potential victim’s facial expression. For example, physical attackers tend to avoid people with an assertive expression because it indicates a possible threat of danger. Individuals identified with increased psychopathic tendencies have been found to be effective at judging the assertiveness of others by their facial expression (Book et al., 2007). Assertive individuals are perceived to be more likely to retaliate during a physical attack, which would not make them an easy victim. However, individuals with a sad or distracted expression may be perceived as having their defenses lowered, making them easier targets for physical assault (Wheeler et al., 2009). Consistent with the evidence presented on gait and body language, certain facial expressions can also suggest an individual’s vul-
nerability to victimization.

As previously discussed, psychopaths have the ability to observe and evaluate gait and body language, which may signify an individual’s vulnerability. Research suggests that psychopaths are also accurate at pinpointing potential victims based on their facial expressions (Book et al., 2007). It is puzzling that psychopaths can be accurate at detecting facial expressions and emotions due to their own inability, or decreased tendency, to feel emotions such as empathy, remorse, and fear (Hare, 1993). Researchers have conducted studies to provide an explanation for this emotional paradox (Book et al., 2007; Lorenz & Newman, 2002). On the Psychopathy Checklist-Revised (PCL-R; Hare 1991), Factor 1 makes up the interpersonal and affective component, including symptoms of reduced affect, and lack of empathy and remorse. Individuals scoring high for Factor 1 are characterized by manipulation and superficial charm (Hare, 1993). To compensate for the reduced affect experienced by psychopaths, social cues, such as facial expressions, are used to make sense of and manipulate social situations. This is supported by research suggesting that psychopaths are highly accurate at identifying emotions (Wheeler et al., 2009) and rating the intensity of emotions (Book et al., 2007).

In addition to perceiving assertiveness through facial expressions, social dominance and submissiveness can also be expressed through facial expressions. As previously mentioned, submissive women are more likely to be judged as vulnerable victims of sexual assault (Richards et al., 1991). In a study investigating which facial expressions indicate social dominance and submissiveness, men and women were perceived to be socially dominant or submissive based on different facial expressions (Hareli et al. 2009). Women with happy or angry facial expressions, and men with neutral facial expressions were perceived as more socially dominant. On the other hand, neutral or fearful facial expressions in women were perceived as more socially submissive. In men, sad, fearful or shameful facial expressions were indicative of social submission. These findings suggest that simply expressing a facial expression associated with dominance can steer physical attackers away from the individual. Facial expressions are another nonverbal cue used to perceive and take advantage of an individual’s vulnerability to victimization.

Concluding Remarks

Victim selection is considered to be an astute and precise process. It requires potential perpetrators to carefully observe their desired victim’s nonverbal behaviours such as gait, body language and facial expressions. These nonverbal behaviours help physical attackers assess whether the individual is vulnerable to victimization. Selecting easy-to-attack individuals makes the victim selection process more cost efficient. For example, it would not be in the best interest of a perpetrator to select a victim who has an increased likelihood to retaliate. It is important for perpetrators to make accurate internal attributions based on the victim’s non-verbal behavioural cues. It may be assumed that only ruthless and intelligent social predators, such as Ted Bundy, are capable of deciphering our every move, however, this may not be true. Specific components of walking style, body language, and facial expressions are easily distinguishable by any individual assessing the target’s behaviour.

Implications of these findings suggest that individuals should increase self-awareness of their nonverbal behaviour and its association with perceived vulnerability. In addition to increasing self-awareness, alterations to personal walking style should be implemented to reduce ease-of-attack ratings, especially in vulnerable individuals. Relevant alterations can be taught through training sessions consisting of how to change specific, individualized characteristics of nonverbal behaviour, which are indicative of victim vulnerability (Johnston et al., 2004). General fluidity and synchronization of body movements should also be taught and practiced to avoid potential victimization. Current research has focused on understanding the underlying mechanisms to victim selection, but the next step should center on the applicability of the knowledge collected. Victim selection research should also examine how to bring awareness to and train the general public to exude dominant and assertive nonverbal behaviour. Furthermore, studies should be conducted to examine whether adopting dominant nonverbal cues through training sessions is feasible, and whether they will remain persistent. By changing one’s body language or facial expression to
appear more dominant, the individual can decrease the likelihood of portraying the role of a victim, and subsequently prevent potential physical assault. Therefore, keeping all of these nonverbal cues in mind can potentially save an individual from harm, or even save their life.

References


The Influence of Accents on Social Perception

Alexandra Kozlowski

Abstract
This paper investigates how significantly a person’s accent affects the way they are perceived as an individual. The author discusses stereotypes associated with different accents, ingroup language preferences (own-accent bias) and the ‘all sound alike’ phenomenon of unfamiliar accents. These biases can lead to accent discrimination and reduced credibility of foreign speech, which can greatly impact a person’s probability of employment and how they are perceived in their occupations. The author also explores why certain accents are considered to be more attractive or prestigious than others and discusses our unconscious tendency to mimic the speech patterns of our conversation partners. From the literature reviewed, the author concludes that it is important to be aware of how accents alter our judgments about others and how we might be perceived, based on the way that we speak. This understanding can help us move towards a greater acceptance and respect of peoples’ various backgrounds, especially in societies that are expanding their cultural horizons.

The voice is an important mediator in how we perceive others as it conveys information about a person’s identity, emotions, intentions, and thoughts (Rule & Ambady, 2008). The way something is said can have a larger influence on impression formation than the contents of the message itself (Eisenchas & Tsurutani, 2011). In particular, accents—the ways in which individuals pronounce, enunciate or stress their words in speech (Giles, 1970)—can significantly influence the way individuals are perceived by others. Accents can be salient markers of outgroup membership and thus evoke negative judgements and stereotypes (Kinzler et al., 2009; Lev-Ari & Keysar, 2010; Neuliep & Speten-Hansen, 2013). Research shows that starting from early childhood, we show a preference for our own accent (Kinzler, Shutts, Dejesus, & Spelke, 2009). These perceptions often lead to discrimination and can have a serious effect on employment opportunities, quality of education, as well as credibility of verbal testimony (Gill, 1994; Kerstholt, Jansen, Van Amelsvoort, & Broeders, 2006; Lev-Ari & Keysar, 2010). These different perceptions have been shown to alter the way individuals evaluate others and the social groups to which they belong.

A Cue to Identity
Everyone speaks with some sort of an accent—whether they are aware of it or not (Lippi-Green, 1997; Gluszek & Dovidio, 2010). An accent is an important part of a person’s identity and can be used as a meaningful cue for categorizing an individual as it conveys a significant amount of social information (e.g., nationality, ethnicity, social status, regional membership; Kinzler et al., 2009). Categorization is a natural process of the mind, allowing for efficient information processing, which is based on what information is available and salient (Allport, 1954). Interestingly, it was found that accents were used over appearance to categorize other individuals when individuals were presented with incongruent ethnic information about a target (e.g., Italian-looking man who speaks fluent German; Rakić, Steffens, & Mummendey, 2011). This suggests that language is a predominant cue for social categorization. Differentiation within one’s own culture is also based more on regional accents (dialects) than appearance. Individuals with standard local accents (i.e., spoken by the majority of individuals living in one’s own community) tend to be perceived as more competent and socially attractive than individuals with regional (e.g., provincial) or foreign accents (Adank, Stewart, Connell, & Wood, 2013). These inferences are largely due to stereotypes associated with particular languages and accents. Southern accents, for example, are strongly associated with a lack
of education, the country, and the image of a ‘redneck’ (Campbell-Kibler, 2007). Personality traits such as warmth and honesty can also be inferred from the language and accent with which a person speaks (Kinzler et al., 2009). Quality of voice (i.e., range in rate and pitch, gentleness or aggressiveness in tone) and certain mannerisms which refers to any feature of speech that is highly repetitious, also play a vital role in how a person is perceived (Rakić et al., 2011).

**Own Accent Preference**

Language preferences are associated with ingroup preferences. Individuals tend to favour those who share their accent and perceive them in a more positive manner, as they automatically infer more positive personality traits. This ingroup preference is known as the ‘own-accent bias’ and can be observed even in infancy; infants as young as five months old spent a longer time looking at the face of someone who spoke in their native language with a native accent, than at someone who spoke in a different language or with a foreign accent (Kinzler, Dupoux, & Spelke, 2007). At five months, infants are able to discriminate between languages and dialects, showing a preference for their native language. This preference is due to greater familiarity with the sound of native speech. Similarly, five-year-old children preferred to be friends with peers speaking in the same native accent as their own, over those with non-native accents (Kinzler, 2009). These five-year-olds also displayed a preference for a native accent when presented with faces of children of a different race. The Caucasian five-year olds chose white faces, over black faces, as friends when the target faces were silent. When the faces were paired with voices, and thereby accents, they showed a preference for black faces paired with a native-accent instead of white faces paired with a foreign accent. These findings suggest that for young children, the way a person sounds serves as a stronger discriminatory cue than the person’s appearance. It is interesting to note that while most research was conducted in English-speaking countries, similar effects have been noted in non-English speaking countries (see Gluszek & Dovidio, 2010, for a review).

**Other-Accent Effect**

Individuals often find it difficult to differentiate between unfamiliar accents and may experience the ‘all sound alike’ phenomenon or the ‘other-accent effect’ (Stevenage, Clarke, & McNeill, 2012). Less exposure to an accent results in less expertise and a weaker ability to distinguish or recognize non-native accented speech. Dutch speakers can process English words spoken with a familiar Dutch accent better than English words spoken with an unfamiliar Japanese accent. The ‘other-accent effect’ is observed for both national and regional accents. Australian listeners are more accurate at recognizing speech with an Australian accent than speech with an unfamiliar English accent (Stevenage et al., 2012). This difficulty in differentiation can have drastic effects on verbal identification of suspects in a police lineup for cases where the perpetrator was not seen, but was only heard during the crime (e.g., if the victim was blindfolded). Ear witnesses were less accurate at identifying the target voice from other voices in a lineup if they had heard them with non-native accents, as compared to voices with native accents (Kerstholt, 2006). These findings suggest that there is a probability that an innocent defendant will be incorrectly identified as the perpetrator if he or she is a non-native speaker. These mistakes occur because individuals can identify familiar speech more accurately and are more confident in their judgments than when they are asked to identify speech with an unfamiliar accent.

**Stigma and Discrimination**

The majority of research shows that attitudes towards non-native speakers in many countries—be they immigrants or international students—are often negative (Gluszek & Dovidio, 2010). A foreign accent is a clear signal that the person is not native born and is a member of an outgroup, which naturally extends to the assumption that they are not fluent in that language. A non-native accent is therefore often seen as an undesirable characteristic and negative evaluations of a person are associated with the strength of the accent (Ryan, Carranza, & Moffie, 1977). Not everyone considers it to be a form of prejudice; however, accent discrimination is a common occurrence. Stereotypes and negative attitudes associated with a particular social group may
be evoked and a person with a non-native accent might be perceived to be lazy, incompetent, and uneducated (Dixon, Mahoney, & Cocks, 2002; Gluszek & Dovidio, 2010; Munro, 2003). Prejudice is often associated with the level of ethnocentrism—that is, a strong identification with one’s culture, belief in one’s language or dialect as superior and a decreased motivation to interact with members outside of one’s ingroup. The more ethnocentric a person is, the less positively they will evaluate a non-native accented speaker (Neuliep & Speten-Hansen, 2013). This negative stigma can leave individuals feeling devalued and can have a serious impact on different aspects of a person’s life, such as the probability of employment. The stereotypes associated with particular accents can greatly influence the way a person is perceived in their occupation. Individuals with non-native accents are typically perceived to be of lower socioeconomic status and have less successful jobs, such as janitorial or fast-food industry work. In contrast, individuals with native accents are characterized to be more successful and in holding of high status jobs such as legal work (Berk-Seligson, 1984; Gill, 1994). Those with non-native accents are also more likely to be assigned to low-status positions than native-accented employees, as standard-accented individuals are seen as more suitable for high status positions (Gluszek & Dovidio, 2010; Munro, 2003). The mere perception of these stereotypes can have a profound impact on how a person identifies another, even though the stereotypes may not necessarily be accurate. The presence of an accent could significantly reduce the credibility of professionals (e.g., physicians), immigrants seeking jobs, and even eyewitness accounts (Lev-Ari & Keysar, 2010). As students were able to recall a greater amount of information from the lecture given by the native-accented speaker, it was hypothesized that more cognitive resources were expended in trying to understand the foreign speaker. Therefore, less attention was directed towards comprehending the meaning of the lecture material. These results provide significant evidence for how accents can directly impact the quality of education.

**Reduced Credibility of Foreign Accents**

It may not be consciously realized, but individuals tend to be more suspicious of those with heavier accents. In a recent study, both native speakers with native accents and non-native speakers with foreign accents simply repeated trivia statements given by the experimenter, and participants evaluated how truthful they perceived the messages of the speakers to be (Lev-Ari and Keysar, 2010). The foreign accented speech was perceived to be less truthful than the native speech, an effect of difficulty in processing and unrelated to any prejudice against foreigners. The accent made it more difficult for the participants to understand what the speaker was saying, but they misattributed the trouble of understanding to the truthfulness of the statements. When participants were made aware of the reason for their processing difficulty, they made an effort to avoid the misattribution, but the effect remained for when they heard a very heavy accent. Stimuli that are more fluently processed appear more pleasant, credible, familiar, and are perceived more positively (Oppenheimer, 2008).

**Attractiveness of Accents**

The aesthetic appeal of certain accents is not inherent to the speech, but as accents are an important social cue, our positive or negative responses are based off the stereotypes we associate with them. Certain accents are more stigmatized than others, while some are more admired. Many countries tend to have an ‘accent hierarchy’, such as in the United States where standard American and Western European accents are generally perceived to be more prestigious and more pleasant-sounding than accents from other areas of the world, such as Asian or Hispanic accents (Lippi-Green, 1994; Gluszek & Dovidio, 2010). Typically, the standard native accent of a particular country is perceived to be
more desirable, as it is familiar, signals ingroup membership, and is largely held by the educated upper-class. Individuals tend to view others with speech patterns that are more similar to their own (whether it be by speed, accent, or proficiency), more favourably and perceive them to be more competent and socially attractive (Hui & Cheng, 1987). Accents from historically and politically colonial nations such as the United States and England are often perceived to be more prestigious by other countries—such as New Zealand—when compared to the standard accent of their own country (Anderson et al., 2007). The prestige associated with these accents may also result in discrimination by others who may feel resentful towards the symbolic meaning of these accents, especially those who may have been placed at an occupational disadvantage.

**Speech Mimicry**

We tend to unconsciously imitate the behaviours, body postures, mannerisms, and facial expressions of individuals with whom we interact in social situations (Chartrand & Bargh, 1999; Stel, 2010). This effect has been shown to extend to imitating individuals based on the way they speak, especially when we consider them to be more socially attractive (Babel, 2012; Adank et al., 2013). The phenomenon is known as 'speech alignment' or ‘phonetic accommodation,’ in which the style of the speaker subtly influences our own way of speaking. We have a tendency to match the pronunciation patterns of the speech of the person with whom we are speaking by picking up the other person’s rate of speech, choice of words, word order, and intonation or pitch, leading us to unintentionally mimic the person’s accent (Miller et al., 2010; Babel, 2012; Adank et al., 2013). Without even hearing speech, individuals can perceive an accent from reading a person’s lips and tend to also mimic the style of speech. Miller et al. (2010) had participants watch targets mouth certain words, then they were asked to repeat the word they believed the person mouthed. Without being asked to imitate the speaker, they surprisingly found that the participants were more likely to repeat the word in the target person’s accent instead of their own. This mimicry could result in an embarrassing situation when interacting with someone with a different accent and may be inappropriate under many circumstances. However, it has been shown that imitating someone else’s accented speech may help in comprehending the message and may increase liking between conversation partners (Adank et al., 2013). It was demonstrated that when participants imitated the speech of someone with a regional accent, they formed more positive attitudes towards them, particularly perceiving them to be more socially attractive than when asked to simply repeat their statements.

**Conclusion**

Accents have a considerable effect on how individuals perceive others. As it highlights social group membership, the presence of an accent can lead to discrimination, which can affect many areas of a person’s life. Some accents are perceived to be more attractive than others, but this is mainly due to the stereotypes individuals have associated with them, as well as the preference for similar-sounding accents. Individuals have an unconscious tendency to mimic a conversation partner’s speech patterns, which may result in more positive impressions and may even minimize individual differences in some situations. As the global society is becoming increasingly interconnected and there is increased contact between native and non-native speakers of languages, it is important to understand how accents alter our judgments of others, especially in English-dominant countries whose populace is becoming more multicultural. With a greater understanding, we can attempt to move towards a greater acceptance of and respect for others and their cultures.

**References**


of Phonetics, 40, 177–189.


Seventy-five percent of individuals diagnosed with borderline personality disorder (BPD) are women. Many of these women are also likely to be mothers and, considering the extensive functional impairments associated with BPD, probably experience many difficulties parenting. However, there is little empirical attention towards the effects of BPD on maternal practices, and the development of treatment for such women. Furthermore, given that parenting impacts both mother and child, and that maternal BPD places children at risk for exhibiting emotional, and behavioural problems, developing a parenting intervention for this high-risk population is important. Accordingly, there are three objectives for this research review. First, past literature pertaining to parenting practices and behaviours of mothers with BPD will be examined. The review will demonstrate that parenting behaviours include intrusively insensitive and affectively dysregulated comments and behaviours, as well as role confusion, disorganized verbal, emotional, and behavioural expressions, and less structured interactions with their children. Next, given that interventions for mothers with BPD and their children do not exist, attachment-based and psychoeducation-based interventions—which address improving parent-child relations regardless of diagnoses—will be compared and contrasted. Finally, strategies for developing a parenting intervention for mothers with BPD will be discussed.

Mental illness can severely impact the interpersonal functioning of afflicted individuals. This especially includes their parenting capabilities and relationships with their child. Some of these individuals may meet the criteria for borderline personality disorder (BPD). Theoretical accounts and clinical conceptualizations of BPD highlight significant impairments in self-functioning, such that afflicted individuals experience severe disturbances in identity or self-direction (American Psychiatric Association, 2013). Additionally, the lack of empathy, intense and unstable relationships marked by mistrust, neediness, preoccupations with real or imagined abandonment, and extremes of idealization and devaluation characterize these patients’ interpersonal problems (APA, 2013). Finally, symptoms of BPD also include negative affectivity (i.e., emotional liability, anxiousness, separation insecurity, and depressive symptoms), disinhibition (i.e., impulsivity and risk-taking), and antagonism (i.e., hostility; APA, 2013). Given their emotional and interpersonal impairments, individuals with BPD are likely to face poor social, occupational, and academic outcomes (Bagge et al., 2004) and have erratic treatment utilization patterns (Levy, 2005).

In clinical settings, 75% of individuals diagnosed with BPD are women (Skodol & Bender, 2003). In the United States alone, over 6 million women are possibly diagnosed with BPD (Friedel, 2004) and a large number of these women might also be mothers. Given the extensive functional impairments associated with this illness, they may face parenting difficulties that could negatively influence their relationships with their children. Thus, it is surprising that, unlike other mental illnesses (e.g., depression and anxiety disorders), the effects of maternal BPD on parenting practices have received little empirical attention or treatment development efforts. Furthermore, previous research suggests that from infancy to early adolescence, maternal BPD places children at risk for a range of emotional and behavioural problems. These include attention deficit hyperactivity disorder, higher rates of BPD symptoms (Feldman et al., 1995), as well as attention problems, delinquency, and aggression (Barnow et al., 2006). As a result of these findings, and the fact that parenting
impacts both the mother and the child, developing a parenting intervention that targets this high-risk population is an important endeavor. Accordingly, there are three objectives in this empirical review. First, a review of past literature on parenting practices and behaviours among mothers with BPD will demonstrate that mothers’ parenting behaviours consist of intrusively insensitive, and affectively dysregulated comments and behaviours, role confusion, disorganized verbal, emotional, and behavioural expressions, and less structure during interactions with their children. Then, given that interventions designed specifically for mothers with BPD and their children do not exist, attachment-based and psychoeducation-based interventions will be compared and contrasted. In conclusion, strategies for developing a parenting intervention for mothers with BPD will be discussed.

**Parenting Practices and Behaviours among Mothers with BPD**

According to Linehan’s (1993) biosocial theory, BPD is a pervasive dysfunction of the emotional regulation system caused by the transaction of biological, temperamental, and environmental factors. The role of invalidating rearing environments—perpetuated by mothers with BPD—is a major construct of this theory, yet remains unexamined in this specific population. An invalidating rearing environment is characterized by a deficit in the environmental support necessary to help emotionally vulnerable children learn how to regulate their emotions. This environment may involve abuse, punishment, neglect, denial, or trivialization of emotional experiences, and oversimplification of affect (Linehan, 1993). In normative samples, parental invalidation of children’s emotions is associated with emotional and social difficulties in early childhood (Eisenberg, Fabes, & Murphy, 1996), and psychological distress in adulthood (Krause, Mendelson, & Lynch, 2003). As a result of their own upbringing in emotionally invalidating environments, difficulties in understanding their feelings, and deficits in managing their emotions, it is hypothesized that mothers with BPD may also invalidate their children’s emotions, especially if they inaccurately perceive these emotions. In turn, this may lead their children to deny or question their own feelings and affective responses. Furthermore, based on Linehan’s (1993) conceptualization of invalidating rearing environments, the enduring invalidation of emotional experiences may disrupt the development of adaptive emotion regulation strategies. Unfortunately, these potential roles of emotional invalidation among mothers with BPD have not been empirically investigated.

Empirical investigations on mothers with BPD have, however, examined this population’s parenting behaviours with the use of the *still-face* paradigm. This paradigm consists of a mother maintaining eye contact with her infant without vocalization, facial expression, or expressive gestures (Tronick, Als, Adamson, Wise, & Brazelton, 1978). It was adopted to assess how mother-infant dyads manage a situation of emotional difficulty and conflict (Crandell, Patrick, & Hobson, 2003). In one study, eight mothers with BPD and 12 healthy controls were videotaped interacting with their 2-month old infants in three successive phases of interaction: two minutes of ‘normal’ face-to-face free play; a 90-second episode where the mother adopted a ‘still-face’; and a two minute period where the face-to-face free play resumed. Mothers with BPD were more likely to be characterized as intrusively insensitive (i.e., hostile, rejecting, unresponsive, and demanding) based on ratings of their speech and behaviours during both the free play period before the ‘still-face paradigm, and the recovery free play period afterwards (Crandell et al., 2003). These findings were replicated in a new sample of 10 infant-mother dyads afflicted with BPD (Hobson, Patrick, Crandell, García-Pérez, & Lee, 2005). Given the meticulous diagnostic screening methods, the small sample size was the primary methodological limitation of both studies; however, these groups of mothers with BPD and their infants are the largest studied so far. One plausible reason for this limitation are the problems of identifying and recruiting mothers with BPD who have very young infants.

The ways in which mothers with BPD engage with their 12-to-18-month-old infants during separation-reunion episodes has also been examined. Hobson et al. (2009) videotaped mother-infant interactions in
separation-reunion episodes in the ‘strange situation’ test, which examines the attachment patterns exhibited between mothers and infants in response to separation, and reunion periods (Ainsworth & Bell, 1970). Masked ratings (i.e., the raters of the videotapes were unaware of the participant diagnoses and the overall nature and predictions of the study) of maternal behaviours were made pertaining to disrupted forms of maternal affective communication (e.g., fear, hostility, and anxiety) with their infant. As compared to mothers with depression, and mothers without a psychopathological disorder, a higher proportion of women with BPD displayed dysregulated affective communication and more frightened and disoriented behaviours toward their infants (Hobson et al., 2009). The participants in this study were not representative of the broader range of individuals with BPD; however, given that the majority of mothers with BPD did not suffer from a comorbid disorder, the study’s findings likely reflect maternal characteristics associated with the diagnosis of BPD alone. Overall, these findings provide substantive support for the perspective that individuals with BPD, who manifest clinical features, such as impulsivity, self-damaging behaviours, and affective instability, also have troubled patterns of affective communication, and relatedness within their relationships with significant others (Hobson, Patrick, & Valentine, 1998). In this particular example, mothers with BPD exhibit such troubled patterns with their infant.

Consistent with findings from observational studies with infants, role-reversals (i.e., the child takes on a parental role, for instance, by telling their fighting parents to stop and go to their room) are more common among mothers with BPD and their 4-to-7 year old children than in healthy controls (Macfie & Swan, 2009). Moreover, an overall maladaptive caregiver-child relationship (as self-reported by the child) is associated with maternal identity disturbance and self-harm (Macfie & Swan, 2009). According to the researchers’ interpretations of these findings, a child begins to develop a sense of autonomy at the beginning of early childhood; however, mothers with BPD, who prefer that the child stay close to them to circumvent the abandonment fears that occur in BPD, might discourage this developmental milestone. This may result in role-reversal, whereby the child takes on an adult role of a peer, friend, or parent (Macfie & Swan, 2009). Additionally, this type of interaction can be characterized as emotional over-involvement in that it inhibits the child’s autonomy in order to meet the mother’s emotional needs.

Mothers with BPD may also find it difficult to balance appropriate limit-setting with the encouragement of exploration and growth for their children. For instance, Bezirganian et al. (1993) reported examples of perceptions that mothers with BPD had about their 6-to-16 year old children. In one example, a mother reported that she wished to place her son in the freezer so that he could never grow old enough to leave her. She also described how she would pout and plead for his company (especially when he was invited to go out with his friends), but still let him socialize (Bezirganian, Cohen, & Brook 1993). These interactions were characterized as inconsistent and disorganized, because the mother’s verbal and emotional expressions conveyed one meaning, but the result of the interaction conveyed another. In line with this interpretation, disorganized attachment during infancy—a frequent outcome for infants of mothers with BPD (Hobson et al., 2005)—has been shown to predict role-reversals with toddlers (Macfie, Fitzpatrick, Rivas, & Cox, 2008) and young children (Main, Kaplan, & Cassidy, 1985).

Research on parenting practices of mothers with BPD also includes assessments of parenting perceptions. First, mothers with BPD were found to be less sensitive, and demonstrated less structuring in their interactions with their infants in comparison to psychologically healthy mother-infant dyads (Newman, Stevenson, Bergman, & Boyce, 2007). Accordingly, infants of mothers with BPD were found to be less attentive, interested, and eager to interact with their mother (Newman et al., 2007). Mothers with BPD also perceived differences in their parenting ability, reporting to be less satisfied, competent, and more distressed relative to psychologically healthy mothers (Newman et al., 2007). Interestingly, Newman et al. (2007) suggested that the levels of distress and perceived difficulties with parenting roles might contribute to neglect and abuse. Neglect, abuse, and emotional under-involvement by caretakers—extreme forms of environmental and emotional invalidation—correlates with, and contributes to the development of BPD (Bornovalova, Gratz, Delany-Brumsey, Paulson, & Lejuez, 2006). For example, chil-
dren (i.e., 4-to-18-year-olds) of mothers with BPD have been exposed to more environmental instability, such as frequent changes in housing and schooling, removal from the home, and maternal suicide attempts (Feldman et al., 1995).

In sum, parenting patterns among mothers with BPD include insensitive and affectively dysregulated forms of communication such as intrusive, hostile, rejecting, demanding, unresponsive, and frightening comments and behaviours. Additionally, these mothers are likely to engage in role confusion with their children, whereby their child takes on the role of a parent or friend. Moreover, parenting practices are also characterized by inconsistent and disorganized verbal, emotional, and behavioural expressions by mothers. Finally, mothers with BPD are likely to have less structure in their interactions with their children and to report high levels of distress and difficulties in roles as parents, which could lead to abuse out of frustration, and hopelessness. The clinical implications of these findings include considering whether an intervention should be designed to foster more optimal mother-infant relations or to support the afflicted mothers specifically.

A Comparison between Attachment- and Psychoeducation-based Interventions
The reviewed studies suggest that maternal parenting strategies among mothers with BPD are characterized by fluctuations between over-involvement (i.e., intrusive, hostile, and demanding comments and/or behaviours) and under-involvement (i.e., unresponsive, rejecting comments, and/or behaviours). Accordingly, interventions should be designed to address such instabilities in behaviours by either targeting the mother-child relationship or the mother’s behaviours alone. However, as previously stated, treatments designed specifically for mothers with BPD and their children, do not yet exist. Interventions that are currently recommended for mothers and family members with BPD include attachment therapies (especially during infancy and through the preschool period) and psychoeducation-based interventions. This section will compare and contrast these two treatment approaches, as they relate to the parenting behaviours and therapeutic needs of mothers with BPD. By doing so, I will argue that mothers with BPD may require psychoeducation and parent-skills training before parent-infant attachment strategies are addressed in treatment.

Attachment-based Interventions
Attachment-based interventions address preventing the transmission of insecure (e.g., anxious, avoidant) and/or disorganized attachment from the parent to child through either psychotherapy with the mother or with the mother-child dyad. Based on the research discussed in the previous section, disorganized attachment during infancy is an outcome for infants of mothers with BPD (Hobson et al., 2005). As a result, attachment-based treatment approaches are important to examine and discuss when considering how to improve and secure relations between a mother with BPD and her child. Interventions designed with the parent as the primary patient aim to provide ‘corrective’ attachment experiences through interactions and experiences with the therapist (Lieberman & Zeanah, 1999). For instance, during individual psychotherapy, the mother talks about her own childhood experiences and links these events to her current relationship with her child, which allows her to gain insight into how she may perpetuate the cycle of insecure and/or disorganized attachment. However, this mode of improving attachment through individual psychotherapy with the mother has not been well manualized, which has deterred dissemination, and evaluation efforts (Slade, 1999).

The second approach of attachment-based psychotherapy is to intervene at the level of the relationship between the mother and child (Stern, 1995). Like individual psychotherapy, mothers also discuss the interactions and experiences they had with their caregivers. However, the difference with this approach is that it is the therapist’s observation of the interactions between the mother and the child that facilitates the mother linking her past experiences and own attachment style to that of her current relationship with her child. There are several codified examples of this type of parent-infant relationship psychotherapy, including Watch, Wait, and Wonder (WWW; Muir, Lojkasek, & Cohen, 1999), Preschooler-Parent Psychotherapy (PPP or toddler-parent psychotherapy; Cicchetti, Rogosch, & Toth, 2000), and Circle of Security (COS; Marvin, Cooper, Hoffman, & Powell, 2002). These interventions differ with respect to the amount of psychoeducation they offer. For ex-
crease maternal sensitivity toward their infants and children, they have little impact on the attachment style of the mother or the child (van Ijzendoorn, Juffer, & Duyvesteyn, 1995). Accordingly, recent efforts have included manualizing these interventions, especially for parent-child dyads, which has resulted in greater evidence to support their effectiveness for fostering a more secure attachment style. In particular, PPP for depressed mothers (Cicchetti, Toth, & Rogosch, 1999), and maltreated children (Toth, Maughan, Manly, Sppardnola, & Cicchetti, 2002), and COS for disadvantaged parent-toddler or parent-preschool dyads (Marvin et al., 2002) have all demonstrated efficacy for improving attachment between mothers, and children.

As a result, even though attachment-based interventions are becoming codified and researchers are beginning to demonstrate their effectiveness in improving attachment patterns in high-risk parent-infant dyads, the utility of these interventions when offered alone for mothers with BPD and their children is questionable. There appears to be a gap between the objectives of attachment-based interventions and the goals of mothers with BPD when seeking professional help (Newman & Stevenson, 2008). That is, as previously addressed, mothers with BPD express to practitioners their difficulties with everyday parenting abilities, such as maintaining daily feeding, and sleeping schedules, and routines for their infants (Newman & Stevenson, 2008). Findings from research regarding parenting practices and efficacy also underscore concerns pertaining to scheduling (Conroy, Marks, Schacht, Davies, & Moran, 2009), in addition to mothers’ distress, lack of satisfaction, and perceptions of incompetency regarding their parenting abilities (Newman et al., 2007). Accordingly, attachment-based interventions applied without a direct focus on parenting skills are unlikely to alleviate the distress and concerns mothers have about providing basic needs for their children (Newman & Stevenson, 2008). It appears that mothers with BPD may require psychoeducation and parent-skills training before addressing parent-infant attachment strategies.

Psychoeducation-based Interventions

In contrast to attachment therapies, which focus on individuals with BPD, psychoeducational approaches typically disseminate information on a variety of issues.
relevant to family members and friends of the afflicted (Gearing, 2008). Given that none of these treatments have been developed specifically for mothers with BPD and their children, they will be addressed in the following paragraphs because many of the guiding principles of family psychoeducation could be relevant for parent-child interventions for mothers with BPD. For instance, these guiding principles include forming social networks with other individuals in the group (e.g., other mothers), as well as learning information about the targeted individuals (e.g., infancy and toddlerhood developmental milestones).

Family-based psychoeducation programs for individuals with serious mental illnesses have received extensive empirical support for reducing relapse rates, family stress, caregiver burden, and feelings of criticalness (Cohen et al., 2008). As such, a family psychoeducational approach to the treatment of BPD has been advocated (Gunderson, Berkowitz, & Ruiz-Sancho, 1997). More specifically, the development and benefits of the Multiple Family Group (MFG) program have been described, such that improvements in family communication and family burden are found after 6 months of this treatment program (Gunderson et al., 1997). The psychoeducational MFG approach is a social treatment that focuses on diminishing stress in the BPD patient’s family environment. While MFG does not specifically address BPD psychopathology, it is intended to create a familial ‘custom-made’ environment that will trigger the sensitivities of individuals with BPD less (Gunderson et al., 1997). As a result, Gunderson and colleagues (1997) suggested that this treatment would be appropriate when more support and structure are needed for patience, and it would help them be able to do more interpersonal work.

Currently, there are three treatments that include family psychoeducation as one component of the treatment model, which have been empirically examined for their effectiveness for families with BPD: (1) Systems Training for Emotional Predictability and Problem Solving (STEPPS; Blum, Pfohl, St. John, Monahan, & Black, 2002), (2) Family Connections (FC; Fruzzetti & Hoffman, 2004); and (3) Multigroup Family Skills Training as part of Dialectical Behaviour Therapy for adolescents (Miller, Rathus, & Linehan, 2006). The relative focus on the family members and other support persons compared to the afflicted individual varies in these treatments. More specifically, FC focuses exclusively on family psychoeducation, whereas the two other programs focus solely on the individual with BPD within their models, and include family members and other support persons in a supplementary fashion.

Overall, research supports FC to alleviate caregiver stress (Fruzzetti & Hoffman, 2004), and STEPPS along with multifamily skills training to improve patient outcomes (Blum et al., 2002; Miller et al., 2006). However, STEPPS and multifamily groups do not routinely collect information from family members or friends involved in the treatment, which limits the ability to determine their effectiveness for ongoing family and friend’s involvement in treatment. Nonetheless, these programs have implications for the development of parent-child interventions for mothers with BPD, especially if the child is also experiencing psychological problems. Accordingly, mothers with BPD may benefit from information about typical and atypical child development, as well as recommended parenting practices, and behaviours.

**Strategies for Future Parent-Child Interventions**

Based on the review of parenting practices, as well as the comparison of current parent-child oriented interventions, there is a strong rationale for developing a specific parent-child treatment intervention for mothers with BPD. However, there are several factors that may limit the development of such intervention. First, there is a lack of information on the relationship between BPD and parenting, because the prevalence rate of mothers with BPD is unclear. Given that this prevalence rate is unknown, the important question of why women, rather than men, are more frequently diagnosed with BPD remains largely unanswered. It is possible that there is a gender bias in the diagnosis of BPD, given that, to varying degrees, sociocultural factors (i.e., gender norms and expectations) inevitably play a role in the expression of disease conditions, and that personality disorders, including BPD, have cultural histories (Bjorklund, 2006). Second, some mothers with BPD may have suitable and effective parenting capabilities, despite their diagnosis. However, most mothers with BPD, due to the impairments and challenges specific to this affliction, may face challenges with parenting
Another crucial therapeutic objective for mothers with BPD is to teach effective ways of adhering to routines, even during difficult circumstances. Learning about the psychological importance of routines (e.g., sleeping, eating, leisure) both for themselves and their children, as well as how to effectively start and maintain a schedule would be useful. In addition, learning how to consistently monitor and supervise their child based on their developmental stage and individualized needs would also be beneficial. Subsequently, increasing these skills—which mothers with BPD report they lack (Newman & Stevenson, 2008)—may promote parenting self-efficacy, as well as decrease the distress, dissatisfaction, and incompetence that these women may feel about their parenting capabilities (Newman et al., 2007).

With respect to emotion-related parenting practices, which are believed to play a key role in the socialization of emotion regulation in children (Morris, Silk, Steinberg, Myers, & Robinson, 2007), an important target for these mother-child dyads should be to facilitate mothers’ positive and consistent responding to their children’s displays of emotion. For example, mothers should be taught emotion-related strategies that do not involve mocking, criticizing, or punishing a child for his or her emotional expression (Eisenberg et al., 1996). It would also be important to help mothers plan how to consistently provide warmth and nurturance, regardless of moments of their own extreme emotional distress and urges to control or avoid their children’s emotional expression. For example, supportive maternal responses can assist the child in practicing strategies for managing emotions during more stressful social interactions with peers and adults.

Finally, in order to provide consistent behavioural and emotional support to their children, mothers with BPD may benefit from mindfulness-based parenting strategies. While the nature of many conflicts and disagreements that arise between parents and children are said to be habitual and repetitive, it is possible for mindfulness-based parenting strategies to help families separate themselves from such negative patterns (Du-
mas, 2005). For example, after 8 weeks of mindfulness training with parents and adolescents with externalizing disorders, adolescents reported a significant reduction in both internalizing and externalizing symptoms and parents reported an improvement in goal attainment with their child (Bögels, Hoogstad, van Dun, de Schutter, Restifo, 2005). Self-awareness might help mothers with BPD gain objectivity in difficult parenting situations, especially when their children are experiencing a strong emotion or eliciting a strong emotion in the mother. Additionally, self-awareness could help mothers with BPD learn their own limits in parenting, and when to ask for support and advice. Overall, this skill might contribute to the ability to provide a stable and warm home environment.

**Conclusion**

The effects of maternal BPD on parenting practices have been the focus of little empirical attention or treatment development efforts. The reviewed literature suggest that parenting behaviours among mothers with BPD include insensitive and dysregulated forms of communication, such as intrusive, hostile, rejecting, demanding, unresponsive, and frightening comments and behaviours. Additionally, these mothers are likely to engage in role confusion with their children, whereby their child takes on the role of a parent or friend. Moreover, inconsistent and disorganized verbal, emotional, and behavioural expressions by mothers characterize this group’s parenting behaviours. Finally, mothers with BPD are likely to have less structure in their interactions with their children and to report experiencing high levels of distress and difficulties in roles as parents, which could lead to abuse out of frustration and hopelessness. Based on these findings, developing a parenting intervention specifically for this high-risk population is an important endeavor. However, it is important for clinical practitioners to consider whether an intervention should be designed to manifest and maintain optimal mother-infant relations or to support the afflicted mothers specifically, given their fluctuations between maternal over- and under-involvement. There is a strong rationale for a specific parent-child treatment intervention for mothers with BPD, despite that accurate estimates regarding the prevalence of mothers with BPD are not known and that some mothers with BPD may have exceptional parenting capabilities. An intervention for mothers with BPD should involve psychoeducation on appropriate developmental tasks and expectations for children, consistency in scheduling and monitoring their children, positive and consistent responding to their child’s emotions, and mindfulness-based parenting strategies to enhance self-awareness.

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Exploring the Cultural and Biopsychological Limitations of the Tripartite Influence Model of Body Dissatisfaction and Eating Disturbance

Michelle Asbury

Abstract

Anorexia nervosa (AN) is a psychological disorder predominantly manifesting in post-pubertal women. It is characterized by a distorted body image and a fear of gaining weight, which results in the restriction of food intake. Consequently, these food intake restrictions lead to severe and unhealthy weight loss. The Tripartite Influence Model of body dissatisfaction and eating disturbance focuses on the interactions among peers, parents, and the media with thin-ideal internalizations and social comparisons. These complex interactions can lead to body dissatisfaction and food restriction behaviours, contributing to the emergence of AN. Although these psychosocial factors play an important role in the development of AN, the Tripartite Influence Model is limited in its ability to conceptualize AN in non-Westernized cultures and it neglects the significance of biological factors specifically present after the onset of puberty. Levels of ovarian hormones, serotonin, hypothalamic-pituitary-adrenal axis activation, and genetics have all been proposed to influence the risk of AN onset. As such, there is a need in AN research for a biopsychosocial model, which would expand our current understanding of the complex etiologies of the disorder, allow for the development of more effective treatments and add to the general understanding of AN prevention.

According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM–5; American Psychiatric Association, 2013), anorexia nervosa (AN) is an eating disorder characterized by body image issues, a fear of gaining weight, and restricted food intake, all of which result in a low body weight. Unlike other psychological disorders, AN is mainly diagnosed after puberty (Klump, 2013) among women between the ages of 15-19 years old (Espie & Eisler, 2015). With the new DSM–5 criteria, it is estimated that by the age of 20, the prevalence of AN among women is 0.8% (Stice, Marti, & Rohde, 2013). In 2010, it was estimated that eating disorders contribute to 2.16 million years lost globally due to disability and premature death, a 65.7% increase from 1990 (Murray et al., 2012). Therefore, compared to a healthy individual’s life, patients suffering from an eating disorder have a drastically reduced lifespan and quality of life—a problem that appears to be increasing over the years. Compared to a population of the same sex and age, individuals suffering from AN are three times more likely to die within a year following hospital discharge (Hoang, Goldacre, & James, 2011). Considering the detrimental effects AN has on an individual’s quality of life, it is crucial to understand the disorder’s etiology in order to better engage in prevention strategies.

Extensive research in the area of AN has focused on the possible psychosocial etiologies of the disorder. The Tripartite Influence Model of body dissatisfaction and eating disturbance highlights the importance of social comparisons and the internalization of thin-ideals (i.e., the belief that being thin is the ideal body type), which are influenced by peers, parents, and the media. Research has shown that both of these components contribute towards body dissatisfaction and an increased risk for developing AN (Keery, van den Berg, & Thompson, 2004). Due to the importance Westernized cultures place on being thin (Swami et al., 2010),
the fear of gaining weight as one of the AN diagnostic criteria may limit the ability to diagnose AN in non-Westernized cultures (Lee, 1995). This also limits the Tripartite Influence Model’s ability to conceptualize AN risk cross-culturally. Furthermore, because AN diagnoses are often made in post-pubertal women (i.e., after the onset of puberty), it has been proposed that changes in hormones and gene expression, not just social factors outlined by the Tripartite Influence Model, play a role in the development of AN. Ovarian hormones, particularly estradiol and progesterone, have been implicated in the development of AN due to their effects on thin-ideal internalization and body dissatisfaction (Racine et al., 2012), assist in the development of secondary sex characteristics, and restrict food intake (Asarian & Geary, 2006). Serotonin contributes to an increase in AN risk by altering food intake (Rivera, Santollo, Nikonova, & Eckel, 2010) and mood (Gauthier et al., 2014), while the activation of the hypothalamic-pituitary-adrenal (HPA) axis maintains self-starvation behaviours (Bergh & Sodersten, 1996). Finally, genes interact with ovarian hormones, as well as heighten the sensitivity and vulnerability to thin-ideal internalization and body weight concerns to increase the risk of developing AN (Suisman et al., 2012). The focus of the Tripartite Influence Model on psychosocial determinants of AN neglects the importance of these biological factors that also contribute to AN risk. The aforementioned limitations of the Tripartite Influence Model will be critically analyzed with the goal of outlining the importance of cultural and biopsychological risk factors for AN in order to develop a new integrative model.

**Tripartite Influence Model of Body Dissatisfaction and Eating Disturbance**

According to the Tripartite Influence Model, peer influences have been shown to play a large role in body dissatisfaction and the desire to lose weight. One study (Clark & Tiggeman, 2006) showed that with greater thin-ideal internalization, girls are more likely to engage in appearance-related conversations with their friends. These conversations establish peer appearance norms that can ultimately lead to body dissatisfaction if there is a discrepancy between the perceived norm and a girl’s current body size. Body dissatisfaction is also affected by appearance-based comparisons between a girl and individuals in her social circle. One study (Lev-Ari, Baumgarten-Katz, & Zohar, 2014) examined how appearance-based comparisons with a girl’s mother, sister, and female friend affected body dissatisfaction, desire to be thin, and ideal body image. Comparisons between friends, in particular, showed the highest correlation with body dissatisfaction and a drive to be thin, as well as as the greatest discrepancy between one’s current body size and their ideal body size. Overall, having a female friend that is thinner than one’s self leads to greater body dissatisfaction and desire to lose weight.

Peers have the capacity to greatly affect body dissatisfaction; however, their influence also extends to food intake behaviours. Girls in grades 6-8, who are exposed to peers engaged in dieting behaviours, are more likely to restrict their own eating as well (Levine, Smolak, Moodey, Shuman, & Hessen, 1994). Appearance-based comparisons among peers also have implications for dieting behaviours. Girls who believe popularity and attractiveness are based on thinness are more likely to engage in restricted eating (Lieberman, Gauvin, Bukowski, & White, 2001). Therefore, social comparisons between peers have important implications for body dissatisfaction and dieting behaviours, ultimately contributing to the development of AN. However, peers alone do not account for the emergence of body dissatisfaction and thin-ideal internalization. It is important to also examine the effects parents have on their children’s susceptibility to AN risk factors.

Girls who experience pressure to be thin from their parents have a greater risk for developing body dissatisfaction. On average, girls not only desire to be thinner, but also believe their parents and best female friends want them to be skinnier (Shneider et al., 2013). The perceived pressure to be thin, whether or not it is explicitly expressed by parents, has implications for body dissatisfaction and restricted food intake. Research has shown that girls who are teased by family members about their weight are more likely to engage in restricted eating behaviours and have greater body dissatisfaction (Neumark-Sztainer et al., 2010). There have also been studies showing that girls are more likely to diet when
shown that social comparison amongst peers mediates the relationship between parents, body dissatisfaction, and food intake (van den Berg, Thompson, Obremski-Brandon, & Coovert, 2002). Therefore, peers play an important role in propagating media-induced thin-ideals, thereby increasing the risk of developing body dissatisfaction and AN. They also play an essential role in mediating the relationship parents have on body dissatisfaction. Altogether, examining psychosocial risk factors is imperative to understanding the etiology of AN. However, psychosocial factors are often shaped by culture, providing a unique set of influences that affect the risk of AN development.

Cultural Influences

Since the fear of gaining weight is one of the diagnostic criteria of AN, some researchers argue that the disorder is culture-bound (Lee, 1995). Western cultures view a thinner body as more beautiful and attractive, thereby motivating the internalization of thin-ideals and, ultimately, generating a fear of gaining weight among many women. Not all cultures, however, share the same body weight ideals. A study (Swami et al., 2010) assessing the beauty standards in 26 countries around the world explored the interactions between physical attractiveness ideals and body dissatisfaction. Some variations in body weight ideals were found between different cultures. However, the greatest variation was found in cultures with both low and high socioeconomic status (SES) areas. In low SES areas of Malaysia and South Africa, a heavier body was considered to be more attractive due to its association with increased resources. In contrast, high SES areas showed a preference for low body weights. Furthermore, low SES areas in Malaysia and South Africa showed lower levels of body dissatisfaction than higher SES areas. In addition, increased exposure to Western media, was associated with greater desire to be thinner, regardless of the world region. These thin-ideals also led to an increase in body dissatisfaction among women. As a result of the variation in body weight ideals between and within cultures, it could be argued that AN may also manifest differently depending on the cultural context.

A study (Lee, Ho, & Hsu, 1993) examining Chinese patients with AN discovered that, with the exception of...
the fear of gaining weight, Chinese patients with AN displayed similar symptoms to Western anorexic patients. However, Chinese patients with AN were more likely to restrict their food intake due to a lack of appetite or stomach bloating. Therefore, it can be argued that the fear of gaining weight is a manifestation of AN, which occurs from Westernization, instead of being an integral aspect of the disorder itself. A recent systematic review and meta-analysis examined the cross-cultural literature of eating disorders and found that AN is not culturally bound as there are similar expressions of the disorder historically and across different cultures. One exception, however, is the fear of gaining weight diagnostic criteria, which is influenced by Western culture (Keel & Klump, 2003). The Tripartite Influence Model focuses on thin-ideal internalization as an integral part of AN development, thereby limiting its conceptualization of AN cross-culturally. In order to better understand the etiology of AN, integrating both psychosocial and cultural factors is required. However, psychosocial and cultural influences alone do not explain why the incidence of AN is greatest following puberty. Therefore, it is essential to examine how physiological factors, such as hormones, may also affect the development of AN.

**Hormonal Factors**

Hormone levels, particularly after puberty, have been implicated in the development of AN. Estradiol and progesterone are steroid hormones released by the ovaries in females. These hormones function by binding to proteins called nuclear receptors within cell nuclei to influence the transcription of genes throughout the body. By altering transcription, these hormones have various widespread effects on the body. These include, but are not limited to, effects on adipose tissue (Kim, Cho, & Kim, 2014), bone tissue growth, reproduction, and brain functioning (Edwards, 2005). In post-pubertal women, ovarian hormone levels fluctuate over the course of their menstrual cycle. These changes in hormone levels affect cognition and emotional processing in female brains (Toffoletto, Lanzenberger, Gingnell, Sundstrom-Poromaa, & Comasco, 2014). To examine estradiol and progesterone’s effect on psychosocial factors that contribute to disordered eating, one study (Racine et al., 2012) followed women across their menstrual cycle, and measured body dissatisfaction and thin-ideal internalization daily. Both body dissatisfaction, and a desire to be thin peaked at the midluteal phase of the menstrual cycle, when estradiol and progesterone levels are the highest. The relationship between body dissatisfaction and progesterone was not influenced by emotional eating or negative affect; however, the relationship between body dissatisfaction and estradiol was mediated through negative affect. This suggests that progesterone has more direct effects on body dissatisfaction than estradiol. The desire to be thin, however, was directly affected by both ovarian hormones. Not only do estradiol and progesterone affect body dissatisfaction and the desire to be thin, but they are also implicated in altered cognitive processing among individuals with AN. Women with AN who experience irregular menstrual cycles and, therefore, lower levels of estradiol and progesterone, have been shown to have deficits in language, math, and reading scores compared to AN patients with regular menstrual cycles (Chui et al., 2008). Therefore, it could be argued that ovarian hormones play an important role in cognition, which may affect the risk of AN among post-pubertal women. According to the Tripartite Influence Model, thin-ideals result from media exposure, which contributes to the development of body dissatisfaction. However, because estradiol and progesterone are important for determining body dissatisfaction and the desire to be thin, it is important to acknowledge these ovarian hormones in the development of AN instead of focusing entirely on psychosocial determinants. As demonstrated, ovarian hormones are important in altering cognition, but both estradiol and progesterone are also crucial for physical changes that occur in women around puberty.

Secondary sex characteristics, such as increased body mass and breast development, occur during puberty in young women. Research has shown that puberty is associated with increased levels of body dissatisfaction, a desire to be thin, and eating concerns among girls. One study (McNicholas, Dooley, McNamara, & Lennon, 2012) showed that girls who mature earlier than their peers tend to be the least happy with their bodies, have the greatest desire to be thin, and show the highest overall eating concerns. The increased weight gain
and physical maturity that is associated with puberty is thought to drive these effects. Secondary sex characteristics are largely affected by increased levels of ovarian hormones throughout the body. It has been suggested that estradiol regulates adipose tissue storage through estrogen receptor signaling, which increases body mass in women (Kim et al., 2014). This increased body mass conflicts with the thin-ideals valued in Westernized cultures. Studies have shown that body dissatisfaction is influenced by both an increase in body mass and thin-ideal internalization (Stice & Whitenton, 2002). This is intuitive as ovarian hormones at the time of puberty increase body weight, thereby increasing the desire to be thin in order to attain a Western ideal of beauty. These thin-ideals then drive the production of body dissatisfaction. Therefore, it is important to acknowledge the role of ovarian hormones through secondary sex characteristics in AN risk. The increased body dissatisfaction induced by secondary sex characteristics may lead to a restriction of food intake to attain thin-ideals. However, ovarian hormones, estradiol in particular, have also been studied in relation to directly affecting food intake.

To study the effects of ovarian hormones on food intake, ovaries are removed (i.e., ovariectomy) in rat models to drastically reduce the levels of ovarian hormones in the body. As a result, the animals will increase their food intake and gain weight. With estrogen supplementation, the rats will decrease their food intake and lose weight (Asarian & Geary, 2002). When examining human subjects, women reduce their food intake during their pre-ovulatory phase, when estrogen levels are high, compared to the other phases of the menstrual cycle (Asarian & Geary, 2006). This research suggests estradiol acts as a mediator between restricted food intake and AN, rather than just body dissatisfaction as a motivator for food restriction behaviours. Therefore, higher levels of estradiol may contribute to dieting behaviours that lead to the development of AN. One of the proposed mechanisms of estradiol’s relationship with food intake restriction is through the neurotransmitter serotonin.

Serotonin regulates both food intake and mood. In ovariectomized rats, it has been shown that estradiol binds to the serotonin receptors in the brainstem, there-by decreasing the rats’ food intake (Rivera et al., 2010). Estradiol has also been shown to increase serotonin production throughout many other brain regions such as the amygdala, hypothalamus (McQueen, Wilson, & Fink, 1997), and frontal cortex (Matsuda, Hirano, & Watanabe, 2002). The increase in estradiol-induced serotonin may result in changes in mood, cognition, and behaviour (McQueen et al., 1997). Serotonin has also been well studied in its relation to symptoms of depression and anxiety, which are often co-morbidly expressed with AN. One study (Gauthier et al., 2014) demonstrated that an increased level of serotonin was associated with greater depression and anxiety symptoms when AN patients were discharged from treatment centers following re-feeding. However, compared to individuals without AN, patients with AN had lower overall serotonin levels likely due to severe malnutrition. Another study (Rodgers, Paxton, & Chabrol, 2010) found that depression increased the perceived pressure that girls experienced from both their peers and the media. This resulted in increased body dissatisfaction and a desire to be thin. Considering estradiol activates serotonin receptors, rises in estradiol levels that accompany puberty may also increase serotonin levels in the body. Theoretically, this would increase depressive symptoms, leading to an increase in body dissatisfaction, thin-idealization, and ultimately increase the risk of AN. This proposed mechanism is neglected by the Tripartite Influence Model, which states that body dissatisfaction is influenced by thin-ideal internalization and social comparison. Therefore, this model fails to properly conceptualize body dissatisfaction. It neglects the interactions between serotonin and estradiol levels and, consequently, the influence of serotonin on mood and cognition. Although the interaction with serotonin and estradiol may explain the emergence of dieting behaviours, it neglects the importance of stress for maintaining food intake restriction.

One of the mechanisms behind self-starvation is the activation of a stress pathway called the HPA axis. Starvation imposes a stress on the body, causing the hypothalamus to release corticotropin-releasing hormone (CRH). CRH indirectly increases glucocorticoid levels in the body. One of the actions of glucocorticoids, a class of hormones released by the adrenal glands, is to...
activate dopaminergic neurons. Research has implicated glucocorticoids in feelings of reward (Keating, 2011). One study demonstrated that rats will self-administer glucocorticoids to maintain optimal levels of the hormones in the blood (Piazza et al., 1993). This results in an increase in dopamine levels within half an hour of the glucocorticoid injections. In the context of AN, it has been proposed that initial feelings of starvation activate the HPA axis, thereby coupling the starvation with a reward mechanism through dopamine release. Therefore, for individuals with AN, it will feel rewarding to experience starvation (Bergh & Sodersten, 1996). A second model used to understand the relationship between dopamine and AN is the lack of reward associated with food consumption. Generally speaking, food can be considered rewarding; however, alterations to the dopamine system among individuals with AN may limit the rewards associated with food intake (Kontis & Theochari, 2012). Although these two proposed models are simplistic and require future research, it highlights the importance of examining the HPA axis and dopamine in the maintenance of AN symptoms rather than focusing on body dissatisfaction and thin-ideal internalization as the only explanations for food intake restriction. Examining how hormones act in the body is crucial for understanding the emergence of AN in post-pubertal women. However, there is a strong connection between hormones and genetics that contribute to AN risk, particularly following the onset of puberty.

### Genetic Factors

Research on AN etiologies has recently focused on the role of genetics that predispose an individual to developing AN. This includes increasing the susceptibility to internalizing thin-ideals, effecting body weight concerns, and interacting with ovarian hormones. Thin-ideal internalization is a major risk factor for the development of AN. However, not all individuals adopt thin-ideals to the same extent. Research has shown that genetic factors influence thin-ideal internalization among young women. Using a twin study design, one study (Suisman et al., 2012) concluded that there were significant differences in thin-ideals among non-shared environments, with little effect on thin-ideals among shared environments. In other words, genetic factors are likely influencing a large proportion of the variation in thin-ideal internalization among twins, whereas environmental factors, such as media exposure, have a smaller effect. It was proposed that personality traits might mediate the relationship between genetics and thin-ideal internalizations by altering the vulnerability to adopt thin-ideals. Genetics not only play a role in the susceptibility to value thin-ideals, but they also alter the concerns one has about their body weight. Recent research has determined that weight and shape concerns have heritability estimates of 64-66% (Spanos, Burt, & Klump, 2010). Due to the heritability of weight and shape concerns, body dissatisfaction is not just a product of thin-ideal internalization and social comparison. As such, the Tripartite Influence Model misses important factors to explain the development of body dissatisfaction and, ultimately, the emergence of AN. Although the heritability of genes influence many risk factors of AN, it is also important to understand how hormones interact with genes to influence AN susceptibility.

Estradiol and progesterone’s mechanism of action is to bind to nuclear receptors to alter the transcription of genes. These hormones, therefore, interact with the genes responsible for disordered eating behaviours. Studies have shown that 0% of the variance in disordered eating could be accounted for by genetic influences before puberty (Klump, Perkins, Burt, McGue, & Iacono, 2007). However, following puberty, 44% of the variance could be explained by genetics. The difference in genetic influence before and after puberty can be attributed to the increase in ovarian hormones at the time of puberty as these hormones alter the transcription of genes (Klump et al., 2007). Furthermore, there is little heritability in disordered eating among twins with low estradiol levels, but high heritability when estradiol levels are high (Klump, Keel, Sisk, & Burt, 2010). Therefore, the genetic influences driving AN are likely to be mediated by ovarian hormones, particularly estradiol. Overall, it is important to acknowledge the role of genetics in the development of AN. However, the Tripartite Influence Model fails to consider how an individual’s genetic makeup can lead to disordered eating. This limits the model’s ability to predict disordered eating, especially at the time of puberty when increases in ovarian hormones interact with underlying genetic
differences.

**Conclusion**

The Tripartite Influence Model of body dissatisfaction and eating disturbance provides a robust overview of psychosocial factors that increase the risk of developing AN. Many studies have supported its claims that influences from peers, parents, and the media affect thin-ideal internalization and social comparison, leading to body dissatisfaction and restricted food intake. Although it focuses on psychosocial etiologies of AN, the Tripartite Influence Model limits its conceptualization of AN to Westernized cultures. The model also neglects a range of possible biological influences that contribute to AN risk.

Considering the Tripartite Influence Model lacks in its comprehension of underlying physiology, a biopsychosocial model is required to better understand the potential etiologies of AN, particularly after the onset of puberty. In order to develop such a model, research connecting the psychosocial factors to underlying physiological mechanisms is needed. Examining correlates, for instance, between social comparison of appearance to other girls, and ovarian hormones across the menstrual cycle would allow for a better understanding of estradiol’s role in AN risk. Understanding the link between social comparison, and ovarian hormone levels could further help in identifying girls at risk for developing AN by allowing for the analysis of estradiol and progesterone levels in the body. Investigating estradiol levels cross-culturally, and examining whether they are related to the prevalence of AN within that culture, is another viable approach to the problem.

Integrating psychosocial, cultural, and physiological factors that contribute to AN risk is also important for treatment of the disorder. Current treatment methods include family counseling (Espie & Eisler, 2015), cognitive-behavioural therapy, and re-nourishment to regain healthy weight (Watson & Bulik, 2013). Some studies have assessed the effectiveness of selective serotonin reuptake inhibitors (SSRIs) to improve weight gain and to treat the anxiety and depressive symptoms associated with AN. The effectiveness of this approach depends on the SSRI used, which results in inconsistent outcomes (Watson & Bulik, 2013). Treatment plans that address psychosocial determinants of AN, such as family counseling, with physiological-based treatments, such as medications, may provide the most effective form of treatment for AN by targeting multiple facets of the disorder. Further research is required to assess the efficacy of such treatment plans.

Overall, the Tripartite Influence Model of body dissatisfaction and eating disturbance encompasses many of the psychosocial factors that may lead to the development of AN. However, integrating psychosocial, cultural, and biological factors into a biopsychosocial model will provide the most robust understanding of AN etiology. Ultimately, this will aid in developing more effective treatment plans as well as provide insight into prevention of the disorder.

**References**


The Role of Empathy in Children’s Development

Anna Lu

Abstract

Empathy has traditionally been regarded as an overall positive trait in children within the psychological literature. In particular, it is known to promote prosocial behaviours that are beneficial to children’s development, such as sharing, agreeableness, and increased cooperation with others. At the same time, certain research also suggests that there exists a functional limit to the trait of empathy: that empathy is most adaptive at a moderate level, and that an excess of it, as well as a deficiency, can signal emotional imbalance and maladjusted development in children. By investigating the trait of empathy from multiple research standpoints, from social psychological experiments to psychobiological evidence, this critical review aims to portray a holistic account of the role of empathy in children’s development, and in arguing that empathy is a trait that is most functional in moderation, propose that it can act as a gauge of a child’s emotional, social, and psychological adjustment.

According to Hay (1994), empathy in children is defined as the ability to make interpretations of the beliefs, and motivations of others. Many researchers suggest that empathy is innate; even infants cry for longer durations if they hear another infant crying, suggesting possession of innate empathic abilities (Preyer, 1889). Research has also found that the presence of empathy promotes prosocial development in children. Children with prosocial tendencies (i.e., who are outgoing, empathetic, and sensitive towards others) tend to develop lower levels of aggression as they mature when compared to less prosocial children (Vivier, Pihl, Cote, & Tremblay, 2014). Moreover, children who are more empathetic have more social interactions, are better liked, and are set on a course that promotes psychological adjustment, in that they are more able to create, and maintain healthy social relationships (Vivier et al., 2014). Similarly, other studies have also documented instances in which prosocial behaviour—holding as true that prosocial tendencies reflect one’s empathic emotions—is linked with an easy-going temperament, increased sharing behaviours, higher agreeableness, increased cooperation with others, and higher competence in resolving interpersonal conflict (Hartup, Glazer, & Charlesworth, 1967; Jennings, 1975).

However, at the same time, there appears to be a functional limit to empathy in children; research also demonstrates a link between empathy and dysfunctional outcomes such as mental distress, and mood dysfunction (Vivier et al., 2014). For instance, children with anxiety issues are more likely to use prosocial actions to appeal to others and avoid possible conflict. Similarly, other findings demonstrate that excessive empathic reactions and prosocial behaviours may be a warning sign of a troubled home life, especially if the child is put into a role that requires a demanding amount of responsibility, care, and concern (Hay, 1994). Further research confirms that empathy appears to be a normative trait: a characteristic that is distributed along a continuum, with the mean indicative of a normal level of healthy empathic expression (Hoffman, 2000). Building upon these propositions, I argue that an excess of empathy may be just as detrimental to development as having an empathy deficit. By focusing on the studies mentioned above, I argue that there is a normative level of empathy and that children who fall outside of this range are at higher risk of developing dysfunctional emotional capacities.

Review and Discussion

Research has shown that excessive prosocial behaviour in children can be considered exceptional in relation to what is believed to be normative (Hay, 1994). Vivier et al. (2014) showed that children who have a moderate empathic range experience less anxiety and depression than children who possessed high levels of empathy.
These researchers propose that this finding stems from the fact that a moderate level of empathy promotes healthy mental functioning, whereas too much empathy can result in the child being overburdened with others’ negative emotions, making them more susceptible to depression, and overwhelming negative affect.

Similarly, in his review of the literature on empathy and altruism in children, Hay (1994) supports the notion that empathy in children is most functional when present within a normative range. She outlines the specific empathic behaviours that seem to develop at particular ages and claims that these behaviours can act as a gauge for a child’s overall social and emotional functioning. She describes this empathic trajectory from infancy, stating that all infants possess and display empathic behaviours. As a child ages, she argues that these generalized infantile empathic displays rapidly become specific behaviours based on the age, mental maturity, and the social norms that the child is raised under. For example, Levitt, Weber, Clark and McDonnell (1985) demonstrated that one of the most common ways that toddlers show their understanding of empathy is through the norm of reciprocity, as evidenced by a two year old’s question: “I gave you a toy, why don’t you give me one?” Just as the norm of reciprocity is representative of a well-regulated empathic and emotional system in toddlerhood, so are the manifestations of other, age-relevant behaviours demonstrative of functional development. Thus, Hay’s (1994) proposed model of empathy recognizes the trait both as a normally distributed with predictable outcomes at each age, while also acknowledging its potential to evolve into a dysfunctional trait.

These findings indicate that empathy can be used as markers of a child’s emotional and social development. While the research shows that particular behaviours are more likely to cluster at specific ages and thereby indicate a normative trajectory for empathic development, Hay (1994) still considers the possibility that a child’s empathetic responses may sporadically fluctuate. What is crucial to Hay’s (1994) understanding of empathy is that she considers it holistically and in relation to what is expected within a particular age-based parameter; small fluctuations are considered normal and healthy. Therefore, what is most important is that the empathic abilities of the child are neither exaggerated nor apathetic, as both would lead to negative developmental outcomes in the long term. Similar to Vivier et al.’s (2014) view, Hay (1994) believes that the development of rules and restrictions on empathetic reactions (i.e., how children tend to restrict empathy to those of their own gender in middle childhood) is beneficial, because it allows the child to ‘balance’ between invoking too much empathy and maintaining their own emotional stability.

This theory of a normative empathetic trajectory also explains why children sometimes display antiempathic tendencies when their self-interest is at risk. For example, assuming that empathy is a normative trait that can be overpowered by the instinctive impulse for self-preservation allows researchers to explain why toddlers are less likely to show empathetic concern for someone in distress if they were responsible for causing the other’s distress (Zahn-Waxler, Radke-Yarrow, & King, 1979). Similarly, Hay’s (1994) theory would interpret this finding as evidence of the fact that empathy is a normative trait: functionally limited by the feelings of guilt or shame that would be induced if the toddler were to feel too empathic towards the person they had hurt. Therefore, in order to spare themselves these negative feelings, the toddlers must choose to prioritize their own needs over sympathizing with others (Zahn-Waxler et al., 1979).

The tendency for children to favour self-preservation over empathy has also been noted in other empirical
In one such study, researchers showed children a video of a child being unjustly punished to either a mild or severe degree (Strayer, 1993). They found that the children were empathetic to the child they saw in the video, only so far as they could give their concern without compromising their own emotional well-being. For instance, in the condition where the child depicted in the video was only punished to a mild degree, the children were able to watch the video and give their full attention to the child being punished: thereby empathizing and relating to the child in the video. On the other hand, in the condition where the children saw the child being severely punished, they tended to turn their attention and concern towards themselves, rather than pay attention to the suffering child in the video, in order to minimize to their own distress and helplessness at not being able to assist the other child. This study demonstrates that although children are empathetically inclined, and the fact that empathic inclination is an adaptive, prosocial response, there appears to be a limit to the functionality of empathy. Additionally, this empathic limit may be particularly salient when a child’s emotional self-interest is at stake.

For empathy to exist as a functional, normative trait, one must possess the ability to limit and control their feelings of empathy. To demonstrate that a limitation of empathic emotions is a functional trait, Gjerde and Block (1991) found that girls who spent prolonged lengths of time listening to the issues of others showed greater depressive symptoms. The researchers concluded that the most likely cause of the emotional distress experienced by these girls was their inability to qualify their empathic emotions; as a result, they would become overly personally invested in the problems of others, eventually to the point of being overwhelmingly burdened, finally, collapse into depressive or other affective disorders as a result. This finding shows that a child’s inability to limit their empathetic emotions puts them in danger of emotional and cognitive overload, which can ultimately result in serious detrimental affective consequences (Zahn-Waxler et al., 1979). The results of this study, which shows the dangers of excessive empathy, also show that empathy is a functional trait only when present in moderation.

An important concession to make in this part of my argument is that empathy is most certainly a necessary trait for a child’s interpersonal, emotional, and mental development. Hay’s (1994) regulatory model states that everyone has empathic abilities, and that if they can afford to without compromising their emotional well-being, people are naturally motivated to act upon their empathic impulses. Research on mimicry by Hoffman (2000) supports this assumption, as he claims that children possess a healthy, strong, and innate desire to empathize with others. In the experiment, he showed participants videos of strangers making happy or sad facial expressions and found that the viewers altered their micro-expressions (facial expressions that occur on a very minute scale) to mirror the expression they saw. He viewed the act of mimicry as evidence that the viewers were, empathizing with the people they saw on a subconscious level; consequently, he interpreted this result as demonstrative of the fact that empathy is so instinctive that its arousal is activated even by something as superficial and far removed as a video clip. These results demonstrate how pervasive and innate the expression of empathy truly is, and conversely, how unusual and extraordinary an absence of empathy would be.

Because of such possible dysfunctions, Hoffman describes how important empathy is, but he is also careful to notice its costs. His research, similar to the conclusion reached by Hay (1994) and Strayer (1993), supports the idea that feelings of empathy can be overwhelming; thus people require the ability to limit their expression to only those situations in which it is manageable. In particular, he believes that once feelings of empathy are activated, it can cause a significant level of discomfort which can only be relieved by helping the person in need; conversely, if the individual was unable to provide help, they would experience intense feelings of guilt. For instance, in an interview, a mental health practitioner reported feelings of depression and anxiety as a result of his inability to effectively treat
The study was conducted by analyzing a catalogue of statistical information gathered by the National Longitudinal Survey of Children and Youth (NLSCY): focusing in particular to examine children aged two to nine, as well as their caregivers, on a number of personality traits and environmental patterns. Both caregivers and their children completed surveys to provide ratings on items such as the strength and consistency of a number of the child’s characteristics on a biennial basis; traits such as prosocial behaviour, anxiety, aggression, and depressiveness were measured and examined for correlations to one another. Using these responses, Vivier et al. (2014) looked for trends among the traits that were predicted to cause or exacerbate an abnormal empathic trajectory (i.e., anxiety, aggression, or caregiving style). This data allowed the researchers to group the children’s tendencies into distinct categories. They found that children fell into one of four categories for the trait of anxiety: Extremely Low, Low, High Decreasing (quickly calmed/regulated), or High Increasing (quickly anxious and overwhelmed). Empathy was mapped onto a similar scale with the following categories: High, Moderate, or Low. The most common combination of traits that researchers found in children to possess was a moderate prosocial trajectory, with low-to-moderate problem trajectories (i.e. exceptionally high or low scores for a given trait, like High Increasing anxiety/depression). This finding confirms that empathy is a normally distributed trait with associated benefits at a moderate level. Vivier et al. (2014) also found strong associations between a moderate prosocial level, a moderate amount of aggression, low levels of depression, and low levels of anxiety. 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This finding confirms that empathy is a normally distributed trait with associated benefits at a moderate level. Vivier et al. (2014) also found strong associations between a moderate prosocial level, a moderate amount of aggression, low levels of depression, and low levels of anxiety. Almost a fifth of the children that were rated as having a moderate prosocial trajectory, with low-to-moderate problem trajectories (i.e. exceptionally high or low scores for a given trait, like High Increasing anxiety/depression). This finding confirms that empathy is a normally distributed trait with associated benefits at a moderate level.
ers. Conversely, they also propose that children who are very prosocial may also possess a strong sense of conscientiousness that causes them to feel responsible and anxious for others. However, as their study was an analysis of existing data, the researchers were unable to determine the directionality of the relationship between these factors. Another interesting observation this analysis made was how strongly factors like gender, family income, and parenting style affected the children’s prosocial tendencies; independently of the children’s individual differences/idiosyncratic traits, there appeared to be strong trends among these factors alone. For example, all boys were found to have lower overall prosocial trajectories. Similarly, low family income tripled the chances that a child would follow a high prosocial and high depressive trajectory (Vivier et al., 2014). This latter finding may be attributed to the fact that children from less wealthy families may be forced to bear more responsibilities which are beyond their coping capacity (i.e., acting as the main caretakers of younger siblings). Under these circumstances, these children become accustomed to being heavily relied upon, to the point that they neglect to protect themselves against the resulting emotional exhaustion. Altogether, these findings show the complex interactions that take place between the social factors, environmental factors, a child’s empathetic trajectory, emotional stability, and mental well-being.

While it is possible that the presence of empathy independently increases the propensity of developing affective disorders (Gjerde & Block, 1991), I argue that distress is the most crucial factor to causing a child’s empathic system to become dysregulated and can consequently lead them to develop affective disorders later on in life. For instance, research has shown that maternal depression is linked to externalizing issues (i.e., aggression and anger), low levels of empathy in boys, as well as internalizing problems (i.e., depression and anxiety), and abnormally high levels of empathy in girls (Gore, Aseltine, & Colten, 1993). Similarly, other research demonstrated that daughters of depressed mothers are more likely to be emotionally distraught by the distress of others, they are more affected by depression, and affective disorders than boys (Hay & Murray, 1982; Rheingold, Hay & West, 1976). On the other hand, there is the evidence that sons of depressed mothers tend to dissociate from the feelings of others (including their mothers) and tend to resort to aggression to deal with conflict (Gore et al., 1993). This finding is also replicated by Vivier et al. (2014), which found that boys of depressed mothers were more likely to classify as high on the aggression scale.

To support the claim that upsetting or traumatic events are the most likely cause of a child’s empathic dysfunction, as opposed to the dysfunction being caused by a trait such as conscientiousness, or an innately anxiety-prone personality, I refer to psychobiological evidence that appears to directly corroborate abnormal levels of empathy with area-specific dysfunction. Bemporad and Kinsbourne (1984) suggest that animals process emotional experiences through both the action-oriented frontal lobes and the inhibition-oriented posterior lobes (which includes the parietal and occipital lobes). According to these researchers, these respective areas of the brain are each responsible for a particular processing function; for instance, the frontal lobes regulate emotional stability and the posterior lobes regulate information processing. Balance and functionality are maintained when both areas are used equally to process emotion. On that note, researchers also added, that the balance between these two parts is always fragile, as each area is constantly attempting to override the other for dominance in the task of emotional processing. Indeed, dysfunction occurs when the brain becomes too heavily area-biased in consolidating emotions. For instance, research has shown that those with frontal lobe damage experience difficulties expressing their negative emotions (Bemporad & Kinsbourne, 1984). Presumably, this is because the emotional information that was once processed through the frontal lobes, which is action-oriented, is now completely delegated to the inhibition-prone posterior lobes, which suppresses emotional expression (Bemporad & Kinsbourne, 1984). On the other hand, researchers found a parallel response in those with damage to the parietal lobes. These individuals exhibited pseudo-psychopathic or pseudo-depressive tendencies, i.e., they were particularly aggressive, unusually non-empathetic, and emotionally detached from the people around them. In other words, being frontally biased in emotional processing caused these patients to become overly reliant on its action-oriented
tendencies, such as displaying aggression, anger, or detachment at will, due to a lack of inhibitory, posterior-lobe function. (Bemporad & Kinsbourne, 1984).

Although the results outlined above were based on patients who had sustained physical brain damage, the researchers also claimed that stress or traumatic events could also lead to cases of area bias: which results in analogous displays of emotional irregularity, aggression, or pseudo-depressive symptomology (Bemporad & Kinsbourne, 1984). By placing these findings in context with aforementioned instances of gender-specific differences in empathic dysfunction (Harris & Siebel, 1975), I argue that environmental stressors, such as a difficult home life or a traumatic event, can disrupt the way that children process information in a physiologically similar way. I also contend that there is little to no predisposed sex-based difference in the manifestation of empathic dysfunction in girls and boys, and that the difference these respective genders exude in their emotional regulation strategies are better explained by gender-specific socialization. Specifically, I argue that particularly upsetting visceral experiences can cause a child to permanently change how they perceive and react to the world, in a manner that is similar to the area bias shown in patients with lesions to the frontal or posterior lobes. However, in the case of these children, rather than physical damage, gender norms may be the most influential determinant for which area the child becomes biased towards for emotional processing. For instance, boys with troubled depressed mothers are found to mainly exhibit many externalizing issues, such as aggression, a lack of emotion and empathy, and other anti-social tendencies. These emotional irregularities are reflective of one who is biased towards the frontal action-oriented lobes for emotional processing (Bemporad & Kinsbourne, 1984). This finding coincides with the fact that societal norms teach boys to refrain from overt emotional attachment, and that their integrity is derived from how emotionally derisive they can appear to be (Harris & Siebel, 1975). Thus, the finding that boys tend to become less prosocial and empathetic in highly stressful environments, rather than revert to a state of heightened empathy, like girls tend to, can be reasonably inferred as a sign of area bias based on socially influenced gendered expectations (Bemporad & Kinsbourne, 1984; Harris & Siebel, 1975).

In contrast, I contend that girls are more socially influenced to become over reliant upon the action-inhibition posterior lobes for processing emotions: a proposition supported by the finding that girls tend to exhibit internalizing issues like depression and anxiety, rather than the aggression, and emotional detachedness that most boys display in similar environmental contexts (Bemporad & Kinsbourne, 1984; Harris & Siebel, 1975). This proposition is consistent with the finding that affect induction makes boys more aggressive and girls significantly less likely to aggress (Harris & Siebel, 1975). The researchers who achieved this result claimed that this finding is evidence of arousal notion, which argues that arousal leads to increased anger, and aggressiveness in boys but to increased anxiety, guilt, and inhibition of aggression in girls. In context of Bemporad and Kinsbourne’s (1984) research findings, it is possible to interpret the discrepancy in how boys and girls process emotions as qualitatively different, i.e., which area they are biased towards, rather than quantitatively different processing channels based on any inherent sex-based disparities. This theory would hypothesize that girls who have had upsetting formative experiences, or an unstable family life, are influenced by societal norms to express overt empathy, while boys in upsetting situations are typically taught to disengage emotionally: this is precisely the dysfunctional developmental trajectory that each respective gender is typically found to have. This also explains, for instance, why girls of depressed mothers are highly empathetic (Gore et al., 1993). Most importantly, what these boys and girls have in common is a deviation from normative empathetic development, which I have argued is influenced in its expression by both psychobiological processes, and societal wide gendered norms.

Conclusion

The present paper has sought to show how empathy is a trait that is functional only in moderation: too much or too little may be a sign of underlying distress or a potential cause of future emotional dysfunctionality. An analysis of the relevant literature demonstrates how empathy interacts with both environmental, and individual traits to influence the development of a child. This sug-
gests that the existence of empathy in and of itself cannot be determined as either functional or detrimental to a child without acknowledgement of their greater social and environmental context: that trait of empathy can be determined to be functional nor detrimental to a child and their development, without consulting other factors like how it expressed, to whom it expressed, and overall, how the child perceives and engages with those around them in a way that both benefits others, as well as their own mental and emotional well-being.

References
Genetic Imprints of Environments: DNA Methylation as a mediator between Childhood Stress and Mental Health Development

Eve Yiran Zheng

Abstract

Stressful experiences in childhood are known to be related to increased risks of various mental disorders. Epigenetic modification, particularly DNA methylation, is one of the mechanisms that biologically encodes the long-term impacts of experiences on individuals. This article summarizes empirical research of DNA methylation in response to two kinds of stressful events early in life: childhood abuse and low childhood socioeconomic status (SES), and how these changes in methylation patterns are associated with mental health development. Alterations in DNA methylation were observed following experiences of childhood abuse and low childhood SES, both on specific loci and on a genome-wide level. The down-stream effect of these alterations led to increased risks of stress-related disorders as well as neuropsychiatric diseases. Overall, evidence from the literature suggest that DNA methylation is an important biological mediator underlying the long-term effect of childhood stressful experience on mental health development.

Stressful early life events are believed to be significant risk factors for multiple mental disorders (Ventura-Junca & Herrera, 2012; Yang et al., 2013). However, the mechanism underlying the long-term impact that childhood experience could have on an individual remains obscure. It is commonly accepted that the interaction between nature and nurture determines the life outcome of an individual (Ventura-Junca & Herrera, 2012). The best-known candidate that connects nature and nurture is epigenetic modification. Epigenetic modification refers to a functional alteration of gene expression without changing the DNA sequence (Gräff & Mansuy, 2008). According to Fraga et al. (2005), monozygotic twins who have more different life histories showed more epigenetic differences. Given that monozygotic twins share the same genetic profiles, this suggests epigenetic modification as an important mechanism that encodes environmental impacts on individuals.

Among various forms of epigenetic modification, DNA methylation is one of the most prevalently studied mechanisms in the developmental literature (IJzenendoorn, Bakermans-Kranenburg & Ebstein, 2011). DNA methylation refers to the addition of a methyl group to a cytosine molecule at specific sites in the DNA sequences. The addition of a methyl group leads to the condensation of chromatin structures, and thus inhibits the transcription of methylated sites (Szyf, 2011). The primary function of DNA methylation is to modulate cell differentiation. It is hypothesized that DNA methylation might also function as an adaptation mechanism, which modulates cell function in response to environmental pressures. The down-stream effect of DNA methylation may underlie a number of physical as well as mental disorders. Here, I will summarize research evidence to argue that DNA methylation plays a critical role in mediating childhood stress and risks in mental disorders.

Childhood Abuse and DNA Methylation

The high prevalence of child abuse makes it one of the risk factors for multiple mental disorders (Yang et al., 2013). A range of studies have examined the association between abusive experiences in childhood and DNA methylation. McGowan et al. (2009) examined the levels of hippocampal glucocorticoid receptor (GR) expression in brain samples of individuals who committed suicide with a history of child abuse (Suicide-abused group), individuals who committed suicide without a history of child abuse (Suicide-nonabused group), and non-suicidal control samples with no abusive history. GR expression in hippocampus was related to the control of stress responses; a higher level of DNA...
methylation could result in a lower level of GR expression, which in turns result in poorer stress regulations. Results revealed a significant reduction of hippocampal GR expression in suicide-abused group comparing to suicide-nonabused group and controls, but no difference was found between the latter two groups. This indicates that the reduction of GR expression is more closely related to the history of childhood abuse instead of the suicide behaviour per se. They further examined the two possible reasons that could be responsible for this reduction of GR expression: neuron-specific glucocorticoid receptor (NR3C1) promoter nucleotide sequence variation or NR3C1 promoter methylation, since the expression of NR3C1 genes determines the tissue-specific hippocampal GR expression. They found that NR3C1 nucleotide sequence showed no differences among groups, whereas NR3C1 promoter DNA methylation was significantly higher in Suicide-abused group than either the Suicide-nonabused group or the control group, with no significant differences between Suicide-nonabused group and controls. This finding suggests that the hippocampal GR expression in Suicide-abused group was more likely to be caused by increased methylation of the NR3C1 promoter area. The overall findings suggest that the history of childhood abuse was closely associated with changes in GR expression, and this changes in GR expression were due to increase in DNA methylation.

In a more recent study, Mehta et al. (2013) examined differences in DNA methylation patterns among individuals with PTSD who have history of childhood abuse, individuals with PTSD who have a history of trauma not involving childhood abuse, and control individuals who have a history of trauma, but are not clinically diagnosed with PTSD. While McGowan et al. (2009) focused on a specific genetic site, Mehta et al. (2013) looked at DNA methylation at a genome-wide level using peripheral blood cells. Both PTSD groups showed significantly different methylation patterns compared to the control. Interestingly, there was very little overlap (2%) of DNA methylation patterns between individuals with PTSD and history of childhood abuse and individuals with PTSD, but no history of childhood abuse. Among the subjects within groups, the methylation patterns of individuals with PTSD and history of childhood abuse matched 12-folds higher than individuals with PTSD, but no history of childhood abuse. These results suggest that childhood abuse may be one of the main reasons that lead to pathological differences among PTSD individuals, established by differences in DNA methylation patterns. Again, these findings provide a better understanding of how experiences of childhood abuse influence the pathological process of psychiatric disorders.

The previous two studies focused on adult samples, and on a specific disease or outcome. In contrast, Yang et al. (2013) studied child samples with more recent experiences of maltreatment. The saliva samples were obtained from children with and without abusive histories, and examined their genome-wide DNA methylation patterns. They discovered, on average, a 17% methylation difference between children with and without abusive histories. The general pattern of methylation indicated that children with abusive history have higher methylation values at CpG sites with low to medium-range methylation, and lower methylation values at CpG sites with high-range methylation. The findings provide further evidence for the linkage between the history of childhood abuse and changes in DNA methylation at a genome-wide level.

**Early-life Socioeconomic Status and DNA Methylation**

Low socioeconomic status (SES) in early life is another childhood stressor that increases an individual’s vulnerability to various diseases. Miller et al. (2009) found an up-regulation of genes involved in catecholamine-mediated pathways and down-regulation of genes bearing glucocorticoid-mediated pathways among individuals with low SES in childhood. Although the researchers did not examine the molecular process in an epigenetic level, the changes in the regulation of genetic expression suggested a high possibility of epigenetic involvement, because the primary function of epigenetic modification is to regulate gene expression.

Later, Borghol et al. (2011) examined DNA methylation using blood samples from adults with different SES levels in childhood or in adulthood. They discovered that compared to SES levels in adulthood, DNA methylation profiles were more closely associated with the levels of SES in childhood. More specifically, a more pronounced clustered methylation pattern corresponded with differences in SES levels in childhood.
Moreover, individuals with high or low SES levels in childhood have different methylation patterns in gene promoters associated with functional signalling pathways. Similarly, Tehranifar et al. (2013) examined DNA methylation of three repetitive elements in adult women blood samples with varied childhood and adulthood SES. They found two repetitive elements having elevated methylation level associated with lower SES in childhood, yet only one element had lower methylation level associated with higher SES in adulthood, suggesting a greater association between changes in methylation levels and SES in childhood than SES in adulthood. Taken together, there is a clear association between childhood SES and DNA methylation values.

**DNA Methylation and Mental Health**

Studies by McGowan et al. (2009) and Yang et al. (2013) also investigated the association between epigenetic methylation and mental health. In McGowan et al.'s (2009) study, an increased level of methylation of NR3C1 promoter interferes with transcription factor binding and down-regulates the level of glucocorticoid receptor mRNA, resulting in a lower level of GR expression. Hippocampal GR expression controls the hypothalamic-pituitary-adrenal (HPA) responses to stress, in which lower GR expression level will result in a greater HPA stress response. Abnormal HPA axis responses are believed to be associated with a variety of psychiatric diseases, including depressive disorders and stress disorders (Ventura-Junca & Herrera, 2012). History of childhood abuse was associated with an increased methylation level of NR3C1 promoter, which in turns lowered the GR expression, results in abnormal HPA axis controls and increased likelihood to develop stress-related disorders later in life. Together, the results propose DNA methylation as one of the major mediators underlying the long-term effect of childhood stressful experience on mental health development.

Another study examining the epigenetic effect of child abuse identified 2868 significant CpG methylation sites and eight significant methylated genes (Yang et al., 2013). 20% of the methylation sites are intergenic regions that are associated with neuropsychiatric diseases, cardiovascular diseases and cancer (Yang et al., 2013). The remaining 80% are intragenic regions altering genes associated with cortical development, depression, and substance dependence (Yang et al., 2013). In addition, a recent study found that methylation values of three genes (ID3, GRIN1, and TPPP) act as significant predictors of depression in children (Weder et al., 2014). These experimental results suggest that DNA methylation is an important factor triggering a variety of health problems.

**Limitations and Future Direction**

As an emerging area, current studies on life experience and DNA methylation do have their limitations. One major limitation across most studies is the lack of longitudinal data. A very limited number of studies examined the variation of DNA methylation in a sample population from childhood to adulthood, and the majority of the existing data is collected at only one point of an individual’s life span. This limitation exists because of the recent and on-going development of methylome measurement technologies (Borghol et al., 2011). Methylome refers to the patterns of methylation modifications in the genome an organism. Methods of methylome measurement are relatively new-established, providing a relatively narrow time span for tracking the developmental path of individuals. Longitudinal studies are helpful in terms of revealing the changes of methylation patterns over time. In the future, research should focus on the formation of longitudinal DNA methylation data set, which facilitates a more extensive understanding of changes in methylations over time, and helps to establish a more explicit interaction mechanisms among experiences, DNA methylation and pathological outcomes.

Another limitation is the use of various tissue types in DNA methylation investigations. The majority of studies used blood samples or saliva samples, with only one group (McGowan et al. 2009) examining brain samples. The advantage of using blood or saliva samples is that these methods are non-invasive, and because the DNA methylation variability is relatively new-established, providing a relatively narrow time span for tracking the developmental path of individuals. Longitudinal studies are helpful in terms of revealing the changes of methylation patterns over time. In the future, research should focus on the formation of longitudinal DNA methylation data set, which facilitates a more extensive understanding of changes in methylations over time, and helps to establish a more explicit interaction mechanisms among experiences, DNA methylation and pathological outcomes.
with experience-triggered methylation is largely unknown. The use of brain tissues provide less ambiguous evidence in studies regarding mental disorders. Given the limited access to brain tissue, one possibility is to further develop the human brain database, especially for individuals with childhood aversive experiences and mental disorders.

In conclusion, epigenetic changes such as DNA methylation provided biological linkage between childhood stressful experiences on mental health development. Epigenetic research inspired a deeper understanding of the nature-nurture interaction. More importantly, epigenetic research findings suggested that chromatin structure manipulation could potentially become a new possible therapeutic intervention for psychological abnormalities induced by childhood aversive experiences, proving a possible direction for more advanced psychopathological assessments or interventions.

References


The Neural Basis of Dietary Self-Control

Vanessa Giuliano

Abstract

In today’s Western society, frequent overindulgence of unhealthy, high-calorie food can lead to detrimental health effects such as obesity and heart disease. To combat these diseases, health practitioners recommend patients decrease their intake of unhealthy, high-calorie, low nutrient rich foods. Some individuals are better at following these recommendations than others. This review highlights the neural underpinnings that allow some individuals to better exercise dietary self-control. Cortical areas including the dorsolateral prefrontal cortex (DLPFC), ventromedial prefrontal cortex (VMPFC), and orbitofrontal cortex (OFC) are involved in crucial aspects of decision making such as inhibition of hedonic rewards, temporal discounting, and option valuation. These aspects of decision making are all used when making dietary choices, causing those who are better at reward inhibition and associated self-control mechanisms to be better dieters. This review suggests a neurobehavioral approach to dieting where dieters are taught cognitive strategies. These strategies can reinforce brain regions that help individuals exercise better decision making skills and aid dieters in making better food choices.

On a daily basis, individuals are confronted with dozens of choices regarding anything from what to eat to how to allocate their time and money. While it is tempting to make choices that are immediately rewarding, such as eating tasty but unhealthy foods, one can often exercise self-control to make more logical decisions that not only consider the present moment, but also future consequences. Self-control is defined as the ability to control one’s homeostatic and hedonic drives for the purposes of self-regulation. From an evolutionary perspective, controlling impulses allows for the maintenance of focus and task completion while maximizing efficiency (Heatherton & Wagner, 2011). The prefrontal cortex is a crucial brain region that supports self-control. This region has evolved to be massively expanded in humans in comparison to other animals, which allows humans to exercise self-control over hedonic drives that other animals cannot match in magnitude (Wood & Grafman, 2003).

In today’s Western society, overindulgence of food is common. Due to the detrimental health effects of over-eating such as heart disease and obesity, dietary self-control is crucial (Hollmann et al., 2011). The most common method of dietary self-regulation is dieting. This involves limiting the consumption of desirable, high calorie foods for weight loss purposes (Ridder, Adriaanse, Evers, & Verhoeven, 2014). This dietary control may be a reflection of the prefrontal cortex expansion noted in humans in comparison to other species. Unlike humans, animals are, for the most part, impulsive and opportunistic consumers. Animals are instinctively driven to eat whenever they are energy deficient and food is present, regardless of its caloric value. Consequently, it is crucial to analyze the neural basis that allows humans to make food intake choices that go against their homeostatic drives and ancestral instincts for the purpose of weight loss.
stated through their poor performance on the Stroop test, a cognitive test which involves inhibition (Stuss, Floden, Alexander, Levine, & Katz, 2001). Overall, those who diet successfully experience greater activation of their DLPFC in response to food and therefore can exercise greater dietary self-control and inhibition.

The idea that DLPFC activity is associated with dietary inhibition has been further analyzed in individuals with obesity, a condition that can be caused and worsened by uninhibited eating. One study investigated DLPFC activity of obese individuals using positron emission tomography (PET) and noted that obese participants had lower activity within the DLPFC than lean controls (Le et al., 2007). Furthermore, individuals who were formerly obese, but had successfully maintained their weight loss had much higher DLPCF activation than obese individuals. This evidence suggests that the DLPFC may be less active in obese individuals, resulting in uninhibited eating and weight gain.

On the other end of the spectrum, individuals with anorexia have also been analyzed. Anorexia is a mental illness that is characterized by fear of weight gain, and severe dietary restriction. The severe dietary restriction that anorexic individuals display is thought to be derived from dysfunction in frontal striatal neural circuits involving the DLPFC (McClelland et al., 2013). It has been shown that anorexic patients display increased activation in the DLPFC in comparison to healthy controls when shown food images (Brooks et al., 2011). Voxel based morphometric analysis has also revealed that anorexic individuals displayed an increased volume of grey matter within the DLPFC in comparison to healthy controls. The DLPFC grey matter volume in participants was positively associated with the amount of dietary restraint displayed. These studies analyzing anorexic patients support the concept that individuals who are able to successfully restrain from eating are exercising cognitive control modulated by the DLPFC.

In hopes of finding a potential treatment against severe dietary disorders, repetitive transcranial magnetic stimulation (rTMS) studies have revealed that stimulating the DLPFC of individuals with binge eating disorders has resulted in increased dietary control and attenuation of binging episodes (Eynde et al., 2010). Decreasing the activity of the DLPFC through low frequency rTMS in anorexic individuals has also aided in recovery of anorexia (McClelland et al., 2013). These rTMS studies show a causal link between the DLPFC and dietary inhibition, clarifying the role of the DLPFC in dietary regulation.

**Delay Discounting and Dieting**

One cognitive bias that humans particularly struggle with is delay discounting. Delay discounting is when humans place disproportionate value on immediate rewards while devaluing rewards that are presented later (Ely, Winter, & Lowe, 2013). Delay discounting plays a pivotal role in dietary regulation, as dieting is resisting immediately rewarding, high calorie foods to achieve weight loss, a long term goal. In comparison to women of normal weight, obese women have shown to perform worse on delay discounting tasks, often choosing more immediate rewards over later ones (Weller, Cook, Avsar, & Cox, 2008). Consequently, it is crucial to consider the neural underpinning behind this process in the context of dietary choice to understand what neural aspects allow some individuals to be more successful at dieting than others.

Activation of the DLPFC is a hallmark of successfully avoiding immediate awards in order to achieve goals present at a later point in time (Ely et al., 2013). Various studies have implicated DLPFC activation in the ability to focus on long-term goals (Peters & Büchel, 2011). Low frequency rTMS of the DLPFC, which decreases its activation, has shown to cause participants to be more likely to choose immediate smaller rewards over larger rewards presented at a later point (Figner et al., 2010). Individuals who experienced less activation of the pre-frontal cortex while performing tasks that involve delay discounting have been shown to experience more weight gain in subsequent years than those with greater prefrontal cortex activation (Kishinevsky et al., 2012). Further, a recent meta-analysis has provided support that stimulation of the DLPFC through both tDCS and rTMS has resulted in decreased food cravings (Jansen et al., 2013). Food cravings can often motivate an individual to choose immediate rewards over long term rewards. By reducing these cravings, avoiding delay discounting could be made an easier task. These results suggest that DLPFC activation allows for successful dietary impulse control through avoidance of delay discounting.

The orbitofrontal cortex (OFC) has also been implicated in delay discounting. Activation of the later-
differences in OFC activity that reflects an ability to avoid delay discount within dietary contexts.

Valuation of Food Rewards

Lesion studies demonstrate that OFC damage leads to decision making deficits, potentially caused by the inability to effectively evaluate presented stimuli (Wallis, 2007). Supporting this idea, DelParigi et al. (2006) used PET to compare OFC activation differences between dieters and non-dieters when exposed to food choices. Successful dieters had decreased activation of the OFC after a satiating meal in comparison to non-dieter controls (DelParigi et al., 2006). The OFC receives visceral sensory input, which can use bottom-up visceral information about hunger to drive behavior. As a result, DelParigi et al.’s (2006) findings could indicate that successful dieters are better able to use bottom-up visceral cues about satiation to devalue further food intake after already eating. The DLPFC activation in successful dieters was inversely correlated to OFC activity. This reciprocal connection could be an inhibitory feedback circuit in response to meals. This circuit may allow successful dieters to use top-down environmental cues that are processed in the DLPFC, to further devalue food intake after eating. In line with this evidence, researchers have studied those with binge eating disorders and noted that in comparison to healthy controls, binge eaters showed increased activity in the mOFC when viewing food stimuli (Schienle, Schäfer, Hermann, Vaitl., & 2009). Increased activity in the mOFC may provide a value-based motivation that causes those with a binge eating disorder, and unsuccessful dieters, to overeat.

The value an individual places on certain goals drives the decisions he or she makes. The ventromedial prefrontal cortex (VMPFC) is another brain region that uses assigned values to drive dietary decisions. Evidence supports the notion that when making decisions, the brain computes the value of the options presented (the decision values) and will compare these values to drive an appropriate behavior (Hare et al., 2009). The VMPFC has been associated with computation of decision values (Sokol-Hessner, Hutcherson, Hare, & Rangel, 2012; Sripada, Gonzalez, Phan, & Liberzon, 2011). Keeping this in mind, Hare et al. (2009) conducted an fMRI study measuring decision value signals in dieters when making dietary choices. As expected, individuals who resisted tasty yet unhealthy foods had VMPFC
activity that correlated with considerations of both taste and health aspects of food. Dieters who were unsuccessful at rejecting tempting and unhealthy foods displayed VMPFC activity only in regards to taste aspects. These results suggest those who exercise a greater ability to refrain from high calorie foods are better able to endogenously activate the VMPFC in regards to health related cues. By recruiting this area, individuals can prioritize the health benefits of dieting over the temptation of food.

Those who successfully undergo dietary restriction have increased DLPFC activation. This was inversely related to activation in the VMPFC (Hare et al., 2009). This suggests a potential circuit involving the DLPFC and VMPFC implicated in decision making and more specifically, dietary choice. These results suggest that the VMPFC initially evolved to place value on short-term goals, but is now able to incorporate long-term consequences into its decision evaluations through modulation by the DLPFC (Hare et al., 2009). This circuit could have critical implications in dietary decision making. Damage to the frontal lobes has been associated with the development of hyperphagia, an eating disorder characterized by excessive uninhibited eating (Erb, Gwirtsman, & Fuster, 1989). Individuals with neurodegenerative disorders, such as frontotemporal dementia, that deplete grey matter in the fronto-temporal lobe, including the VMPFC, have been associated with disinhibited eating behaviors (Woolley et al., 2007). Those with VMPFC lesions have poor decision making skills, which can impact which foods they decide to eat (Fellows & Farah, 2007). This body of evidence suggests the VMPFC has a crucial role in dietary regulation through its ability to evaluate aspects of food intake to drive behavior.

**Dietary Regulation Failure**

The DLPFC plays a pivotal top-down role in controlling our mesolimbic and reward systems to regulate behavior. When individuals are under cognitive load, it may deplete DLPFC resources to inhibit impulsivity and restrict reward driven behavior. Consequently, self-regulation failure can occur. This was reflected in Ward and Mann (2000); participants who underwent cognitive depletion tasks engaged in more disinhibited eating than controls. Further, chronic dieters performed a task that depleted their cognitive resources and were later shown palatable food images (Wagner, Altman, Boswell, Kelley, & Heatherton, 2013). Those who underwent the cognitive depletion task revealed significantly increased activation in OFC and other brain structures that reflected the value of food with decreased activation in the lateral prefrontal cortex. The cognitive depletion task group also showed a reduced connectivity between these regions (Wagner et al., 2013). These results support the theory that high cognitive load can be detrimental to dieters. As high cognitive load depletes the resources of higher order brain regions to modulate the hedonic value of food, high cognitive load can result in disinhibited eating.

The environment in which one finds oneself can also affect the ability to inhibit impulses. Meule et al. (2014) investigated the effects of food cues on dieters. Showing participants visual food cues elicited impulsivity and automatic cravings for food, while the degree of impulsivity expressed was related to dieting success (Meule, Lutz, Krawietz, Stützer, Vögele, & Kübler, 2014). Because the OFC, VMPFC, and DLPFC receive input about external stimuli to drive behavior, these cues may interfere with cognitive control over impulsive behaviors, thus motivating dieters to make poor dietary choices. This presents a particular danger of dieting failure in today’s society, as ads promoting impulsive indulgence in high-calorie foods are almost unavoidable.

**Real World Implications**

The current approach for dietary regulation is to educate individuals on the nutritional content of their food choices and to emphasize personal choice (Appelhans, Whited, Schneider, & Pagoto, 2011). As a result of this method, humans believe that poor dietary choices reflect a personality flaw. This thinking stigmatizes failed dieters as being unmotivated. However, many failed dieters are motivated to lose weight (Appelhans et al., 2011). In this review, we show that dietary regulation extends beyond the intention of weight loss, and has complex neural underpinnings. There is support for a neurobehavioral approach to weight loss, moving away from ‘willpower’ as lacking in dietary regulation.

Inhibition is a crucial aspect of dieting which is linked to activation of the DLPFC (Appelhans, 2009). External cues from one’s environment can modulate DLPFC activity, which can in turn affect inhibitory behavior.
Surrounding dieters with health related cues, or removing cues that promote unhealthy food ingestion, can be strategies dieticians and practitioners recommend when treating those struggling with weight management. This review highlighted negative effects of cognitive stress on the ability of the DLPFC to modulate the VMPFC and OFC valuation processes. These studies suggest that dieters may benefit from training programs involving stress management. This may result in the reduction of cognitive load and the overall disruption of the inhibitory process—both necessary for diet maintenance.

All individuals, including dieters, struggle with the cognitive default of delay discounting. By educating dieters about temporal discounting and cognitive reappraisal therapy, dieters can learn to rethink food consumption in the context of long-term health benefits and weight loss. This dietary perspective can reinforce OFC and DLPFC activity among other regions to motivate dieters to continue through consideration of long-term goals.

Future Research

The majority of neuroscience research surrounding the complex human behavior of dieting has focused on understanding the brain regions involved in successful diet regulation. Recent findings indicate that behavioral intervention may facilitate self-regulation and inhibition by activating crucial brain regions that support top-down cognitive control (Kober et al., 2010). Few studies, if any, have investigated cognitive behavioral intervention on inhibition and dietary success. Future research should analyze the potential effects of cognitive reappraisal strategies to increase dietary success and weight loss of dieters. The neural underpinnings underlying this process may be understood through observable changes within the brain as individuals use these behavioral strategies. A longitudinal study could track the success of two groups: dieters taught reappraisal strategies and dieters unaware of these strategies. These strategies could increase dietary inhibition through reinforcement of brain regions involved in inhibition and self-control. Imaging studies along with voxel-based morphometric analysis could be conducted to test if these cognitive strategies affect activation and volume of brain regions associated with inhibition. Correlations between regional changes and dieting success can be examined. A study with this framework could support the implications in this review, and could further support neurobehavioral approaches to dieting as a recommendation by dieticians.

Although cortical brain regions appear to be playing a key role in dietary self-regulation, subcortical brain regions have also been implicated in dietary failure (Demos, Kelley, & Heatherton, 2011). Consequently, future studies should also analyze the effects that these cognitive strategies and potential cortical changes could have on subcortical brain regions associated with failure of dietary self-regulation.

References


