

EXECUTIVE FUNCTIONING AND THEORY OF MIND: LINKS WITH EMERGING
ADULT PEER, OCCUPATIONAL, AND ROMANTIC ADJUSTMENT

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Abstract

Few studies have directly examined associations between executive functioning (EF), theory of mind (ToM), and social adjustment among emerging adults, as well as contextual variables influencing these associations. This dissertation was devised to explore relationships between EF, ToM, and social adjustment in emerging adults in a programmatic fashion, utilizing different methodologies. Study 1 was a systematic review. The goal was to outline a research-based model of emerging adult peer, occupational, and romantic adjustment, based on EF and ToM. The review protocol was published with PRISMA. Descriptive synthesis across 38 studies revealed small to moderate effects of survey measures of self/emotional regulation EF difficulties on peer or romantic adjustment, with larger effects on aggression-based peer or dating variables. Both survey-based and performance-based EF measures predicted occupational adjustment. ADHD symptoms moderately predicted impairment in all domains. Rare studies examining ToM showed its significant positive associations with romantic adjustment, inconsistent associations with peer adjustment, and did not investigate its associations with occupational adjustment. The Study 2 goal was to address research gaps identified in Study 1, and to test an SEM model of executive dysfunction (EDF) and ToM effects on social adjustment in a sample of 295 emerging adults. Survey-based EDF negatively predicted peer and occupational adjustment, and positively predicted dating aggression. Latent ToM positively predicted peer and academic adjustment, and negatively predicted dating aggression. ADHD positively predicted EDF, and family-functioning negatively predicted EDF through increased anxiety. As partially hypothesized, performance-based EDF negatively predicted academic, though not employment adjustment. Study 3 was a qualitative deductive thematic analysis with 15 emerging adults with head injury histories. The goal was to further explore variables contextualizing associations between EF, ToM, and social

adjustment. Several sub-themes assumed apriori resulted, including problems with EF, ToM, friendships, school, work, and romantic relationships, in addition to social support protective factors. Emergent themes included non-executive cognitive problems, physical symptoms, temperamental characteristics, sports and driving problems, and coping strategies. In summary, the common themes across the three studies included evidence of significant but limited associations between EF, ToM, and social adjustment, with influences on these associations from biopsychosocial risk and resilience factors.

Dedication

This dissertation is dedicated to my beautiful wife Amy Mintah, daughters Mila and Ella, parents Gloria and Charles Mintah, and my siblings Ajoa and Afua, and extended family who went above and beyond in support for me over the years to pursue my dreams.

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Chapter One: Introduction

Executive functioning (EF) and theory of mind (ToM) are interrelated cognitive abilities associated with social adjustment (see Moriguchi, 2014; Riggs, Jahromi, Razza, Dillworth-Bart, & Mueller, 2006 for reviews; O'Toole, Monks, & Tsermentseli, 2016). EFs are a set of cognitive functions allowing individuals to control and coordinate their thoughts and behaviours toward goals (Luria, Karpov, & Yarbuss, 1966; Miyake & Freedman, 2012; Salimpoor & Desrocher, 2006). These can be classified into inhibition, mental set shifting, and updating functions, the latter of which relies heavily on working memory (Carlson, Zelazo, & Faja, 2013; Miyake & Friedman, 2012). ToM is a social cognitive ability allowing individuals to interpret others' intentions from their social behaviours (Wimmer & Perner, 1983).

The social information processing model (Crick & Dodge, 1994) demonstrates that social interactions can be ambiguous—often carrying opportunities to misinterpret benign social behaviours for aggressive or antagonistic acts. EF skills allow individuals to shift mental sets and inhibit maladaptive misinterpretations. Once maladaptive thoughts are inhibited, ToM is used to more constructively interpret peers' social behaviours, promoting positive interactions (Crick & Dodge, 1994; Dempster, 1992; Pérez-Edgar, 2012). In this way, EF and ToM work within a social information processing sequence to support social adjustment.

Investigating the associations between EF, ToM, and social adjustment is important. According to research on healthy school children, improvements in social adjustment are related to improvements in either of these abilities (Jaeggi, Buschkuhl, Jonides, & Perrig, 2008; Qu, Shen, & Chen, 2015; Riggs et al., 2006). These abilities may be particularly important for emerging adults, be they emerging adults from the general population, or those with cognitive impairments from acquired frontal brain injuries (Beauchamp & Anderson, 2010; Yeates et al.,

2007). In addition to getting along with peers, emerging adults require cognitive abilities to navigate more complex, developmentally advanced social tasks such as those required for occupational or romantic adjustment (McCormick, Kuo, & Masten, 2011). The goal of this dissertation is to examine the associations between EF, ToM, and emerging adult social adjustment across peer, occupational, and romantic domains.

1.1 Definitions

EF

EF includes, but is not limited to, inhibition, mental set shifting, and working memory functions. Two decades of research demonstrate that the EF skills tapped by many popular EF tasks, are subsumed under these three abilities (Carlson et al., 2013; Friedman & Miyake, 2017; Miyake et al., 2000; Miyake & Friedman, 2012). While these abilities are separate, but unified under a common EF factor, inhibition in particular is statistically indistinguishable from the common EF factor. For this reason, theorists regard inhibition as integral to EF, given its role in the control of lower-level cognitive processes in service of higher-level goal maintenance.

Inhibition is a cognitive ability that manifests socially and behaviourally as will-power, or more technically as self-regulation, behavioural inhibition, self-control, effortful control, emotional regulation, or other similar abilities (Miyake & Friedman, 2012). Mental set shifting is also known as *cognitive flexibility*. It refers to the ability to shift mental conceptual frameworks. It manifests socially as flexibility across changing circumstances, or as flexibility when switching between tasks. Working memory allows one to hold information in mind while using, manipulating, or updating it, to perform various cognitive tasks.

ToM

ToM is a specific ability within a broader set of social cognitive abilities serving to represent others' intentions, beliefs, feelings, or experiences, in one's own mind (Adolphs, 2001; Amodio & Frith, 2006). *ToM* is defined as the ability to distinguish between our own and others' mental states (Premack & Woodruff, 1978), and infer others' mental states from available social information such as facial expressions, body language, voice tone, or behaviour (Adolphs, 2001; Amodio & Frith, 2006). For this reason, it underlies many social cognitive abilities including social encoding, social perception, and perspective-taking.

Social Skills and Outcomes

The developmental social tasks of interest in this dissertation include peer, occupational, and romantic social adjustment. *Social adjustment* in each context is defined as the degree to which an individual accomplishes developmentally appropriate and socially desirable tasks. This is determined by internal or external subjective evaluations of performance qualities in social contexts. *Social skills* contribute to social adjustment, as they represent the abilities or talents used to achieve social adjustment. *Social outcomes* refer to objective outcomes resulting from the pursuit of social adjustment (Cavell, 1990; Yeates et al., 2007).

Social Adjustment

Peer adjustment. In the current dissertation *social adjustment* is an umbrella term encompassing all the aforementioned definitions of social adjustment, skills, and outcomes. Therefore, *peer adjustment* is broadly defined by the quality of one's peer relationships (e.g., quality of friendships), one's social skills (e.g., prosocial skills), or one's social outcomes (e.g., popularity, aggression). These refer to platonic peer relationships across everyday settings, such as leisure, work, or class settings. In this dissertation, peer adjustment excludes romantic or

family functioning (Moilanen, 2017), or substance abuse or criminal justice system issues not easily reduced to everyday one-on-one interactions between peers (Lopes et al., 2011).

Occupational Adjustment. *Occupational adjustment* refers to either academic or employment occupational adjustment. This includes subjective evaluations of academic or work performances or experiences (e.g., academic satisfaction, work performance reviews, career path confidence), occupational skills (e.g., performances on reading or writing tests, job innovation skills), or objective occupational outcomes (e.g., educational attainment, employment status).

Romantic Adjustment. Finally, *romantic adjustment* refers to the degree to which one has developed social skills for satisfying interactions in dating or romantic contexts (Buhrmester, Furman, Wittenberg, & Reis, 1988; Cavell, 1990). Depending on one's level of romantic development which itself is influenced by sociocultural factors, developmentally appropriate romantic goals can range from singlehood, to group or casual dating, to committed relationships (Connolly, Nguyen, Pepler, Craig, & Jiang, 2013; Dhariwal & Connolly, 2013; Li, Connolly, Jiang, Pepler, & Craig, 2010). More specifically, romantic adjustment is defined as subjective evaluations of one's romantic life (e.g., romantic relationship qualities, or singlehood satisfaction), one's level of romantic relationship skills (e.g., conflict resolution skills), or by one's romantic outcomes (e.g., dating aggression, relationship status).

Predictors, Outcomes, and Effects Versus Causal Influences

The goal of this dissertation was to empirically examine the associations between EF, ToM, and social adjustment. Guiding these empirical investigations were theoretical social information processing models situating EF and ToM as predictors and social adjustment variables as outcomes (Crick & Dodge, 1994; Dempster, 1992; Pérez-Edgar, 2012; Yeates et al.,

2007). The assumption made by these models is that appropriate research methodologies will establish EF and ToM predictors as causal influences on social adjustment outcomes.

Multiple regressions are statistical tools used in empirical investigations which in and of themselves, are not sufficient to establish causality (see Schumacker & Lomax, 2016 pp. 52, 69). Nonetheless, *predictors* will refer to independent variables in regression or path analyses. *Outcomes* will refer to dependent variables in regression or path analyses (Schumacker & Lomax, 2016, p. 52). *Effects* will be used to describe the relationship between regression predictors and outcomes. These terms will be used with the understanding that despite their being suggestive of causality, multiple regression and path models are not causal models, per se (Schumacker & Lomax, 2016, p. 69). These terms are distinguished from *cause* and derivative terms (e.g., *causal*, *causing*) which will be reserved for empirical investigations that meet criteria for establishing causality (Schumacker & Lomax, 2016, p. 69). These conventions for referring to regression findings are supported by the literature reviewed for this dissertation wherever multiple regression is employed. These conventions are also apparent across a range of other cross-sectional social adjustment studies employing multiple regression (e.g., Asghari, Connolly, & Cochrane-Brink, 2020, p. 162; Cohn, Jakupcak, Seibert, & Hildebrandt, 2010, p. 55).

Notwithstanding, the terms *predictors*, *outcomes*, and *effects* will be avoided when describing mainly Pearson correlations, which are distinguished from multiple regression effects (Schumaker & Lomax, p. 52). When referring generally to empirical investigations of EF, ToM, and social adjustment associations, as opposed to mainly regression effects in particular, terms such as links or associations will be used.

Sex Versus Gender

In the absence of clarity on past studies' participants reporting biological sex or gender identity, the reporting of biological sex will not be assumed. In all such cases the term "gender" will be used.

1.2 Dissertation Goals

The goal of this dissertation was to study the associations between EF, ToM, and peer, occupational, and romantic social adjustment. The goal of Study 1 was a systematic review of research on the effects of EF and ToM on these domains of social adjustment. Study 2 used latent variable analysis to investigate these topics among emerging adults sampled from the general university population. Study 3 was a qualitative study of social adjustment among emerging adult university students suspected to have cognitive impairments from head injuries.

A general discussion explores themes across these three studies, as well as the studies' implications, limitations, directions for future research, and clinical applications.

Neuropsychological Theory

Neuropsychological theory was of interest in interpreting the results from all three studies. Neuropsychology comprises the study of brain-behaviour relationships. The co-localization of medial prefrontal structures critical for EF and ToM (Bowman, Kovelman, Hu, & Wellman, 2015; Carlson et al. 2013; Tanner & Arnett, 2016), as well as other forms of social cognition, and social behaviour (Babakien, Merkley, Savage, Giza, & Levin, 2015), informs the connections between these cognitive and social abilities at the behavioural level. In Study 1, neuropsychological models were needed to explain patterns of findings found across included review studies. These same neuropsychological models guided the specification of the Study 2 structural equation model (SEM). Moreover, in Study 2 a neuropsychological model developed

through research with neurologically and neurodevelopmentally disordered populations guided the selection of attention-deficit/hyperactivity disorder (ADHD) as a neurological status variable used as a predictor of EF and ToM. Finally, a neuropsychological model guided the selection of the clinical sample featured in the Study 3 qualitative study. This sample from the traumatic brain injury (TBI) population was expected to exhibit unique cognitive and social cognitive difficulties. More pronounced difficulties in this population were expected to facilitate the study of the associations between EF and ToM difficulties, and social dysfunction. Neuropsychological theory and the specific neuropsychological models employed will be reviewed and discussed in detail in each study's introduction and discussion sections.

Chapter Two: Study 1 Systematic Review of the Effects of EF and ToM on Peer, Occupational, and Romantic Adjustment Among Emerging Adults

The majority of studies on the influences of EF and ToM on social adjustment have focused on peer social interactions and academic skills among preschool and school age youth (see Devine & Hughes, 2014, for meta-analysis). These stages are characterized by the rapid development of prefrontal cortical regions mediating EF and ToM (Diamond, 2002; Durston et al., 2006). However, it is worth noting that by emerging adulthood, prefrontal cortical development is not complete (Hao & Liu, 2016; Taylor, Barker, Heavy, & McHale, 2013). This warrants continued study of these abilities at this stage. Incidentally, emerging adults also face complex developmental tasks, such as the establishment of occupational and romantic relationships (McCormick et al., 2011), requiring additional cognitive resources (Ciarocco, 2011; Watkins, DiLillo, Hoffman, & Templin, 2013). For this reason, studying EF and ToM in relation to social adjustment at this stage is particularly important.

2.1.1 Developmental Task Theory

Developmental tasks are expectations that societies place on individuals at particular stages of development. According to developmental task theory, learning to meet these challenges promotes psychosocial adjustment, competence, and resilience (Havighurst, 1948).

Researchers have emphasized different developmental tasks when discussing emerging adult social adjustment. For Arnett (Arnett, 2000; Tanner & Arnett, 2016), emerging adults' developmental task is to depart from societal expectations, to explore alternatives for work, romantic relationships, and worldviews. His views are based in Erikson (1968) and Keniston's (1971) emphases on identity moratorium and free role experimentation during a "prolonged adolescence".

In contrast, other researchers emphasize the resolution of such role explorations when defining emerging adult developmental tasks. Recently, Arnett's contemporary has emphasized "recentering" as the primary emerging adult psychosocial task. Recentering involves renewing personal goals and priorities for the purpose of committing to specific occupational and romantic roles (Tanner & Arnett, 2016). Such a view may be influenced by Levinson (1978) who saw emerging adulthood as a time for building stable life structures in love and work.

It may be that these views emphasize different aspects of the same developmental processes. These processes entail undergoing unstable role explorations, for the purposes of meeting societal expectations for stable life structures in the near-future. In this sense, "recentering" can be seen as involving role exploration, insofar as it is used for gathering a variety of experiences and life lessons, to be used for the selection of stable roles (Tanner & Arnett, 2016). In keeping with this view, Arnett (2000) originally distinguished between immature adolescent exploration and mature emerging adult exploration for the purpose of upcoming role commitments. Examples of the latter are experimentation with longer-term relationships as opposed to adolescent short-term dating, or experimenting with different career internships as opposed to high school summer retail jobs.

School Age Versus Emerging Adult Developmental Tasks

While Arnett (2000), Tanner (Tanner & Arnett, 2016) and others' views on developmental tasks focus specifically on the emerging adult stage, others take a lifespan focus. Given the desire to relate the school-age literature on EF, ToM, and social adjustment to emerging adult social adjustment, McCormick et al.'s (2011) lifespan focus was ideal for conceptualizing and comparing emerging adults' developmental tasks. While there are similarities between Arnett's (2000), Tanner's (Tanner, Arnett, 2016), McCormick et al.'s (2011)

and others' views on emerging adulthood, McCormick et al. (2011) also relate developmental tasks more clearly to social adjustment.

By the time well-adjusted individuals reach emerging adulthood, they have mastered basic academic fundamentals and peer interactions skills acquired as children (McCormick et al., 2011). Emerging adults continue to use and develop their peer interaction skills to balance assertiveness with propriety for effective everyday interactions with friends and acquaintances (Buhrmester, Furman, Wittenberg, & Reis, 1988). However, McCormick et al. (2011) assert that emerging adults are expected to be navigating more complex relationships, including those in more advanced occupational roles and romantic relationships. Other emerging adult developmental tasks may include independent living, financial independence, establishing worldviews, or parenting (Arnett, 2000; Levinson, 1978; Tanner & Arnett, 2016). However, most researchers agree on the pursuit of higher education, work, or committed romantic relationships, or some combination of these endeavours as emerging adults' main developmental tasks (Arnett, 2000; Shulman & Connolly, 2013; Tanner & Arnett, 2016). For this reason, occupational and romantic adjustment are deemed *salient* tasks for emerging adults. Research demonstrating that emerging adults perceive themselves as more competent in peer versus romantic relationships (Buhrmester, Furman, Wittenberg, & Reis, 1988), and experience instability in work, educational, romantic, residential, or financial status (Arnett, 2000), suggests that for emerging adults there may be more variance in adjustment in salient, developmentally advanced tasks, than in peer interaction tasks.

Developmental Task Theory and Cognitive and Biological Contributors to Psychosocial Adjustment

The effects of cognitive factors on social adjustment are beginning to intrigue theorists for their potential to facilitate developmental task achievement (McCormick et al., 2011, p.134; Tanner & Arnett, 2016, p. 41). Among other cognitive abilities, these include speed of information processing and language abilities useful for conversational skills, memory abilities useful for learning, retaining, and retrieving peers' personal details, and visual-perceptual and visual-motor integration skills for engaging in visually-based social activities like dancing and sports (Levin et al., 2004).

While many cognitive skills have been investigated in relation to social adjustment, prominent among these are EF and ToM (Levin et al., 2004; McCormick et al., 2011; Yeates et al., 2007). Together, they help individuals regulate their behaviour and emotions in social settings. Extensive research supports that EF and ToM facilitate young children's academic and social success (Cavojova, 2012; Devine, White, Ensor, & Hughes, 2016; Finch & Obradovic, 2017; Kunhert, Begeer, Fink, & Rosnay, 2017; Ziv, Kupermintz, & Aviezer, 2016), and help make young at-risk children resilient against poor academic and social outcomes (Buckner, Mezzacappa, & Beardslee, 2009; Finch & Obradovic, 2017; Huyder, Nilsen, & Basco, 2015; Lengua et al., 2015; McCormick et al., 2011; O'Toole et al., 2016; Razza & Blair, 2009; Korucu, Selcuk, & Harma, 2017; Sasser, Bierman, & Heinrichs, 2015). However, despite interests across the lifespan (Baltes, 1987; McCormick et al., 2011, p. 120, 131), researchers have produced few studies on the impact of EF and ToM on adjustment past the school age stage. Literature on the neural substrates underlying EF and ToM suggests that these abilities continue to develop past school age through emerging adulthood and beyond (Hao & Liu, 2016; Taylor et al., 2013).

In their view of the future directions of developmental task research, McCormick et al., (2011, p. 133) called for analyses of developmental task achievement at multiple levels, including biological, in addition to behavioural levels. Other developmental task theorists are following suit (e.g., Tanner & Arnett, 2016, p. 41). Reviewing briefly here the neuroscientific literature in relation to EF and ToM contributes to our understanding of the behavioural interrelations between these abilities, and the implications of each of these abilities for social adjustment.

2.1.2 Neurological Interrelations Between EF and ToM

Understanding the neurological interrelations between EF, ToM, and social functioning informs the understanding of their interrelations at the behavioural level. EF and ToM are localized in the prefrontal cortex (PFC). Many EFs used in planning and problem-solving, including working memory and cognitive flexibility, are mediated by the dorsolateral PFC extending into the cingulate cortex (Barnea-Goraly et al., 2005; Blakemore & Choudhury, 2006; Fuster, 2002; Konishi et al., 1999; Mesulam, 2002; Stuss, 2011; Takeuchi et al., 2013). Attentional effort which directly depends on inhibition (Millikin & Tipper, 1998) is mediated by the medial prefrontal cortex, while behavioural and emotional control are mediated by the orbitofrontal cortex (Fuster, 2002; Mesulam, 2002; Stuss, 2011; Takeuchi et al., 2013). ToM is also mediated by the medial prefrontal cortex, dorsally (dmPFC), as well as the orbitofrontal cortex during affective tasks. It is also mediated by the temporoparietal junction (TPJ), and the posterior superior temporal sulcus (pSTS; Bowman et al., 2015; Carlson et al., 2013; Enrici, Adenzato, Cappa, Bara, & Tettamanti, 2011; Tettamanti et al. 2017). Therefore, in addition to distinct brain structures, EF and ToM are mediated by common medial prefrontal, and orbitofrontal structures (Bowman et al. 2015; Carlson et al. 2013). Neuroimaging studies confirm

that the medial prefrontal cortex activates when one is inhibiting thoughts to focus on a particular topic, and together with the TPJ, also activates when one reflects on what another might be thinking (Bowman et al., 2015; Carlson et al., 2013).

Structures mediating EF and ToM including the cingulate cortex, TPJ, pSTS, and dmPFC, are also implicated in a common broader social brain network with other lower-level neurological structures involved in emotion and motivation processing. Together, these brain structures are responsible for distinct social cognitive and social functions including ToM, empathy, facial recognition, social perception, and social behaviour. White matter connections from dorsolateral prefrontal areas are responsible for functionally coordinating these areas, in keeping with the role of EF (Babakien, Merkley, Savage, Giza, & Levin, 2015). Notably, neuroimaging research has shown greater coactivation of prefrontal brain regions mediating EF and ToM than in the control condition, as emerging adults engaged in prosocial behaviour (Telzer, Masten, Berkman, Lieberman, & Fuligni, 2011).

Growth of prefrontal cortical structures follows particular developmental patterns. While white matter connections in the prefrontal cortex grow rapidly in these areas in early childhood through and beyond emerging adulthood, gray matter decreases via synaptic pruning. These neurodevelopmental processes correlate with increasing EF and ToM abilities during these time periods that are observable behaviourally (Blakemore, 2012; Eslinger & Long, 2016; Hao & Liu, 2016; Riggs et al. 2006).

2.1.3 Behavioural Interrelations Between EF and ToM

Connections between neurological substrates of EF and ToM manifest at the behavioural level. While EF performance is classified into inhibition, cognitive flexibility, or working memory abilities—and these are all correlated with ToM (Carlson et al., 2013; Miyake et al.,

2000; Pineda-Alhucema et al., 2018)—inhibition abilities in particular share a moderate, more consistent association with ToM (Blair & Razza, 2007; Carlson, Moses, & Claxton, 2004; Hughes, Dunn, & White, 1998; Pineda-Alhucema et al., 2018). According to the social information processing model, EF is a condition for ToM, allowing individuals to inhibit current thoughts in social settings to be able to attend to and interpret social cues (Crick & Dodge, 1994; Pérez-Edgar, 2012; Pineda-Alhucema et al., 2018). Therefore, execution of ToM depends on EF inhibitory abilities.

This dependent relationship is exemplified in the resolution of a debate on which of the two abilities develops from the other. Perner and Lang (2000) believed that ToM develops before EF. By their account, ToM development stretches one's capacity for metacognitive thought, allowing for the subsequent development of EF abilities. However, an alternative *emergence account* where EF develops before ToM, has received greater support from meta-analytic and longitudinal research (see Devine & Hughes, 2014 for meta-analysis; Marcovitch et al., 2015; Razza & Blair, 2009). By this account a base of EF develops during preschool, from which ToM can then develop (McKinnon & Moscovitch, 2007; Russell, 1996). This emergence account aligns with the social information processing model (Crick & Dodge, 1994; Pérez-Edgar, 2012), where use and development of ToM depends on use and development of EF. EF and ToM abilities allow individuals to be competent and flexible in social interactions, and to regulate themselves appropriately while taking into account the perspectives of social counterparts (Eslinger & Long, 2016).

2.1.4 Respective Influences of EF and ToM on Social Adjustment

EF and social adjustment in childhood. EF contributes to social adjustment by allowing children to integrate and coordinate responses to social pressures from family and

peers. This is accomplished through setting and achieving goals to obtain social acceptance and avoid rejection and exclusion from social counterparts (Giedd, 2008). As mentioned, research with children has reliably found that EF facilitates academic and social success (Finch & Obradovic, 2017) and contributes to the resilience of young at-risk children against poor academic and social outcomes (Buckner et al., 2009; Lengua et al., 2015; McCormick et al., 2011; Sasser, Bierman, & Heinrichs, 2015). Additionally, EF indirectly improves social adjustment by helping children regulate their attention and behaviour, while learning educational material from social interventions (Hughes, 2002; Kusché, Cook, & Greenberg, 1993; Riggs et al., 2006).

Note that many child social adjustment studies examine behavioural self-regulation or effortful control abilities and not EF, per se. These share a moderate association with the inhibitory aspects of EF (Carlson & Moses, 2001; Davis, Bruce, & Gunnar, 2002; Gerardi-Caulton, 2000; Rothbart, Ellis, Rosario, & Posner, 2003). Similarly to EF, these studies show that self-regulation and effortful control abilities allow children to behave in social settings (Korucu et al., 2017) and to avoid aggressive or violent behaviours that compromise social adjustment (Eslinger & Long, 2016).

EF in Adulthood

Occupational Adjustment. Academic Adjustment. Studies relating EF to college or university performance are surprisingly rare (Tadlock, 2016). One study showed that self-regulation abilities applied to college-level writing mediated the association between executive goal-setting and writing grades (Tadlock, 2016). Another study demonstrated that, independent of academic ability, goal setting predicted increased academic interest and achievement (e.g., SAT scores; Harackiewicz, Barron, Tauer, & Elliot, 2002).

Employment Adjustment. One meta-analysis found that EF shared strong positive associations with employment status, along with intellectual functioning and memory (Kalechstein, Newton, & Van Gorp, 2003). However, other studies exploring EF and work performance among adults were focused on self-regulation in particular. A recent meta-analysis examined personality traits and an aspect of self-regulation known as regulatory focus, in their relation to various aspects of work performance (Lanaj, Chang, & Johnson, 2012). Unlike those avoiding unpleasant work outcomes, adults self-regulating their behaviour *toward* promotion goals were more likely to achieve in formal job responsibilities, contribute to the informal social work climate, and innovate on the job. These associations were independent of the effects of stable personality traits on the work adjustment variables. Taken together, these findings suggest that emerging adults are likely to demonstrate improved employment or study performance in relation to stronger EF and self-regulation abilities.

Romantic Adjustment. Another set of adult studies demonstrate a connection between EF and romantic adjustment. These studies also focus on self-regulation skills. The studies showed that self-regulation promotes relationship qualities through increased skills in forgiveness (van der Wal, Karremans, & Cillessen, 2014), avoidance of temptations by alternative romantic partners (McIntyre, Barlow, & Hayward, 2015; Pronk, Karremans, Wigboldus, & Daniel, 2011), balance of personal and relational concerns (Visserman, Righetti, Kumashiro, & Van Lange, 2017), and one's own or one's partner's perceptions of their self-control (Hamburg & Pronk, 2015; Righetti & Finkenauer, 2011). There may also be a bidirectional relationship between self-regulation and romantic adjustment whereby romantic adjustment also promotes better self-control (Farley & Kim-Spoon, 2014). Another set of studies identified self-control and emotion regulation as protective factors against dating aggression

(Baker, Klipfel, & van Dulmen, 2018; Gover, Jennings, Tomsich, Park, & Rennisn, 2011; Guzman-Gonzalez, Lafontaine, & Levesque, 2016). Self-regulation skills promote relationship functioning by helping individuals use self-control and flexibility in the service of protecting and maintaining healthy satisfying relationships.

ToM and Social Adjustment in Childhood

A brief review of the literature suggests most studies on ToM and social functioning are conducted with school-age child participants. Regarding ToM, inaccurate social cue interpretation and the attribution of peers' ambiguous behaviours to hostile intentions are associated with aggressive behaviours and rejection. On the other hand, making situational attributions for peers' behaviours leads to better social adjustment (see Crick & Dodge, 1994, for a review). Doing the latter is facilitated by ToM. ToM allows children to interpret others' social cues by taking their perspectives into account. Extensive research focusing on ToM alongside EF, demonstrates its role in promoting social and academic resilience among at-risk children (e.g., Huyder et al., 2015; Korucu et al., 2017; O'Toole et al., 2016; Razza & Blair, 2009). Meta-analytic and theoretical reviews assessing ToM and social functioning suggest a small to moderate positive relationship between ToM and social adjustment among young children (see Astington, Repacholi, & Slaughter, 2003 for review; Slaughter et al., 2015).

ToM in Adulthood

Occupational Adjustment. Studies relating ToM to academic or employment adjustment are rare. However, one study of college students demonstrated that perspective-taking, which is related to ToM (Hamilton, Brindley, & Frith, 2009), positively predicted reading appreciation. The authors reasoned that perspective-taking allows a reader to get involved with story characters and situations, enhancing appreciation for the reading material (McCreary &

Marchant, 2017). Another study showed that impoverished urban adults high in ToM were twice as likely as those low in ToM to complete a job training program and were three times as likely to find a job. This finding was explained by relating ToM to social competence skills that facilitated work acquisition (Bly et al., 2012). The effects of ToM on academic or employment adjustment are under-researched. However, if ToM skills are applied as a tool to facilitate functioning in academic, or employment settings, they should promote success.

Romantic Adjustment. ToM and romantic functioning studies are also rare. One study of university students in the general population varying in sub-clinical autistic traits, examined the relation between the ability to interpret social cues from eye-expressions (Reading the Mind in the Eyes Test, Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) and socially appropriate courtship behaviour. Results demonstrated that this ToM ability positively predicted appropriate courtship skills, through preventing individuals from inaccurately over-perceiving others' romantic interest toward themselves (Mintah & Parlow, 2018).

A small set of studies revealed an association between perspective-taking and romantic functioning. Perspective-taking positively predicted romantic functioning through positive perceptions of one's own and their partner's behaviour (Davis & Oathout, 1992; Davis & Oathout, 1987; Vorauer & Quesnel, 2013), as well as through greater accommodation of a partner's transgressions (Arriaga & Rusbult, 1998; Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991), greater commitment and conflict resolution skills (Courtain & Glowacz, 2018; Lin & Rusbult, 1995), and even through greater physiological markers of romantic harmony as measured by stress hormone levels (Nelson, Laurent, Bernstein, & Laurent, 2017). These associations were facilitated by high self-esteem and low heterosocial anxiety (Davis & Oathout, 1992; Vorauer & Quesnel, 2013) and, among women, greater attachment security (Péloquin &

Lafontaine, 2010). Through promoting a flexible approach to relationships, perspective-taking continues the process through which EF and self-regulation skills facilitate relationship maintenance. In addition, perspective-taking was associated with a number of mental health variables which promote positive relationship qualities.

2.2 Current Study

Research positively relating EF and ToM to social adjustment among children has been extensively reviewed (e.g., Riggs et al., 2006; Slaughter et al., 2015). A handful of studies also suggest that EF and ToM, and related variables, may predict adult social adjustment variables. However, no reviews relating EF or ToM to social adjustment variables among emerging adults were found.

2.2.1 Goal for Study 1: Systematic Review

The goal of Study 1 was a comprehensive systematic review of the behavioural relations between EF and ToM, and peer, occupational, and romantic adjustment to address the above-mentioned gap in the literature. To ensure thorough coverage, the review focused on studies varying in design and included cross-sectional, longitudinal, and experimental studies. The target populations for the review included healthy emerging adults aged 18 to 29 (Arnett, 2004), as well as clinical populations of emerging adults with neurological, or neurodevelopmental disorders. Clinical populations were included because brain damage or hypoactivation from neurological and neurodevelopmental disorders can have negative effects on EF and ToM abilities (Yeates et al., 2007).

2.2.2 Hypotheses

Based on the social information processing model (Crick & Dodge, 1994) and the brief literature review on children and adults, it was expected that the emerging adult literature would

reveal positive effects of EF and ToM, or related variables, on peer, occupational, and romantic adjustment.

2.3 Methods

2.3.1 Information Sources and Search Terms

PsycInfo, Sociological Abstracts, Medline, and Web of Science databases were used to search for relevant studies. Inserted into each database were terms related to EF (i.e., “executive function”, “effortful control”, “self-regulation”, deplet*, “self-control”, “emotional regulation”), or ToM (i.e., "theory of mind", mentaliz*, mentalis*, "false-belief", "false belief", "perspective-taking", "perspective taking", “social cognition”); and using the “AND” function, crossed with terms related to social adjustment (i.e., “prosocial behavior”, “social adjustment”, “social competence”, “social function”, “social interaction”, “social outcome*”, “social skill*”), or occupational adjustment (occupation*, job, employ*, career*, “educational attainment”), or romantic adjustment (courtship, romanc*, romant*, "romantic relationship", dating, boyfriend, girlfriend); and using the “AND” function, crossed with terms related to the emerging adult age range (teen*, adolescen*, "young adult", "emerging adult", "university student", "college student", "high school student"). Partial search terms followed by the wild-card symbol (*) were used to search for all morphological variants of certain terms. The reader will note that terms related to emotional intelligence (EQ) were not considered for ToM terms. Though EQ may be related to ToM, the rationale is that EQ pertains to the adult organizational psychology literature. In contrast, the focus was on ToM which is more closely related to the emerging adult developmental psychology literature.

Search results were limited by publication date, from 2010 to 2019. Where possible they were also limited by record type, such as “dissertation, dissertation abstract, or peer-reviewed journal only” in the options provided in PsycInfo or Sociological Abstracts.

2.3.2 Inclusion and Exclusion Screening Eligibility Criteria

To ensure inclusion of high-quality articles, it was required that studies be peer-reviewed. However, approved dissertations were included as a strategy to minimize publication bias (Card, 2015, ch.3, p. 46). This ensured the inclusion of published as well as unpublished peer- or committee-reviewed studies. To ensure the articles were appropriate for the current study’s goals, they had to be quantitative behavioural studies on the effects of either EF or ToM or related variables, on variables related to peer, occupational, or romantic adjustment. To ensure current relevance and accessibility of the articles, they had to be English-language articles published between 2010 and 2019, inclusive. Neural correlates and pharmacological studies were excluded, to maintain a focus on behavioural studies of EF, ToM, and social adjustment. Studies on empathy that did not investigate ToM or perspective taking were excluded. This decision was made to maintain a distinction between empathy, which comprises emotion understanding, and ToM or perspective-taking, which comprise cognitive mental state attributions (Slaughter et al., 2015). Studies focused only on attachment variables (e.g., romantic attachment) were excluded as attachment was not included among the definitions of social adjustment, skills, or outcomes (Yeates et al., 2007). Studies on forensic or justice system outcomes were excluded to maintain a focus on common everyday peer adjustment outcomes (e.g., aggression), applicable to one-on-one interactions (Lopes et al., 2011). Narrative or systematic review articles were also excluded to avoid duplicate reports of the same data.

2.3.3 Screening Procedure

Excluding duplicates, unique articles were compared against eligibility criteria across three passes. The first pass entailed comparing study titles against the eligibility criteria, the second pass entailed comparing study abstracts against the eligibility criteria, and the third pass entailed comparing full-text articles against the eligibility criteria. Seven additional articles were obtained from the reference and “cited-by” sections of the articles from the final inclusion list after the third pass. These seven articles were also compared against eligibility criteria.

2.3.4 Coding

The principal investigator extracted relevant details from each study. These included the study country of origin, study design, population, sample characteristics including sample size, age range, mean, and standard deviation; as well as gender and ethnic compositions; predictors and outcomes relevant to the study goals, covariates used in any multivariate analyses, and main findings including effect sizes wherever possible. To bolster data extraction three undergraduate volunteers extracted the same data from a quasi-random selection of 19 of the 38 studies. Each volunteer coded six or seven studies consisting of equal proportions of cross-sectional, longitudinal, and experimental studies, which were randomly selected within each of these categories. Disagreements in data extraction were resolved through discussion.

Assessment of Study Qualities

The principal investigator and three undergraduate volunteers rated each study using the quantitative study quality assessment tool, QualSyst (Kmet, Cook, & Lee, 2004). Disagreements were resolved through discussion.

2.3.5 Data Visualization

A flow diagram of the screened, excluded, and included studies is reported in Figure 1. A table summarizing the coded data is reported in Table 1 in the Results. Study quality ratings are also included in Table 1, with full details in a different table in Appendix A. The names and citations of the measures used for the predictors and outcomes of interest in each study, are reported in a table in Appendix B.

2.3.6 Synthesis

The synthesis of study findings was qualitative, given the heterogeneity of the specific predictor and outcome variables included across studies. Findings were organized within three major sections pertaining to peer, occupational, and romantic adjustment. Findings from cross-sectional, longitudinal, and experimental studies were distinguished from one another in the results narrative. Multivariate statistics were distinguished from univariate results, through the mention of controls of important confounds when describing study results. These approaches were used to provide greater clarity on the results, and to avoid misrepresenting the impact or qualities of specific findings (van den Berg et al., 2013).

These methodological details were published prior to conducting the review. The published review protocol was registered with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, & Altman, 2009). The registration number and website for the protocol are CRD42020177808,

https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=177808

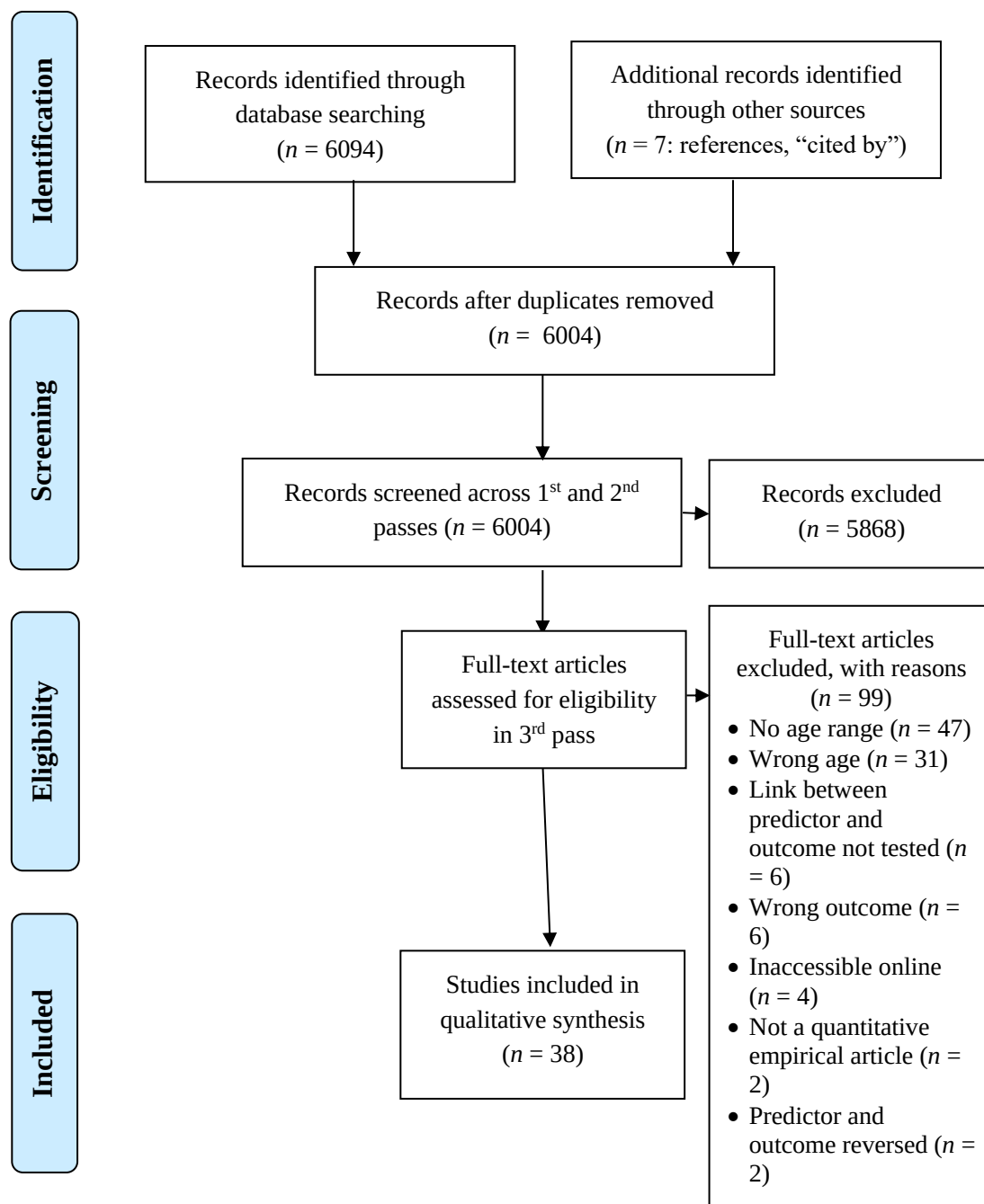


Figure 1. PRISMA Flow Diagram of the study selection process (adapted from Moher et al., 2009)

2.4 Results

2.4.1 Included Studies

A total of 6094 articles resulted from the electronic database searches. Removing article duplications resulted in 5997 articles. Articles were excluded during two screening passes consisting of an initial screening of study titles, and a subsequent screening of study abstracts. Articles excluded during the screening were those not including EF or ToM predictors of interest; peer, occupational, or romantic adjustment variables of interest; participants aged 18 to 29 years, or quantitative behavioural study methods. The full-text of the 136 remaining articles were used to confirm eligibility. During this third pass, 47 articles were excluded for not reporting an age range, 31 for not meeting age range eligibility, six for not testing the association between the variables of interest, six for the outcome variables not meeting eligibility criteria, four for not being accessible online¹, two for not being quantitative empirical articles, and two for the predictors and outcomes of interest assessed in reverse order. Seven articles were added from scanning the reference sections and citations from each article in the remaining set of articles. This resulted in a final set of 38 articles (see Figure 1). A flow diagram of the study selection process is illustrated in Figure 1. The list of studies and relevant characteristics are presented in Table 1.

Note that relevant literatures were not included among the studies. Screening returned studies on autism spectrum disorder, stroke, epilepsy, and traumatic brain injury. These were excluded due to focus on childhood, or the methodology or variables not meeting eligibility.

1 During the COVID-19 pandemic, libraries and interlibrary loan scanning services were often closed.

Table 1. *List of Studies and Select Study Characteristics*

Std	Cite	Cntry	Design	Pop.	Smpl (N)	Age or Age Range (mean, SD); %Wom %Wh	Predictors of interest	Outcomes of interest	Covariates	Effect type and size	Qu alit y Scr. (%)	Rat ng
1	Baker et al. (2018)	U.S.A.	Cross-section al	General	226 (113 hetero sexual couples)	18-25 (19. 8; no SD); 50% women; 88% White	Men and women's self- reported self- control	Men and women's self- reported and experimenter- observed emotional and verbal dating aggression (EVA)	Length of relationship, relationship satisfaction, partner's self- control	Small to moderate negative effects: Strongest for women self- control on actor and partner observed EVA	90.9	Stro ng
2	Barkley & Fischer (2010)	U.S.A.	Cross- section al	ADHD; General	210	Outcom es at ages 21, 27; 7- 16% women; 3-19% White	Self-reported ADHD symptoms of inattention, hyperactivity- impulsivity, or emotional impulsivity	Self-reported impairment in social, academic, work, and romantic domains	None	Mostly moderate positive effects; emotional impulsivity a unique contributor in most areas	72.7	Goo d

3	Bradbury & Shaffer (2012)	U.S.A.	Cross-sectional	General	492	18-25 (no mean, no SD); 72.6% women; 82.7% White	Difficulties in emotion regulation	Relationship satisfaction	Gender, romantic relationship duration, physical abuse and neglect, sexual abuse	Small negative effect	86.4	Strong
4	Caiozzo et al. (2016)	U.S.A.	Short-term longitudinal	General	1180	18-25 (18.9, 1.2); 68.2% women; 77.0% White	Time 1 (T1): Difficulties in emotion regulation	Time 2 (T2, 2 months after T1): verbal, physical, and sexual dating aggression perpetration	T1: dating violence, aggressive attitudes, gender, callous-unemotional (CU) traits, narcissism	Small effect on verbal aggression; large effect for men with low levels of CU traits	86.4	Strong
5	Cairns et al. (2017)	Australia	Cross-sectional	Help-seeking adults in early intervention youth health service	107	18-25 (20.2, 1.9); 62% women; no race data	Performance EF (spatial working memory, impulsivity, decision-making)	Vocational engagement rate; vocational functioning	Gender, family history schizophrenia /bipolar disorder, SES, psychotic experiences, completed secondary school, cannabis use; site	One unit increase in spatial working memory predicted 8% increased vocational engagement rate	81.8	Strong

6	Chan (2019)	Canada	Cross-sectional	General	790	18.1 - 29.4 (20.4, 2.1); 80.6% women; 25.1% White	Self-reported cognitive emotional regulation strategies (acceptance, self-blame, rumination, positive reappraisal, catastrophizing subscales); difficulties in emotion regulation (DERS)	Self-reported best friend or romantic partner relationship qualities	None	Small positive and negative correlations between positive reappraisal and DERS on best friend relationship qualities, respectively; small negative DERS- romantic relationship qualities correlation	77.3	Good
7	Ciaracco et al.	U.S.A.	Experiment	General	32	18-23 (19.7, no SD); 59.4% women; 96.6% White	Food taste depletion task condition vs. no depletion condition	Infidelity: Self-reported and observed coffee date agreement, phone number disclosure with confederate	None	Moderate positive effect on observed, but not self-reported infidelity	75.0	Good
8	Cohn et al. (2010)	U.S.A.	Cross-sectional	General	104	18-25 (19.3; 1.3); 0% women; 80.5% White	Self-reported DERS, or DERS subscales: Nonacceptance, goal-directed, impulsive, strategies,	Observed mean shock intensity measure of aggression	Self-reported restrictive emotionality	Moderate positive effects of impulsivity or non-acceptance-problems on aggr.; small pos. correlations between clarity or awareness	63.6	Adequate

							awareness, or clarity problems			problems, and aggression		
9	Côté et al. (2011). Study 1	Canada	Cross-sectional	General	131	18-26 (20.2, 1.4); 59% women; no race	Emotion-regulation knowledge (ERK)	Prosocial behavior	Gender, age, moral identity and moral identity interactions	At +1SD ERK, positive moderate effect of moral identity on prosociality	81.8	Strong
10	Daly et al. (2015) emerging adult (EA) cohorts studies 1. and 2.	Britain	Population long-term longitudinal	General	1. Cohorts aged 21 (n=759), and 26 (n=4339); 2. Cohort aged 23 (n=7616); N = 12,714	1. Outcomes (...) at ages 21 (50.6% women), and 26 (51.1% women) 2. ... at age 23 (43.4% women); no race data	1. Teacher-reported childhood self-control (10 years); 2. Teacher-reported childhood self-control (7 years)	1. Unemployment at ages 21 and 26; 2. Unemployment at age 23	Child covariates: 1. intelligence, father social class; 2. intelligence, father social class, gender, health, and family difficulties, birth weight and region, household size	1. Age 21: one unit increase in child self-control (...) predicts 4.2% decrease in EA unemployment. Age 26: ... 1.2% decrease in EA unemployment. 2. Age 23 ... 2.6% decrease in EA unemployment	95.5	Strong
11	Farrell & Vaillancourt (2019)	Canada	Long-term longitudinal	General	463	Outcomes at 19; 55% women 77% White	Grade 6 inhibitory control	Age 19 dating aggression; age 19 number of dating partners	Grade 5 gender, race, household income, parental education	Only small indirect negative effects through Grade 8 bullying perpetration	95.5	Strong

12	Flandermeyer (2019)	U.S.A.	Cross-sectional	General	156	18-23 (20.1, 1.3); 72% women; 91% White	Self-reported cognitive flexibility	Self-reported career indecision, anxiety, or confidence	None	Only small positive corr.'s between cognitive flexibility and career indecision, anxiety	77.3	Good
13	Fosco et al. (2012)	U.S.A.	Longitudinal	General	792	Outcomes at 22 (.61) and 23 (.63); 49% women, 44% White	Age 17, 22, and 23 effortful control	Age 23 hostility or aggressive behaviour	None	Small negative cross-sectional and longitudinal correlations	77.3	Good
14	Francoeur et al. (2019)	Canada	Cross-sectional	General	482	18-25 (22.05); 81.2% women; 65.2% Canadian; 14.8% "Mostly White"	Self-reported emotional regulation or mentalization	Resilience, or psychiatric symptoms or distress, after romantic break-up	Childhood maltreatment mediator acting as covariate	Moderate variance in resilience, psychiatric symptoms, or distress from emotion regulation, mod. variance only in psychiatric symptoms, from mentalization	90.9	Strong

15	Gover et al. (2011)	U.S.A., South Korea (S.K.)	Cross-sectional	General	U.S.A. n = 2340; South Korea n = 2335	18-21 all. U.S.A. (19.27, 1.15); 66% women; S.K. (19.93, 1.12) 55% women	Self-control	Psychological or physical dating violence perpetration or victimization	Age, family structure, gender, relationship status, sexual risk taking; childhood physical abuse, witness intimate partner violence; risky sexual behavior	U.S.A. or S.K.: odds of psych or physical abuse perpetration or victimization when low in self-regulation are 1.02 to 1.04 the odds when high in self-regulation (except S.K. phys. violence victimization: 1.11 the odds)	90.9	Strong
16	Guilmette et al. (2019)	Canada	Cross-sectional	General	401	18-25 (21.1, 1.7); 76.8% women; 79.8% White	Goal regulation persistence and reappraisal	Academic performance or satisfaction	Sex, varsity athlete status for mediation analyses (but did not report coefficients for aca. var's on goal reg.)	Small positive correlations, save a moderate positive correlation between persistence and aca. satisfaction	95.5	Strong
17	Guzman - Gonzales et al. (2016)	Chile	Cross-sectional	General	608	18-29 (21.5, 2.2); 60.7% women; no race data	Emotion regulation difficulties	Physical dating violence perpetration	Romantic anxious attachment, or avoidance	Moderate positive effect	90.9	Strong

18	Hao & Liu (2016)	China	Cross-sectional	General	62	Grp 3: 19-24 (20, 1.1); 58% women; no race data	ToM social-cue reading from story characters	Experimenter-observed prosocial behavior	None	No correlation	72.3	Good
19	Kercood et al. (2017)	U.S.A.	Cross-sectional	ADHD; General	55	18-22 (no mean, no SD); 63.6% women; no race data	ADHD ratings; subjective or objective cognitive flexibility	Reading, writing, math skills, and career confidence	age, gender, year of education, race and ADHD characteristics	Moderate positive effects; ADHD students with lower-, and non-ADHD students with higher cognitive flexibility had the most career confidence	59.1	Adequate
20	Klipfel (2015)	U.S.A.	Cross-sectional	General	276	18-29; 50% women. Women 18-25 (19.9, 1.4); 86% White; men 18-29, (20.6, 2.2); 81% White	Performance-based shifting, updating, inhibition difficulties	Emotional/verbal, physical, or sexual dating aggression	Age, ethnicity, cohabitation status, relationship length and satisfaction, head injury, alcohol use, ADHD symptoms, premorbid IQ	Small negative effects of women inhibition difficulties on men's psychological, and women's (own) physical dating aggression	86.4	Strong

21	Langeslag & van Strien (2016) Study 2	Netherlands	Experiment	General	2. n=40 (n= 20 in relationship; n = 20 recent break-up)	2. reltnshp: 19-25 (21.7, no SD) 50% women, no race; break-up: 19-26 (21.9, no SD) 50% women, no race	Intervention love regulation task (regulate love feelings up, or down)	infatuation, valence, arousal	None	Infatuation lower (.5 to 1.0 5-point Likert ratings), and positivity lower (.75 to 1.25 Likert ratings) after down-regulation, than after passive viewing or up-regulation; no arousal effects	71.4	Good
22	Lopes et al. (2011). Study 3	U.S.A.	Cross-sectional	General	53	18-27 (19.8, 1.8); 66% women; 72% White	Strategic emotion regulation ability	Diary: quality of interactions with friends, roommates, and acquaintances; conflict and tension in social interaction; importance of positive or negative social events	Gender, verbal ability, age, Big 5 Personality traits	Only moderate negative effects of self-regulation on conflict and tension in social interactions, or on importance of negative social events	81.8	Strong
23	Lopez (2015)	U.S.A.	Cross-section.	General	118	18-28 (19.95, no SD);	Difficulties with EF: time management,	Relationship satisfaction	Age, SES status,	Only moderate negative effect of emotion self-	72.7	Good

						66.1% women; 66.1% White	organization/p roblem- solving, self- restraint, self- motivation, emotion self- regulation		education, ethnicity	regulation on relationship satisfaction		
24	Malatras & Israel (2012)	U.S.A.	Cross- section al	General	289	18-25 (19.0); 53.6% women; 69.2% White	Self-control (mediator)	Aggressive behaviours or rule-breaking	Age, gender, household income	Large negative correlation	68.2	Ade quat e
25	McClea r et al. (2012)	Canad a; U.S.A.	Cross- section al	General	50	18-26 (20; 2); 60% women; 86% White	ToM social- cue reading from story characters and eye expressions	Social functioning	Gender, intellectual ability	No correlation	72.7	Goo d
26	Moilane n & Manuel (2017)	U.S.A	Cross- section al	General	302	18-24 (21.6, 1.9); 64.9% women; 80.4% White	Self- regulation	“Same-sex” peer social competence; romantic social competence; current relationship status, lifetime romantic relationship experience	Gender, ethnicity, age, relationship status, lifetime romantic relationship experience, sexual orientation; parenting practices	Moderate positive effects on peer or romantic competence; small positive correlations between self- regulation and lifetime romantic	86.4	Stro ng

										relationship experience		
27	Moilane & Manuel (2018)	U.S.A.	Cross- section al	General	274	18-24 (21.4, 1.9); 60.2% women; 78.8% White	Self- regulation	Romantic competence; last sexual partner relationship status	Gender, age, ethnicity, sexual orientation, and college enrollment status	Moderate positive effect on romantic competence; no correlation with last sexual partner relationship status	86.4	Stro ng
28	Moilane & Manual (2019)	U.S.A.	Cross- section al	General	302	18-24 (21.57, 1.9); 64.9% women; 79.4% White	Self-control	Social competence, prosocial behaviour	Gender, race, sample, parenting, acceptance, psychological or firm control, mastery	Moderate positive effects	86.4	Stro ng
29	O'Conno r (2011)	Austra lia	Longitu dinal	General	1158	Outcom e at ages 19-20; 55.9% women; no race data	Late childhood self-control; early or mid- late adolescent emotional control	Latent positive development (social competence; life satisfaction., trust and tolerance of others, trust in authority, civic engagement)	Family SES, school adjustment, parent/peer relationships, lower reactivity; early adolescent emotional control, late	Small effect of mid/late- adolescent emotional control on positive development moderate among men, small among women	68.2	Ade quat e

											childhood self-control	
30	Owens & Hinshaw (2016)	U.S.A.	Longitudinal	ADHD	228	Outcomes at Wave 4, 21-29; 100% women; approx. 53% White; Wave 1, ages 6-12 (8.9)	Wave 1 (ages 6-12) self-control	Wave 4 internalizing/externalizing psychopathology	Childhood family SES, IQ, and neurocognitive problems; and adolescent peer acceptance, school performance, or delay of gratification	Adolescent self-control indirectly explains a large amount of variance in EA internalizing/externalizing through late adolescent/EA delay of gratification, peer acceptance, or school failure.	90.9	Strong
31	Perrone-McGover et al. (2013)	U.S.A.	Cross-sectional	General	31	19-25 (21.1, 1.47); 67.7% women; 65% White	Empathy/ perspective-taking	Interbeat interval (IBI); skin conductance level (SCL); relationship satisfaction	None	High empathy group 5.9 units higher in relationship satisfaction than low empathy group; no effect on IBI; SCL	59.1	Adequate
32	Ramenzoni et al. (2012)	U.S.A.	Experimental	General	10	19-26 (21.5); 90% women;	Task condition: joint coordinative structure requiring	Number of principal components, or the percentage variance accounted for by	Height, weight	Using ToM to work together on a movement task compared to working in parallel,	66.7	Adequate

						no race data	interpersonal coordination (ToM), vs. control condition (parallel behaviour)	the first component, in the PCA of movement trajectories of pairs of participants		accounts for larger variance in the principal components of movement trajectories		
33	Sanders et al. (2016)	U.S.A.	Experiment	General	96	18-29 (20.1, 2.0); 56.2% women	Condition for reading comprehension task: Focus on preventing mind-wandering VS. focus on what was read VS. control: no instructions	Reading comprehension	Z-scores of memory for priming (necessary for inducement for intervention), arousal, pre-existing knowledge	Re-focusing on reading comprehension rather than on preventing mind-wandering makes an .875 SD increase in reading comprehension score; no diff. from control	56.5	Adequate
34	Situ et al. (2016) Sample 2	China	Cross-sectional	General	671	18-28 (20.7, 1.2); 64.8% women; no race data	Self-control, self-control squared-term	Aggression	Either self-control ² ; or self-control (each predictor covaried with the other)	Self-control (not self-control ²) negatively predicts aggression - accounting for a small amount of variance (11%)	81.8	Strong

35	Véronneau et al. (2014)	U.S.A.	Longitudinal	General	997	Outcome at 23-25; 47% women; 42.4% White	Latent late adolescent effortful control (EC) indicated by self-reported, parent-reported, and teacher-reported late adolescent EC	Self-reported emerging adult educational attainment	Early adolescent latent positive family involvement, problem behaviour, and family SES, parental education, substance use, GPA, gender, ethnicity	Moderate positive effect of latent EC; small positive correlations with self- and parent-reported EC; moderate correlation with teacher-reported EC	100	Strong
36	Watkins et al. (2013)	U.S.A.	Experiment	General	118	18-27 (19.6; 1.8); 50% women; 89% White	Random assignment to dual-attention self-control depletion video-viewing task	After induced couple conflict, observed trial 1 reactionary aggression white-noise imposition on partner; and observed trial 2 retaliatory aggression white-noise imposition on partner	Men and women's pre-conflict negative emotion reactivity, post-conflict negative emotion reactivity; and self-control/negativity interactions	Self-control depletion not associated with aggression. When either women or men alone were depleted, men's greater negativity usually predicted women's higher aggression	69.2	Adequate
37	Wymbs et al. 2012	U.S.A.	Longitudinal	ADHD; General	ADHD: n=125; general	ADHD 18-25 (20.0; 1.9); control 18-25	Parent- and teacher-reported childhood disruptive behaviour	Self-reported verbal and physical dating violence perpetration	For partial correlations, adult anti-social personality	No longitudinal effects of child ADHD symptoms on adult verbal or physical dating	72.7	Good

					popul ation contro l: n = 88; N = 213	(19.8, 1.7); both: 0% women. ADHD 84.1% White; Control 85.9% White	disorders ratings; averaged- maximum ratings of adult self- and mother- reported ADHD symptoms		disorder symptoms	violence; no effects of ADHD on verbal or physical dating violence with controls		
38	Yarkovs ky (2016)	Canad a	Cross- section al, APIM	General	316	18-29 (20.9; 2.2); 50% women; 78.5% White	Actor emotion regulation	Dating violence perpetration and victimization	Gender, partner's emotion regulation, relationship satisfaction, relationship commitment, anxious attachment	Actors with high emotion regulation difficulties have 1.03 times the odds of dating violence perpetration	86.3	Stro ng

2.4.2 Quality of Studies

The included studies achieved Adequate to Strong ratings in quality assessments based on the QualSyst scale (Kmet et al., 2004). The precise percentage ratings ranged from 56.5% to 100%, with a mean of 79.4% and standard deviation of 11.4%. There were 20 Strong ratings (80%-100%), 10 Good ratings (70%-79%), and eight Adequate (50%-69%) ratings. To reduce risk of publication bias, eligibility criteria allowed for dissertation studies (Card, 2015, ch. 3) resulting in the inclusion of five dissertations. There was no significant difference in quality scores between dissertations ($M = 80\%$, $SD = 6.1\%$) and published studies ($M = 79.3\%$, $SD = 12.0\%$), $F(1, 36) = .014$, $p = .91$. Overall areas of weakness included an overreliance on convenience sample or volunteer participants ($n = 33$), failure to correct for multiple testing ($n = 22$), failure to include confidence intervals or standard error estimates of variances ($n = 17$), and incomplete reporting of confounding variables ($n = 14$). However, given the overall Strong level of quality, the results were not separated according to study quality. Please see Appendix A for each study's 14 item scores and final rating, or Table 1 which includes each study's final rating.

2.4.3 Assessment of Risk of Bias

The unpublished and published studies were assessed for bias for reporting null findings. Of the five unpublished studies, all reported null findings among the study variables of interest. Of the remaining 33 published studies, only 17 reported null findings among the study variables of interest. Coding 0 for no report of null findings, and 1 for report of null findings among the study variables of interest, there was a significant difference between percentage of unpublished studies reporting null findings ($M = 100\%$; no deviation) and published studies reporting null findings ($M = 51.5\%$, $SD = 50.75\%$), $F = 4.46$, $p = .042$, $\eta^2 = .11$. Published studies displayed a moderate bias in not reporting null findings among the study variables of interest.

2.4.5 Study Characteristics

The included studies were published from 2010 to 2019. They were conducted in the U.S.A. ($n = 25$), Canada ($n = 7$), China ($n = 2$), Australia ($n = 2$), Britain ($n = 1$), Chile ($n = 1$), and the Netherlands ($n = 1$). They collectively reported on 28, 646 participants, with mean ages ranging from 18 to 29. Five studies recruited participants from clinical or combined healthy-clinical populations including four from the ADHD population (Barkley & Fischer, 2010; Kercood, Lineweaver, Fank, & Fromm, 2017; Owens & Hinshaw, 2016; Wymbs et al., 2012). One study recruited participants from the population of help-seeking adults in an early intervention youth help service (Cairns, Kaanagh, Dark & McPHail, 2017). The majority of these participants (70%) were diagnosed with mental health disorders, which were predominantly affective disorders (Cairns et al., 2017). Most studies were observational ($n = 33$) including mostly cross-sectional ($n = 25$), as well as some prospective longitudinal ($n = 8$) and experimental ($n = 5$) studies. Many more studies predicted social adjustment variables from EF measures ($n = 34$), than from ToM measures ($n = 5$).

2.4.6 Measures

Predictor Measures

EF. Self- or Emotional Regulation. Most studies ($n = 24$) used survey-based self-report measures of self- or emotional regulation as measures of EF (e.g., Difficulties in Emotion Regulation, DERS, Gratz & Roemer, 2004). Names of constructs varied and included effortful control, emotional regulation, emotional control, inhibitory control, self-control, and self regulation. Parent, teacher, and self-report measures of self-regulation were used in cases of child and adolescent participants in long-term prospective longitudinal studies ($n = 6$), including the Self-Control Subscale of the Social Skills Rating System (Gresham & Elliot, 1990) in O'Connor

(2011) or Owens and Hinshaw (2016), or the Early Adolescent Effortful Control Questionnaire (EATQ; Ellis & Rothbart, 2005) in Farrell and Vaillancourt (2019), Véronneau, Racer, Fosco, and Dishion (2014), and Fosco, Caruthers, and Dishion (2012).

Cognitive Flexibility. Three other studies measured self-reported, or performance-based cognitive flexibility or related measures (Guilmette, Mulvihill, Villemare-Krajden, & Barker, 2019; Flandermeyer, 2019; Kercood et al., 2017). One example was the self-report Cognitive Flexibility Scale (Martin & Anderson, 1998).

Performance-based Measures. Rare studies ($n = 3$) assessing the effects of clinically-normed performance-based measures of EF on social adjustment variables used comprehensive batteries. These collectively assessed attention, inhibition, cognitive flexibility, visual learning memory, set-shifting, impulsivity, updating, information-processing, and decision-making, as well as spatial, auditory, and visual working memory (Cairns et al., 2017; Kercood et al., 2017; Klipfel, 2015).

ADHD Symptoms. Meanwhile, three studies measured self-reported ADHD symptoms of inattention, impulsivity, and hyperactivity (Barkley & Fischer, 2010; Kercood et al., Wymbs et al., 2012) such as the Adult ADHD Barkley scales (Barkley & Murphy, 2006).

Experimental Measures. Experimental intervention studies were rare. Two interventions experimentally manipulated self-regulation through tasks designed to deplete participants' self-regulation resources (Ciarocco, 2011; Watkins et al., 2013). Two other interventions instructed participants on their use of specific self- or emotional regulation strategies to accomplish certain tasks (Langeslag & van Strien, 2016; Sanders, Wang, Schler, & Smallwood, 2015).

With regard to the effects of EF on peer, occupational, and romantic adjustment among emerging adults, researchers were most interested in effects of self- or emotional regulation. They relied mainly on single-informant self-report measures.

ToM. *Observational Studies.* Four studies featured ToM survey measures. Two studies featured the popular Strange Stories (Happé, 1994) ToM measure (Hao & Liu, 2016; McCleary et al., 2012). In addition to Strange Stories, McLeary et al. (2012) used the Mind in the Eyes Test to measure affective ToM (Baron-Cohen et al., 2001). Perrone-McGovern et al. (2013) used the popular Interpersonal Reactivity Index (Davis, 1980), to measure empathy and perspective-taking. Another author used the Mentalization Scale (Dimitrijevic et al., 2018) to measure ToM (Francoeur et al. 2019).

Experiment. There was one experiment on ToM. In that study, investigators manipulated a situation so that joint coordination requiring ToM, was either needed or not needed to complete a social movement task (Ramenzoni, Riley, Shockley, & Baker, 2012).

Association Between ToM and EF Measures. Only McCleary et al. (2012) assessed associations between ToM and EF, finding a moderate positive association between performance-based cognitive flexibility and ToM Strange Stories. This is important, because although the goal of the systematic review was to assess the respective effects of EF or ToM on social adjustment variables, the association between EF and ToM is also of interest for fully specifying an emerging adult social adjustment model. ToM measures were far less associated with emerging adult social adjustment variables, than EF measures.

Outcome Measures

Peer Adjustment. Observational Studies of Social Impairment or Aggression, or Externalizing Behaviours. Peer adjustment measures were mostly self-report measures ($n = 12$).

Many of these were measures of social impairment, or aggressive or externalizing behaviours ($n = 6$), such as the Brief Symptom Inventory's Hostility Index (Derogatis & Melisaratos, 1983) in Fosco et al. (2012).

Observational Studies of Positive Peer Adjustment. Other peer adjustment measures, such as the Social Adjustment Scale (SAS; Weismann & Bothwell, 1976) in McCleary et al. (2012), assessed positive social adjustment ($n = 7$). With the exception of one study using vignettes (Côté, DeCelles, McCarthy, Kleef, & Hideg, 2011) and another using diary reporting procedures (Lopes et al., 2011), these were questionnaire survey studies. Only two studies (Fosco et al., 2012; Owens & Hinshaw, 2016) employed multi-informant designs.

Experiments. Three studies employed experimental measures of peer adjustment. One study on social aggression used Zeichner, Parrott, and Frey's (2003) Response Choice Aggression Paradigm (RCAP; in Cohn, Jakupcak, Seibert, & Hildebrandt, 2010). Two others included experimental observations of participants' level of cooperation (Ramenzoni et al., 2012) or prosocial behaviour (Hao & Liu, 2016). Overall, researchers relied heavily on self-report survey measures of social adjustment, rarely employing multi-informant study designs.

Occupational Adjustment. Academic Measures. There were slightly more studies measuring academic outcomes ($n = 6$), than employment outcomes ($n = 5$). Measures of academic outcomes included self-report questions developed by study authors to assess academic satisfaction (Guillmette et al., 2019), impairment (Barkley & Murphy, 2006 in Barkley & Fischer, 2010), and performance (Barkley, Murphy, & Fischer, 2008, in Barkley & Fischer, 2010; Guillmette et al., 2019), as well as educational status (Cairns et al. 2017), and attainment (Barkley & Fischer, 2010; Véronneau, et al., 2014). Only Barkley and Fischer (2010) also used transcript records to assess academic performance. Two studies assessed outcomes through

performance-based measures of reading, writing, and math skills, including Kercood et al. (2017) who used the Woodcock Johnson Tests of Achievement (Woodcock, McGrew, & Mather, 2001), and Sanders et al. (2015), who used Smallwood et al.'s reading comprehension task (2013).

Employment Measures. Employment variables were assessed using self-report and interviewer-rated measures of work impairment and functioning (Barkley & Murphy, 2010; Cairns et al., 2017), such as the Global Functioning: Role Scale (GFR; Cornblatt et al., 2007) in Cairns et al. (2017). Only Barkley and Fischer (2010) assessed work history. Three studies developed their own questions on employment status (e.g., Barkley et al., 2010; Cairns et al., 2017; Daly, Delaney, Egan, & Baumeister, 2015). While both Flandermeyer (2019) and Kercood and colleagues (2017) developed their own questions on career confidence, Flandermeyer (2019) also used previously published measures to assess career anxiety, and indecision (i.e., Holland, Daiger, & Power, 1980; Thai, 2014). Relatively few studies included academic and employment measures. These measures included self-report surveys, interviewer-rated surveys, single questions developed by the authors, and performance-based tests of academic achievement.

Romantic Adjustment. Observational and Experimental Studies of Negative Dating Outcomes and Dating Aggression. The majority of romantic adjustment studies measured negative outcomes in dating situations ($n = 11$). Most of these authors ($n = 8$) used popular and established self-report questionnaires of dating aggression, such as the Conflict in Adolescent Dating Relationships Inventory (CADRI, Wolfe et al., 2001) and the Conflict Tactics Scale (CTS, Straus, 1979; Straus, Hamby, Boney-McCoy, & Sugarman, 1996). Only Yarkovsky (2016) and Baker et al. (2018) used multi-informant designs to assess dating aggression. Only Barkley and Fisher (2010) assessed self-rated dating or marriage impairment. Interventions used

experimental measures to assess dating aggression (Watkins et al., 2013) and a combination of experimental and self-report measures to assess infidelity (Ciarroco, 2011).

Observational Studies of Positive Romantic Adjustment and Relationship

Characteristics. Other studies assessed positive romantic adjustment variables ($n = 9$). These included relationship qualities, satisfaction, and break-up resilience; and skills in romantic competence, or romantic passion, measured through published surveys such as the Relationship Assessment Scale (RAS; Hendrick, 1998, in Bradbury & Shaffer, 2012; Perrone-McGovern et al., 2013). Other relationship characteristics and qualities including relationship length, relationship status, lifetime relationship status, number of partners, commitment, love feelings, and infatuation, were measured by background questionnaire items (Farrell & Vaillancourt, 2019; Langeslag & van Strien, 2016). One cross-sectional study used physiological measures to assess participants' levels of arousal for their partners (Perrone-McGovern et al., 2013). Of all the emerging adulthood social adjustment domains, romantic adjustment was the most thoroughly represented among the included studies. Many of the well-known and established dating adjustment measures assessed dating aggression.

2.4.7 Study Findings

Peer Adjustment

EF. Observational Studies. After controlling for important confounds, there were small to moderate negative cross-sectional effects of self-regulation on social impairment or externalizing behaviours (Barkley & Fischer, 2010; Cohn et al., 2010; Lopes et al., 2011; Malatras & Israel, 2012; Situ, Li, & Dou, 2016). In contrast, there were overall smaller non-significant, or small to moderate cross-sectional effects of self-regulation on positive peer adjustment variables (Chan, 2019; Côté et al., 2011; Lopes et al., 2011; Moilanen, 2017; 2019).

With the exception of Chan (2019), these were multivariate effects controlling for important confounds. There were small but significant longitudinal effects of childhood self-regulation on positive peer adjustment or externalizing symptoms (Fosco et al., 2012; O’Conner, 2011; Owens & Hinshaw, 2016).

Differences Based on Clinical Population or Gender. The set of cross-sectional and longitudinal studies included in the review suggested that the effect of self-regulation on social outcomes may be larger in the ADHD population (Barkley & Fischer, 2010; Owens & Hinshaw, 2016). One longitudinal study suggested that the effect of behavioural regulation on positive youth development was larger for men than women (O’Conner et al., 2011).

ToM. Observational and Experimental Studies. Two out of three included cross-sectional studies found no association between ToM and peer adjustment (Hao & Liu, 2016; McCleary et al., 2012). The third ToM study was an experiment finding a large positive effect of joint coordination, on a social motor task which required ToM (Ramenzoni et al., 2012). Authors acknowledged the contrived nature of the experiment, which would make generalization of the results difficult. Overall, the literature has established more consistent effects of self-regulation on emerging adult aggression, that range from small to moderate depending on the context.

Occupational Adjustment

EF. Academic Adjustment Cross-sectional and Experimental Studies. Relative to self-report survey measures of cognitive flexibility (Guilmette et al., 2019; Kercood et al., 2017), performance-based cognitive flexibility had more consistent moderate positive effects on academic performance measures. These included standardized reading, math, and writing scores, and academic grades (Kercood et al., 2017). Inhibiting distracting thoughts as opposed to

engaging them, was also found to moderately positively predict reading comprehension, in an experimental intervention (Sanders et al., 2015).

Longitudinal Studies. After controlling for important confounds, a longitudinal study found a moderate positive effect of latent Grade 11 adolescent effortful control on 23-year-old educational attainment (Véronneau et al., 2014).

Differences Based on Clinical Population. Cognitive flexibility also positively predicted healthy university students' career confidence and reduced career indecision or anxiety (Flindermeyer, 2019; Kercood et al., 2017). However, this association was inverted in an ADHD sample, making cognitive flexibility detrimental to career confidence among university students with ADHD (Kercood et al., 2017). ADHD inattention, hyperactivity-impulsivity, and emotional impulsivity symptoms were moderately and positively associated with self-rated educational impairment, and negatively moderately associated with college graduation (Barkley & Fischer, 2010).

Employment Adjustment Cross-sectional and Longitudinal Effects. After controlling for important confounds, unstandardized regression findings showed that employment rates were negatively affected by current performance-based working memory difficulties in a sample of help-seeking adults in an early intervention youth help service, by 8% (Carins et al., 2017). Unstandardized longitudinal findings in the general population showed that late childhood teacher-reported self-control was related to decreased unemployment measured at age 21 by 4.2%, decreased unemployment measured later at age 23 by only 2.6%, and decreased unemployment measured later at age 26 by only 1.2% (Daly et al., 2015).

Differences Based on Clinical Population. In addition to a relatively large effect of EF on employment rates among help-seeking emerging adults (Cairns et al., 2017), effects of EF on

employment adjustment were observed in the ADHD population. Emotional impulsivity ADHD symptoms had moderate-sized negative effects on employment functioning, adjustment, satisfaction, performance, and status (Barkley & Fischer, 2010). In contrast to Daly et al.'s (2015) small longitudinal effects, Cairns et al.'s (2017) and Barkley and Fischer's (2010) cross-sectional effects were slightly larger. It is not clear whether the tendency for cross-sectional effects to be larger than longitudinal effects (Adachi & Willoughby, 2014), or the presence of the cross-sectional effects among disadvantaged ADHD or help-seeking samples, is responsible for Cairns et al.'s (2017) or Barkley and Fischer's (2010) relatively larger effects of EF on employment adjustment.

Overall, emerging adults' cognitive flexibility and inhibition skills appear to moderately positively affect emerging adult educational skills and performance (Guilmette et al., 2019; Kercood et al., 2017; Sanders et al., 2015). ADHD symptoms demonstrate relatively larger, more consistent moderate negative effects on educational and employment performance (Barkley & Fischer, 2010), and undermine factors promoting career confidence. Child and youth self-control abilities have positive longitudinal effects on educational attainment and employment status, which diminish with greater time-spans between self-control measurements and outcome measurements (Daly et al., 2015).

ToM. No studies examining the effects of ToM on academic or work outcomes were found. Thus, this type of research was not included in the final set of articles.

Romantic Adjustment

EF. *Observational Studies.* Among observational studies, only self-report surveys measuring self- or emotional regulation difficulties had significant (small to moderate) positive effects on physical or psychological dating violence perpetration (Baker et al., 2018; Caiozzo et

al., 2016; Farrell & Vaillancourt, 2019; Gover et al., 2011; Guzman-Gonzalez et al., 2016; Yarkovsky, 2016). Klipfel (2015) failed to demonstrate significant positive effects of performance-based measures of inhibition and other EF difficulties on physical, psychological, or sexual dating aggression (Klipfel, 2015). Dating violence *victimization* was only slightly positively affected by self- or emotional regulation difficulties (Gover et al., 2011; Yarkovsky, 2016). *Sexual* dating aggression was consistently incorporated into general dating aggression measures, which were only slightly positively affected by inhibitory- or emotional regulation (Farrell & Vaillancourt, 2019; Yarkovsky, 2016). One long-term longitudinal effect was small and indirect, from childhood inhibitory control to emerging adult general dating aggression, through Grade 8 bullying tendencies (Farrell & Vaillancourt, 2019).

Only self-report surveys measuring self- or emotional regulation in observational studies had small to moderate positive effects on positive romantic adjustment variables including relationship satisfaction, competence, commitment, positive qualities, and break-up resilience (Bradbury & Shaffer, 2012; Chan, 2019; Farrell & Vaillancourt, 2019; Francoeur et al., 2019; Lopez, 2015; Moilanen & Manuel, 2017; 2018; Yarkovsky, 2016). Lopez (2015) did not find significant effects of other self-reported EF difficulties on relationship satisfaction, including self-management to time, self-organization/problem solving, self-restraint, or self-motivation. There were also no effects of self- or emotional regulation on some relationship characteristics such as relationship length (Yarkovsky, 2016), or relationship status of last sexual partner (Moilanen & Manuel, 2018). However, there was a small positive cross-sectional effect on lifetime relationship status (Moilanen & 2017), and a small negative longitudinal effect on lifetime number of dating partners, through reduced Grade 8 bullying tendencies (Farrell & Vaillancourt, 2019).

Differences Based on Gender and Other Individual Differences. Despite these small to moderate effects, there were a number of conditional effects. Heterosexual women's self-control was a moderate-sized protective factor against women's own, or their partners', experimenter-observed psychological aggression perpetration (Baker et al., 2018). Other gender differences showed that when a partner's emotion regulation difficulties were very high, women were 5-8 times more likely than men to experience dating aggression perpetration or victimization, but when a partner's emotion regulation difficulties were very low, *men* were 8-11 times more likely than women to experience dating aggression perpetration or victimization (Yarkovsky, 2016). The effects of emotional regulation difficulties on physical dating perpetration were also higher among those with aggressive attitudes (Caizzo, Houston, & Grych, 2016), or when men in heterosexual partnerships were high in negativity (Watkins et al., 2013).

ADHD inattention and hyperactivity-impulsivity symptoms did not predict psychological or physical dating aggression longitudinally—or cross-sectionally, after controlling for antisocial personality (Wymbs et al., 2012). However, hyperactivity- or emotional impulsivity symptoms moderately positively affected self-rated dating/marriage impairment (Barkley & Fischer, 2010).

Experiments. Interventions showed significant positive effects of self-regulation depletion on experimentally observed infidelity (Ciarroco et al. 2016), and on the physical aggression of women with negative men for partners (Watkins et al., 2013). An intervention study found that an emotional regulation task to increase or decrease one's feelings toward their partner, had apparently small effects in the expected directions on their self-reported infatuation, positivity, or passion, but not arousal (Langeslag & van Strien, 2016).

ToM. Mentalization skills were a moderate-sized protective factor against break-up distress (Francoeur et al., 2019), and empathy/perspective-taking positively predicted

relationship satisfaction, but not physiological measures of romantic passion (Perrone-McGovern et al., 2013).

Of all the three emerging adult social adjustment domains, romantic functioning appears to be the most thoroughly researched. As with peer adjustment, effects of survey-based self- or emotional regulation were slightly larger overall for dating aggression, than for non-aggression variables.

2.5 Discussion

The goal of this systematic review was to provide a summary of the behavioural effects of EF and ToM on peer, occupational, and romantic adjustment among emerging adults. A search across four databases resulted in approximately 6000 articles. These articles were compared against eligibility criteria resulting in 38 included studies. Seven of these studies were identified by searching through the reference and forward citation sections of the other articles uncovered through the electronic databases. Most studies were considered Strong in quality, including five dissertations rated Good to Strong in quality (see rating scale by Kmet et al., 2004). The inclusion of the dissertations was justified by a relative bias to underreport null results, among this review's published studies. As expected, the review uncovered substantial evidence for the effects of EF on a range of emerging adult social adjustment variables. However, contrary to expectations, relatively few of the included studies investigated the effects of ToM on social adjustment.

2.5.1 Relation of Findings to Previous Literature

Measures

Predictors. The large majority of studies focused on EF, as opposed to ToM predictors. Consistent with a prominent literature on self-regulation and social adjustment among children

(Korucu et al., 2017; Lengua et al., 2015; McKown et al., 2009; O'Toole et al., 2016), most EF studies focused on measures of self-regulation, going by various names including effortful control, emotional regulation, emotional control, inhibitory control, self-control, and self-regulation. As mentioned, emotional regulation is a marker for EF. It is a behavioural manifestation of inhibitory cognitive EF (Carlson & Moses, 2001; Davis, Bruce, & Gunnar, 2002; Gerardi-Caulton, 2000; Rothbart, Ellis, Rosario, & Posner, 2003). In addition to self-regulation, cognitive flexibility featured as a common predictor of occupational adjustment (Guilmette et al., 2019; Kercood et al., 2017). This aligns with findings on the importance of cognitive flexibility for academic and employment skills such as learning, collaboration, multi-tasking, problem-solving, and creativity (Bull & Scerif, 2001; Deak, 2004; Ionescu, 2012; Kercood et al., 2017). Three studies collectively assessed the effects of ADHD symptoms on all three social adjustment variables (Barkley & Fischer, 2010; Kercood et al., 2017; Wymbs et al., 2012). Given the association between ADHD and EF or self-regulation difficulties (Barkley & Fischer, 2010; Barkley & Murphy, 2010), it was appropriate that these clinical symptoms were represented among the reviewed studies.

Outcomes. Peer adjustment measures were mostly self-report measures of externalizing symptoms, or positive peer adjustment. Academic and employment occupational measures assessed educational satisfaction and performance; educational status, attainment, and performance-based measures of academic skills; and work performance, and employment status, confidence, anxiety, and indecision. Romantic adjustment measures consisted mainly of popular self-report measures of dating aggression, as well as measures of positive relationship adjustment variables including relationship qualities, satisfaction, commitment, and love feelings. Authors also asked participants questions on relationship status, length, number of partners, and romantic

passion. Of all the social adjustment domains, romantic adjustment was the most thoroughly represented.

Findings According to Differences in Social Adjustment Variables, Executive Functions, and Types of EF Measurement

Effects of self- or emotional regulation on peer or dating aggression variables were larger or more consistent than effects on positive peer or romantic adjustment, or other non-aggression relationship characteristics. This difference was especially prominent among peer adjustment studies. This result makes sense in light of models of adult social aggression driving most of these studies, such as the pre-cortical balance, or I³ models (e.g., Finkel, 2014; Heatherton & Wagner, 2011). These models predict that inhibition impairments can interact with sub-cortical emotional impairments to result in socially aggressive behaviours. The models are based on peer social relationships, and generalizations are made to intimate partnerships (Finkel, 2014) explaining the relatively larger effects on peer interactions. These models account for how in peer and romantic relationships, socially aggressive behaviours undermine basic social skills mastered during early stages of development (McCormick et al., 2011). This negatively affects social adjustment.

In addition to self-regulation, cognitive flexibility and working memory positively predicted academic and employment outcomes (Cairns et al., 2017; Kercood et al., 2017). Unlike peer or romantic contexts where survey-based, as opposed to performance-based, measures of EF exert significant effects (Fosco et al., 2012; Gover et al., 2011; Klipfel, 2015), performance-based measures of cognitive flexibility demonstrated larger or more consistent effects than survey measures, on occupational outcomes (Cairns et al., 2017; Kercood et al. 2017). A discussion of this measurement issue was lacking in the included studies (Kercood et al., 2017;

Klipfel, 2015). However, a clinical review comparing performance-based and survey measures of EF suggests that performance-based measures are more likely to measure cognitive efficiency, whereas survey measures are more likely to measure goal pursuit success. The review also concluded that performance-based measures assess EF under highly structured environments, whereas surveys assess EF in unstructured settings (Toplak, West, & Stanovich, 2013). This explains why among relatively less-structured social domains such as peer and romantic relationships, survey measures of less-structured everyday EF led to success in finding significant effects (Klipfel, 2015; Moilanen & Manuel, 2017; 2018; 2019). Similarly, it explains why among more structured adjustment domains including academic and employment settings, more structured performance-based measures of cognitive flexibility and working memory also led to more results (Cairns et al., 2017; Kercood et al., 2017). It also makes sense that performance-based tests of math, reading, and writing skills were more consistently predicted by performance-based EF measures tapping into cognitive efficiency, than survey-based EF measures (Kercood et al., 2017).

Study Design

Longitudinal Studies. Comparisons between cross-sectional effects and longitudinal effects assessing the same phenomena often revealed smaller-sized longitudinal effects, relative to corresponding cross-sectional effects. This occurred when comparing small longitudinal effects on peer adjustment (Fosco et al., 2012; O’Conner, 2011) to corresponding small to moderate cross-sectional effects (Lopes et al., 2011; Malatras & Israel, 2012; Situ et al., 2016). It was evident when observing declining effects of childhood self-control on emerging adult unemployment across greater time spans (Daly et al., 2015). It was also evident when comparing small longitudinal effects of EF on dating aggression (Farrell & Vaillancourt, 2019) to

corresponding small to moderate cross-sectional effects (Baker et al., 2018; Caiozzo et al., 2016; Gover et al., 2011; Guzman-Gonzalez et al., 2016; Yarkovsky, 2016). These trends were consistent with findings that longitudinal effects are generally smaller than cross-sectional effects assessing the same phenomena (Adachi & Willoughby, 2014). Any of these significant longitudinal findings, even if small, are indicative of important childhood self-regulation effects influencing social development into emerging adulthood.

Experimental Studies. Although often contrived and less ecologically valid, experimental studies in this review supported observational findings of the effects of self- or emotional regulation and ToM on peer, occupational, and romantic adjustment. In their observational study, Perrone-McGovern et al. (2012) concluded that ToM (i.e., empathy and perspective-taking) likely lead to relationship satisfaction. Accordingly, Ramenzoni et al.'s (2012) experiment on joint coordination and social motor tasks confirmed the predictive relationship between ToM and social cohesion. Similarly, Sanders et al.'s (2015) reading comprehension intervention confirmed findings on the importance of attention in predicting academic functioning (Barkley & Fischer, 2010). Through lab-controlled depletion studies, Ciarocco et al. (2011) and Watkins et al. (2013) confirmed this review's many observational findings of the harmful effects of self-regulation difficulties on romantic adjustment. As with longitudinal designs (e.g., Caiozzo et al., 2016), experimental studies in this review helped confirm the predictive effects of EF, and in some cases ToM, on social adjustment variables. This added a degree of strength to causal hypotheses.

Gender

Given the highly-gendered nature of heterosexual interactions, it is not surprising that six of the seven studies examining gender differences were dating aggression studies. O'Conner's

(2011) longitudinal study was unique as the only one to assess gender differences in a peer, as opposed to romantic adjustment study. The positive effect of boys' mid/late adolescent emotional control on emerging adult positive development was greater than that of girls (O'Connor et al., 2011). Provided they are not excessively callous or unemotional, men also stood more to gain from their use of emotional regulation skills to reduce physical dating aggression in emerging adulthood (Caiozzo et al., 2016). These findings are consistent with literature demonstrating that boys and men have a greater tendency towards physical aggression, and emotional arousal to aggression than girls and women (Bjorkqvist, 2018; Knight et al., 2002). This would seem to suggest men have more to gain from emotional regulation skills to reduce aggression and maintain social adjustment. This is consistent with research suggesting that men are more likely than women to be aroused by anger-related stimuli (Knight et al., 2002), act aggressively (Bjorkqvist, 2018), and overtly express anger (Brody & Hall, 2008).

However, other research contradicts the notion of a greater role for EF, and emotional regulation in particular, in social adjustment among males. It is true that men were the only ones to demonstrate a small correlation between cognitive flexibility difficulties and sexual aggression (Kliffel, 2015). However, only women showed a small correlation between these issues and *physical dating aggression* (Kliffel, 2015). This finding is consistent with the teen dating violence literature demonstrating greater sexual aggression among very young men, yet greater physical dating aggression among very young women (Wincentak et al., 2017). Moreover, young women stood more to gain in relationship satisfaction from their own emotional regulation skills with higher correlations between these variables for women than men (Yarkovsky, 2016). Interestingly, women in heterosexual relationships were also more likely to react or retaliate aggressively with white noise blasts to their partner's negativity when either they or their partner

were experimentally depleted of self-regulation (Watkins et al., 2013). Buttredding these findings were the results that women responded significantly more to men's emotion regulation difficulties with general dating aggression than vice versa (Yarkovsky, 2016), and that women's, not men's, self-control acted as a moderate-sized protective factor against their own, or their partner's psychological dating aggression (Baker et al., 2018). Together, these findings suggest that women are more dissatisfied with the presence of emotional dysregulation issues in their romantic relationships and are more prone to aggressively express their displeasure in the absence of self-regulation resources. Such notions are consistent with literature demonstrating women's greater sensitivity to their own and others' emotions and greater facial and non-verbal emotional expressivity in general, when considering the full range of emotions (Broody & Hall, 2002). Overall, emotional regulation may play a larger role in social adjustment for young women than for young men, particularly in dating aggression contexts comprising psychological or physical dating aggression, to the exclusion of sexual aggression. However, given that Guzman-Gonzalez et al. (2016) found no gender differences in the effect of emotion regulation on physical dating violence, future research should continue to disentangle the complex issues surrounding gender differences in the role of emotional regulation in social adjustment and dating aggression.

Clinical Findings. Four of the five ADHD, or combined ADHD-general population, studies reported significant moderate to large effects of EF on social adjustment variables (Barkley & Fischer, 2010; Kercood et al., 2017; Lopez, 2015; Owens & Hinshaw, 2016). This is in contrast to non-significant, or small to moderate findings across this review's non-ADHD samples. Given the prominence of EF and self-regulation difficulties in the ADHD population (Barkley & Murphy, 2010; Barkley & Fischer, 2010), it is not surprising that ADHD formed the

majority of this review's clinical samples (Barkley & Fischer, 2010; Kercood et al., 2017; Lopez, 2015; Owens & Hinshaw, 2016; Wymbs et al., 2012). ADHD is a neurodevelopmental disorder representing mild congenital frontal-striatal circuit disruption (American Psychiatric Association, 2013; Barkley & Murphy, 2010). Although findings are less consistent among adults than children with ADHD, recent functional imaging research suggests that abnormal activation in dorso- and ventro-lateral, as well as medial prefrontal cortical, anterior cingulate, and related areas continues into adulthood in this population (see Salavert et al., 2018 for a review; Dibbets, Evers, Hurks, Bakker, & Jolles, 2010; Valera et al., 2010; Valera, Faraone, Biederman, Poldrack, & Seidman, 2005). As suggested in the introduction, different frontal activation could be related to attentional and inhibitory control and ToM difficulties (Fuster, 2002; Mesulam, 2002; Stuss, 2011; Takeuchi et al., 2013). The associations between abnormal frontal activation, executive dysfunction, and a greater potential for inhibitory control and self-regulation deficits, explains the greater effects on social adjustment in the ADHD population.

ToM. Despite the introductory review of ToM and its relation to dorsomedial frontal activation, EF, and childhood social adjustment, ToM has received scant discussion thus far. This is owing to only five studies featuring ToM as a predictor of social adjustment variables. Of these, only McLeary et al. (2012) assessed its association with EF. They revealed a positive and moderate association in keeping with established literature (Blair & Razza, 2007; Bowman et al. 2015; Carlson et al. 2013; Pineda-Alhucema et al., 2018). Another study reported that ToM predicted greater breakup resilience, presumably because of the positive role played by ToM in general romantic functioning (Francoeur et al., 2019). Indeed, a second study in this review found that an empathy/perspective-taking measure was positively associated with relationship satisfaction (Perrone-McGovern et al., 2013). However, despite these two significant findings,

the majority of studies failed to establish a convincing argument that ToM consistently predicts social adjustment in emerging adulthood. Two studies failed to find any association between popular ToM measures and peer adjustment variables in respective healthy or sub-clinical schizotypy samples (Hao & Liu, 2016; McCleary et al., 2012). A fifth study's contrived experimental setup made its significant findings difficult to generalize to common everyday situations (Ramenzoni et al., 2012).

To account for the mixed findings regarding ToM and social adjustment in emerging adulthood, the reader is referred to Hao and Liu's (2016) lifespan research on ToM and prosocial behaviour. It suggests that the relationship between ToM and social adjustment changes across development. In the early stages of social and social cognitive development the limited cognitive capacities of preschool and school age children restrict their use of ToM to the promotion of prosocial behaviour. However, by adolescence youth have developed the awareness and capacity to use ToM to deceive, lie, and manipulate, for self-serving or antisocial purposes (Cillessen & Borch, 2006; Mayeux, 2014; Stoltz et al., 2016). Hao and Liu (2010) reasoned that by emerging adulthood, EF allows adults to separate ToM ability from its application towards prosocial behaviour. The independence of ToM skills from prosocial behaviour accounts for inconsistent or no associations between ToM and social adjustment among emerging adults. This may be why impaired EF was more consistently featured in this review as a predictor of social adjustment.

However, aside from conceptual reasons, there may also be measurement reasons for the less consistent effect of ToM deficits on social adjustment. An explanation offered by McCleary et al. (2012) who studied a sub-clinical sample of participants with schizotypal traits, is that current ToM measures are not sensitive enough to capture significant deficits in non-clinical samples. This explanation is supported by stronger and consistent findings between ToM and

social adjustment among young adults in clinical populations including autism (Baron-Cohen, 2000; Baron-Cohen et al., 2001), and schizophrenia (Corcoran, Cahill, & Frith, 1997). Another problem is that ToM is still poorly understood and different ToM measures show inadequate intercorrelations (McClearly et al., 2001; Warnell & Redcay, 2019). Future research should explore strategies to overcome ToM measurement issues among emerging adults, such as latent variable analysis. The process of establishing a latent ToM variable would ensure a high correlation between at least two ToM tasks. Latent variables are also useful for reducing measurement error among constructs of interests (Ullman & Bentler, 2012).

2.5.2 Implications and Future Directions

Most of the study findings focus on the role of self-regulation in social adjustment, as opposed to other forms of EF. This pattern is speculated to support neuropsychological and social information processing models of social adjustment, which also focus on self-regulation. As mentioned, the pre-cortical balance (Heatherton & Wagner, 2011) and I³ (Finkel, 2014) models based in neuropsychological theory, provide a mechanism for how self-regulation can become compromised, making one vulnerable to externalizing symptoms and social aggression. In these models, self-regulation is compromised by imbalances in frontal cortical/sub-cortical relationships. The imbalances can be created by impaired prefrontal functioning from various sources. One source of impairment is self-regulation depletion, as seen in this review's self-regulation depletion studies (Ciarroco et al., 2010; Watkins et al., 2013; see Finkel, 2014). Another source is frontal-striatal circuitry disruption, as seen in this review's studies on ADHD symptoms and the ADHD population (e.g., Barkley & Fischer, 2010; Kercood et al., 2017; Wymbs et al., 2012). The imbalance can also result from overly strong subcortical emotional impulses (Finkel, 2014). This was seen in this review when dating aggression resulted from the

interactions between self- or emotion dysregulation and aggressive or negative dispositions (Caiozzo et al., 2016; Watkins et al., 2013).

This review's findings also support the social information processing model (Crick & Dodge, 1994). EF and ToM directly map onto stages of the social information processing sequence. These include the initial attentional and inhibitory stage required for social cue encoding, as well as the stages of social cue interpretation, and response construction, evaluation, and enactment (Crick & Dodge, 1994; Perez-Edgar, 2012). The social information processing model predicts that the self- or emotional regulation difficulties discussed in this review will impair navigation through these stages, ultimately impairing social adjustment.

2.5.3 Applications

The reviewed cross-sectional and longitudinal studies suggested several clinical applications to improve emerging adults' social adjustment. The majority of these applications involved interventions to help emerging adults improve their self-regulations skills, or prevention programs to prevent children and youth from developing future self-regulation issues (e.g., Baker et al., 2018; Chan, 2019; Cohn et al., 2010; Daly et al., 2015; Flandermeyer, 2019; Fosco et al. 2012; Francoeur, 2019; Guilmette et al., 2019; Wyms et al., 2012; Watkins et al., 2013). For example, adult interventions could focus on individual or couple counseling for self-regulation skills to improve peer or romantic functioning. This would especially operate through the prevention of aggressive or disinhibited behaviour that threaten to undermine existing social skills (Fosco oet al 2012; Gover et al., 2011; Malatras & Israel, 2012; Situ et al., 2012). Children could be also trained in self control or effortful control skills as a matter of policy to improve social adjustment outcomes, including future peer interactions, as well as educational attainment and employment (Daly et al., 2015; Fosco et al., 2012). Kercood and colleagues (2017) and

Flandermeyer (2019) recommended that emerging adults in the general or ADHD populations engage in cognitive flexibility trainings to promote greater career confidence and adjustment. Finally, clinicians working with young adults with ADHD can promote their social adjustment indirectly, by helping them manage EF deficits (Barkley and Fischer, 2010). It is important that clinicians understand the nature of the neuropsychological impairments underlying ADHD. This would help them develop effective EF coaching programs that can help patients manage behavioural or emotional problems, to facilitate social adjustment.

2.5.4 Limitations and Future Research

The current review shares the same limitations of its included studies. First, with the majority of studies being cross-sectional studies, the overall evidence is limited in its ability to establish causal connections between EF and ToM predictors and emerging adult social outcomes (e.g., Barkley et al., 2010; Chan, 2019; Cohn et al., 2010; Francoeur, 2019; Guzman et al., 2016; Klipfel, 2015; Malatras et al., 2012; Moilanen, 2018). The few included longitudinal and experimental studies helped support causal hypotheses. Future research should continue to employ multivariate controlled longitudinal designs, which may be superior to experiments, which are often contrived and not applicable to everyday settings. Second, many studies, some of which used convenience samples, cannot generalize their findings to sectors of the general population (e.g., Baker et al., 2018; Bradbury et al., 2012; Chan, 2019; Cohn et al., 2010; Farrell et al., 2019; Flandermeyer, 2019; Gover et al., 2011; Guilmette et al., 2019; Lopes, 2011; Watkins, 2013; Wymbs, 2012). In particular, samples with low ethnic diversity (e.g., Guilmette et al., 2019) may not apply to underrepresented populations which often have different mores for the expression of emotions and behaviour (Markus & Kitayama, 1991). Such cultural rules and norms would be important to take into consideration on studies of EF, inhibition, and self-

regulation. Third, because some studies reported limitations of small sample sizes (e.g., Cohn et al., 2010; Langeslag, 2016; Perronne-Mcogvern, 2013; Situ et al., 2016; Yarkovsky, 2016), it is possible that some small but significant effects were reported as non-significant due to power issues. Sample size issues could also have limited researchers' abilities to hypothesize or find conditional effects based on gender or other demographic variables, or indirect effects which require larger sample sizes to be detected (Yarkovsky et al., 2016). Fourth, some studies reported being limited by measurement issues. These issues included low measure reliability (e.g., Lopes, 2011), or validity issues such as theory of mind measures not correlating with one another (McLeary et al., 2012). Other measurement issues included failing to employ multiple informants (Chan, 2019; Moilanen 2017, 2018, 2019; Wymbs, 2012). There were also limitations from social desirability issues arising from the use of self-report questionnaires (e.g., Situ et al., 2016). Due to the usefulness of questionnaires to capture everyday behavioural and social functioning, future researchers should go to lengths to assure participants and informants of their privacy, to reduce social desirability issues. Fifth, studies of the effects of self- or emotion regulation on dating aggression often failed to measure the full range of dating aggression domains including sexual dating aggression perpetration, or dating victimization, in addition to psychological or physical aggression perpetration (e.g., Baker et al., 2018; Farrell & Vaillancourt, 2019; Guzman-Gonzalez, 2016). Finally, only studies on dating aggression thoroughly explored gender differences on the effects of EF on emerging adult social adjustment. Given the literature on gender differences in emotional regulation, sensitivity, and expression (Brody & Hall, 2008), studies of other social adjustment domains should do likewise.

The systematic review was itself limited in a few ways. First, the variations in study designs, variables and informants used for predictor measures and outcome measures, and the

statistics reported, precluded quantitative synthesis. Second, accounting for publication bias was difficult. As only a few dissertations were included in the final list of studies, assessment of qualities of published versus non-published studies was limited. Third, due to the COVID-19 pandemic, at the time of this study, some studies were not able to be screened owing to closed libraries and interlibrary loan services. Note, however, that this prevented the screening of only four articles. Such a small number of articles were not likely to pass eligibility criteria. Fourth, most of the studies included were performed in one geographic location (i.e., North America), and among the healthy general population. This makes generalization to other cultural and clinical populations difficult.

Last, there were slight discrepancies between the protocol and the final study. Emerging adulthood is defined by the range of 18 to 29 years (Arnett, 2004). However, to ensure a sufficient number of articles would be included in the review, the proposed age eligibility was originally expanded to span 17 to 29 years. When it was clear a sufficient number of articles would be included using the correct age range for emerging adults, the age eligibility criteria was reverted to the 18 to 29 year age range. Another discrepancy involved study quality assessment. The QualSyst Tool (Kmet et al., 2004) was used to assess study quality, as opposed to Cochrane's risk of bias tool (Higgins & Altman, 2008) as originally planned. This change was made because the QualSyst Tool was subsequently considered more appropriate to assess quantitative observational studies (Kmet et al., 2004). Finally, it was proposed that univariate and multivariate results would be reported in their own subsections. However, given the variability in the reporting of control variables across the included studies, this was not feasible. Details of the covariates associated with each analysis, if present, were included in Table 1.

Conclusion

Despite the limitations mentioned in this discussion, this review possesses many strengths. This was the first systematic review of EF and ToM effects on social outcomes salient to emerging adults. It employed a rigorous pre-registered systematic search methodology (Moher et al., 2009). This involved screening over 6000 articles for comparison to predetermined eligibility criteria. The large number of resulting high-quality studies allowed inferences to be made from the data of tens of thousands of participants. Data synthesis demonstrated that the literature has begun to establish cross-sectional and developmental effects of behavioural regulation on a number of peer and romantic adjustment variables important for the overall social adjustment of emerging adults. It also suggested a number of avenues for future research, including guidelines for a quantitative model of social adjustment variables salient to emerging adults.

Chapter Three: Study 2 Latent Variable Analysis of Data From University Students

The goal of Study 2 was to recruit a new sample of emerging adults to directly test a model of the effects of EF and ToM on emerging adult social adjustment variables. This was accomplished through structural equation modeling (SEM) and latent variable analysis. One of the assumptions of structural equation models is that the models should be correctly and fully specified (Poole & O'Farrell, 1971). The results from the systematic review from Study 1 helped guide model specification. Preceding a summary of those results is a review of neuropsychological models of social adjustment that also guided SEM model specification.

3.1.1 Developmental-Contextual Factors Influencing EF and ToM

Studying social adjustment necessitates a transactional developmental-systems, or multi-level approach (McCormick et al., 2011, p. 133; Sameroff, 2010; Yeates et al., 2007). This approach captures the complexity of interrelations between the broader set of biopsychosocial factors influencing social adjustment (Blair, 2002). The multi-level social competence model suggests that in addition to the integrity of prefrontal brain matter, psychosocial internal and external risk and resilience factors also influence the effects of cognitive and social cognitive abilities on youths' social interactions and social adjustment (Yeates et al., 2007, see Figure 2). While external social factors include distal processes such as cultural or sociopolitical influences, they also include proximal processes such as the quality of the home environment and immediate family interactions. The multi-level social competence model (Yeates et al., 2007) was developed from clinical psychopathological studies of youth with a traumatic brain injury. However, it applies to healthy individuals in addition to individuals with a range of acquired or congenital brain injuries or neurodevelopmental issues (Yeates et al., 2007). For this reason, this model was selected for the current study.

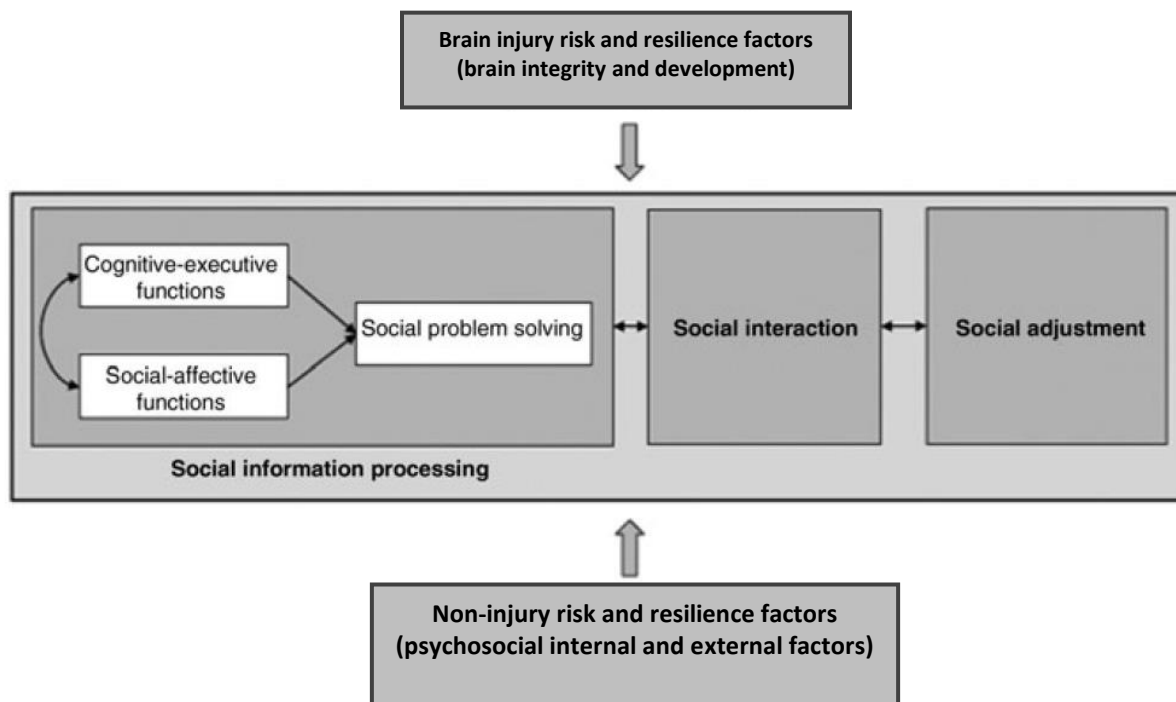


Figure 2. Yeates et al.'s (2007) multi-level social competence model, as simplified by Rosema et al. (2012).

3.1.2 Multi-Level Model of EF, ToM, and Social Adjustment

Brain Integrity and Development

One source of individual variation in EF and ToM is the integrity of prefrontal cortical structures (Yeates et al., 2007). Acquired injuries or neurodevelopmental disorders damaging prefrontal cortical matter may negatively impact cognitive development. This can negatively impact EF and ToM development, and by implication social information processing and social adjustment (Yeates et al., 2007).

TBI. TBIs are acquired brain injuries resulting from blows to the head or other forces impacting the brain (e.g., acceleration/deceleration forces during car collisions). Just over 30% of youth in the general population have experienced a head injury by the time they reach age 25, with the greatest incidence rate of TBI found among late adolescents and emerging adults aged 15 to 25. Injuries in this age group most commonly result from car collisions and sports injuries

(McKinlay et al., 2008) when youth sustain blows to the face or front of the head. These can cause the frontal and temporal lobes to hit against frontal skull plates (Bigler, 2008). They may also result in diffuse axonal injury and microbleeds, following the shearing or twisting of frontal white matter from acceleration and deceleration forces characteristic in these injuries (McDonald, 2013). As evidenced by MRI and diffuse tensor imaging (DTI) studies, frontal axonal injury in the dorsolateral prefrontal cortex correlates with EF difficulties (Lipton et al., 2009).

Concussions, or mild TBIs (mTBIs), comprise 70-90% of TBIs (Cassidy et al., 2004). While mTBI results in acute-term variable-sized effects on a range of cognitive abilities, EF is the most sensitive to multiple mTBIs (Karr, Areshenkoff, & Garcia-Barrera, 2014). Ventromedial prefrontal damage, in particular, can also lead to deficits in emotion recognition and ToM that become more chronic and severe, with greater TBI severity. At least in the case of moderate to severe TBI, frontal lesions in general can result in social functioning problems that exceed intellectual deficits (Ietswaart, Milders, Crawford, Currie, & Scott, 2008; Milders, Ietswaart, Crawford, & Currie, 2008).

Attention Deficit Hyperactivity Disorder (ADHD). ADHD is prevalent in 2.9% of adults (Hesson & Fowler, 2018). It is considered to also be a frontal disorder, due to characteristic frontostriatal circuitry disruption (Barkley, 2015; Bora & Pantelis, 2016). Frontostriatal circuitry represents one type of cortical-sub-cortical networking with sub-cortical disruption feeding back to cortical disruption. In accordance with frontal cortical disruption, ADHD is associated with medium-range problems with attention, impulse or emotional inhibitory control, and a range of other EF problems (Barkley 2015; Bora & Pantelis, 2016; Chahín-Pinzón, 2015; Jiménez-Figuerora et al. 2017; Nigg 2006). The strongest and most

consistent effects on EF are on response inhibition, vigilance, working memory, and planning. These occur over and above effects on academic achievement, symptoms of other disorders, and relatively minute effects on intelligence (Bora & Pentalis, 2016; Wilcutt, Doyle, Nigg, Faraone, & Pennington, 2005). As partially explained by inhibitory and sustained attention deficits, mild social cognitive difficulties also result from ADHD (Sinzig, Morsch, & Lehmkuhl, 2008; Uekermann et al., 2010). These occur mainly in the forms of emotional prosody and facial affect perception among children and adults. Effects on empathy and ToM are also present, but mainly among children, with relatively smaller effects among adults (Bora & Pentais, 2016; Uekerman et al., 2010). Accordingly, effects of social cognition on psychosocial functioning in ADHD including poor academic performance, low self-esteem, aggression, and oppositional behaviour are modest and mostly seen among children (Mikami & Pfiffner, 2008; Pineda-Alhucem, Aristizabal, Escudero-Cabbarcas, Acosta-Lopez, & Velez, 2018; Uukermans et al., 2010). Therefore, in ADHD, inhibition and sustained attention difficulties are more severe than effects on social cognition (Bora & Pentalis, 2016).

3.1.3 External Social Factors: Family Functioning

External social factors can also affect the neurological, cognitive, and social development of youth in the general population. For example, chronic parent or family dysfunction can negatively influence neurocognitive development through emotionally stressful experiences (Blair, 2002; Ryan et al., 2016). These stressful experiences hyperactivate the amygdala and other sub-cortical limbic structures (Blair, 2002, p. 115). Because of connections between the dlPFC or anterior cingulate cortex, and the amygdala (Derryberry & Tucker, 1994; LeDoux, 1996), repeated hypothalamic–pituitary–adrenal axis (HPA; cortisol stress hormone) activation from family stressors may compromise use of and development of executive functions including

attention and problem-solving functions (Matthews & Wells, 1999; Mogg & Bradley, 1999). This occurs through long-term potentiation where repeated HPA activation by fearful and anxious stimuli suppresses EF. Conversely, the ability to use attentional control and EF to dampen orientation to fearful and anxious stimuli is weakened (Amaral, Price, Pitkanen, & Carmichael, 1992; Blair, 2009; Van Eden & Buijs, 2000). This creates a vicious cycle whereby the HPA regularly hyperactivates and increases cortisol in the brain, compromising cognitive functioning. Compromised EF, in turn, can interfere with the coordination of social cognitive skills necessary for social adjustment (Yeates et al., 2007).

EF and ToM Predictors of Emerging Adult Social Adjustment Variables

Developmental Task Theory. According to developmental task theory, social adjustment tasks salient at the emerging adult stage include occupational and romantic adjustment (McCormick et al., 2011). Adjustment in these domains depends on having attained adjustment in social interactions with peers, and in academics, at earlier developmental stages. Given that peer adjustment skills mastered in childhood form the common basis for occupational and romantic adjustment in emerging adulthood, adjustment in occupational adjustment should correlate with romantic adjustment.

Neuropsychological Models of Social Aggression Applicable to Emerging Adults.

The literature describing how EF or ToM predictors relate to peer, occupational, or romantic adjustment in emerging adulthood, was reviewed in Study 1. Most studies reported relatively large effects of self- or emotional regulation on peer or dating aggression, when using self-report survey measures. The prevalent focus on self-regulation in this literature made neuropsychological models such as the cortical/sub-cortical balance (Heatherton & Wagner, 2011) and I³ (Finkel, 2014) models highly useful in interpreting the findings. Both models

account for social adjustment difficulties as a combination of frontal dysfunction and sub-cortical hyperactivation. This relates to the dampening effects of hyperactivated sub-cortical amygdala and HPA structures on inputs from the dlPFC or anterior cingulate cortex, as just reviewed (Matthews & Wells, 1999; Mogg & Bradely, 1999). In addition to significant effects of survey-based executive functions on occupational adjustment, some studies also found moderate effects of performance-based inhibition and cognitive flexibility on academic adjustment (Guilmette et al., 2019; Kercood et al., 2017; Sanders et al., 2012), and other performance-based EF measures on employment and academic adjustment (Cairns et al., 2019). The conclusions reached through these bodies of research are more thoroughly discussed in Study 1.

Covariates

Other variables that should be included in a model of emerging adult social adjustment have not yet been discussed. When assessing the effects of EF or ToM on emerging adult social adjustment, it is important to control for confounding variables, or covariates. In the current study, candidate covariates were selected on the basis of their having empirical associations with the social adjustment variables in the literature.

Peer Adjustment. Research shows, for example, that sexual orientation is associated with peer adjustment struggles. One study showed that non-heterosexual youth worry more than heterosexual youth about losing friends and have smaller peer networks (Diamond & Lucas, 2004). Depression and anxiety are also known to be associated with social difficulties (Hirschfeld et al., 2000; Mikami, Rnasone, & Calhoun, 2011). These findings point to sexual orientation, depression, and anxiety as candidate covariates for the current study.

Academic Adjustment. There is an advantage among girls and women in scholastic achievement throughout elementary to graduate school education (Voyer & Voyer, 2014).

Disparities in socio-economic status between ethnocultural groups are also thought to lead to scholastic achievement disparities between ethnocultural groups (Fletcher & Tienda, 2010). Therefore, it would also be important to control for gender and ethnicity when assessing for effects of EF and ToM on academic variables.

Employment responsibilities may also interfere with scholastic achievement. Working more than 20 hours a week has been negatively associated with young peoples' school performances (Staff & Schulenberg, 2010). However, another study showed that part-time students employed full-time had higher GPAs than full-time students employed part-time (McKenzie & Schweitzer, 2001). This study suggested that some students enrolled part-time may be motivated toward higher academic achievement. Therefore, when assessing the effects of EF and ToM on academic adjustment, one should control for participants' employment status, number of hours worked, and part-time status, while being a university student.

Employment Adjustment. When assessing employment functioning, it would be important to control for one's self-declared ability to work. While university students with significant financial needs are often forced to work, other students declaring they cannot work decide to forgo work opportunities to focus on their studies (Hall, 2010).

In assessing employment adjustment, it would also be important to control for one's type of work experience, distinguishing between paid work and volunteer work history. While relevant paid work experience is considered an asset to employability among future university graduates, volunteer work experience is only considered so under limited circumstances (Sagen, Dallam, & Laverty, 2000). Hours worked per week were also logically assumed to positively influence one's work adjustment skills.

Romantic Adjustment. Several romantic relationship characteristics were considered as potential covariates. These included one's current and past year level of commitment, number of partners, weekly time and frequency spent with one's partner, average relationship length, and relationship status. It is not difficult to see how any one of these variables may influence positive relationship qualities or dating aggression. For example, empirical findings show a negative association between dating aggression and relationship intimacy (Gaertner & Foshee, 1999; Slotter et al, 2012). However, findings are mixed on this topic as greater relationship length or commitment has also been associated with *increased* relationship aggression (Brown & Bulanda, 2008; Mason & Smithey, 2012). Number of dating partners has also been positively associated with aggressive bullying behaviour (Farell & Vaillancourt, 2019). Sexual orientation may be associated with romantic adjustment, in that non-heterosexual youth report more anxieties about romantic relationships than heterosexual youth (Diamond & Lucas, 2004).

Gender and Dating Aggression. Finally, gender receives special mention as a potential covariate for dating aggression. A recent meta-analysis found consistent gender-differences in various forms of dating aggression perpetration among young people (Wincentak et al., 2017).

Spill-over Effects Between Social Adjustment Domains. Given the interrelated nature of domains of social adjustment (McCormick et al., 2011; Shulman, Laursen, & Dickson, 2014), spill-over effects from covariates from one domain to another were considered. One's relationship status was considered to relate to peer social functioning, in that it may pose as a competitive alternative to connecting with the peer group. According to romantic development theory time spent connecting with the peer group occurs at the expense of time connecting with an intimate committed partner (Brown, 1999; Connolly & Goldberg, 1999). Excessive hours at work have also been found to negatively associate with healthy social activities with peers

(Safron, Schulenberg, & Bachman, 2001), and these excessive hours at work may also interfere with one's academic adjustment (Staff et al., 2010). A growing literature of work-family spill-over effects documents the influence of work-related covariates on family life. In the context of emerging adults, this is comparable to negative work experiences interfering with romantic relationship qualities and vice-versa (Shulman et al., 2014). Applied to the current study, examples may include excessive hours at work interfering with a romantic relationship, or one's romantic relationship status influencing their work adjustment.

3.2 Current Study

The goal of the current study was to use SEM to model emerging adult social adjustment variables on EF and ToM. One benefit of SEM is the ability to find diverse but highly correlated measures assessing a particular construct, to indicate a single latent variable for that construct. The latent variables also overcome measurement limitations by reducing measurement error (Ullman & Bentler, 2012). As reviewed in Study 1, low correlations between many popular adult ToM measures have made ToM difficult to study for some researchers (McCormick et al., 2011; Warnell & Redcay, 2019). It was hoped that these two features of SEM would help overcome difficulties measuring ToM, and difficulties associating it with either EF or social adjustment outcomes, as indicated by Social Information Processing Theory (e.g., Crick & Dodge, 1994). Popular clinical measures of EF such as the Behaviour Rating Inventory of Executive Function (BRIEF, Roth & Gioia, 2005) are better interpreted as measures of EF difficulties, or executive dysfunction (EDF). The current study will therefore switch from focusing on EF to EDF.

Current Model

In social information processing models, inhibitory EDF interferes with access to ToM. However, ToM is needed in concert with a range of executive functions to guide healthy social

interactions (Crick & Dodge, 1994; Pérez-Edgar, 2002). Therefore, a mediation model of social adjustment is indicated with inhibitory or self-regulation, or emotional-regulation EDF as predictor and ToM as mediator. There should be a more direct association between ToM and social adjustment, than between EDF and social adjustment. Such a hypothesis is in line with the “emergence account” of EF and ToM development, in which the latter develops from the former (see Devine & Hughes, 2014 for meta-analysis; Marcovitch et al., 2015; Razza & Blair, 2009). Moreover, according to multi-level neuropsychological models of social adjustment (Yeates et al., 2007), biopsychosocial developmental-contextual variables need to be added to a model of the effects of EF or ToM on social adjustment (Yeates et al., 2007). Brain integrity and the effects of one’s immediate family environment on their mental health can affect EF (Matthews & Wells, 1999; Mogg & Bradely, 1999; Yeates et al., 2007). A model of social adjustment must therefore include these factors as well, in addition to appropriate covariates. Given the target population is emerging adults, effects on social adjustment variables salient to emerging adults, such as occupational and romantic adjustment (McCormick et al., 2011), should be stronger than effects on social adjustment variables salient at earlier developmental stages, such as peer social adjustment. However, different domains of social adjustment should be correlated with one another.

This line of reasoning has led to the following research questions and hypotheses:

3.2.1 Questions

1. Does EDF negatively predict peer, occupational, and romantic social adjustment among emerging adults?
 - a. Does a latent variable based on survey measures of self- or emotional regulation difficulties predict peer, occupational, and romantic adjustment?

- b. Does a latent variable based on performance measures of cognitive flexibility and inhibition predict occupational adjustment in the form of either academic or employment adjustment?
2. Is latent ToM able to overcome the measurement issues seen in non-SEM studies, to predict social adjustment variables among emerging adults?
3. Do latent survey-based EDF and latent performance-based EDF predict latent ToM?
4. Does a mediational model involving latent self-reported EDF as predictor and latent ToM as mediator account for variation in social adjustment outcomes?
5. Are these associations stronger for advanced social adjustment tasks salient in emerging adulthood, namely occupational and romantic adjustment, than for peer social adjustment salient at prior developmental stages?
6. Do the peer, occupational, and romantic social adjustment variables covary with one another?
7. Does family functioning predict EDF?
8. Can any link between family functioning and EDF be explained through anxiety mediating the association between family functioning and EDF?
9. Does brain injury status predict EDF and ToM?
10. Do these associations hold over and above important covariates?

3.2.2 Hypotheses (See Figure 4)

1. Latent EDF should negatively predict emerging adult peer, occupational, and romantic adjustment (the social adjustment variables).
 - a. Survey-based latent EDF based on self- or emotional-regulation difficulties, should negatively predict peer, occupational, and romantic adjustment.

- b. Performance-based latent EDF should negatively predict academic and employment occupational adjustment.
- 2. Latent ToM should contribute to a strong measurement model, and should positively predict the social adjustment variables.
- 3. Latent survey-EDF or latent performance-EDF should negatively predict latent ToM.
- 4. Latent ToM should mediate the associations between latent survey-based EDF, or latent performance-based EDF, and the social adjustment variables.
- 5. These associations should be stronger for advanced developmental tasks salient in emerging adulthood such as occupational and romantic adjustment, than for social adjustment tasks salient at prior developmental stages, such as peer adjustment.
- 6. Peer, academic, employment, positive relationship, and dating aggression adjustment variables should covary with one another.
- 7. Family functioning should negatively predict latent survey-based EDF.
- 8. The association between family functioning and latent survey-based EDF should be mediated by increased emotional stress.
- 9. Brain injury status based on a head injury or a neurodevelopmental disorder such as ADHD, should positively predict all forms of EDF and negatively predict ToM.
- 10. These associations should apply over and above associations between important covariates and the social adjustment outcomes.

3.3 Methods

3.3.1 Participants

A total of 302 emerging adults from York university's research participant pool were recruited to complete measures of the aforementioned variables. This sample size fell within the

parameters of a power analysis. Such an analysis based on the number of model variables suggested recruiting a minimum of 232 participants. A maximum of 483 participants was indicated when using the model degrees of freedom for the analysis. Participants aged 18 to 29 were included in the final sample in keeping with the defined age range for emerging adults (Arnett, 2004). Another 14 emerging adult participants with reported histories of head injuries were recruited by posters placed around the athletic centres and psychology building on campus. One friend of a participant recruited from the university research participant pool also completed the study measures.

Final Sample

The final sample consisted of 295 participants aged 18 to 29 ($M_{\text{age}} = 20.22$, $SD = 2.39$). There were 75 men (26.6%, $M_{\text{age}} = 21.16$, $SD = 3.018$) and 220 women (73.4%, $M_{\text{age}} = 19.90$, $SD = 2.048$). The sample was ethnically diverse consisting of 65 participants identifying as White (22.0%), 41 as Black (13.9%), 39 as East Asian (13.2%), 81 as South-Asian (27.5%), seven as Latin American (2.4%), and 62 by a heterogenous mix of other ethnocultural identifications (21.0%). A total of 262 participants identified as heterosexual (88.1%), while 23 identified by another sexual orientation (7.8%). Two participants identified as transgendered: one as a “trans man” and the other as “Female/Genderqueer/Gender non-conforming/LGBTQ2”.

There were 15 participants reporting a history of head injury (5.08%), nine with ADHD (2.8%), and 4 with an unspecified neurological condition (1.4%). All participants (100%) were students at the same university. There were 266 participants (90.2%) studying full time, and 184 who were employed (62.3%). Single participants numbered 147 (49.8%), while those currently in a relationship or those having been in one within the past two months, numbered 132 (44.7%). See Tables 2-5 for complete sample descriptives.

Table 2

Continuous Age, Study, Work, and Dating Characteristics

Variable	Mean	Standard Deviation	Range
Age	20.22	2.39	18-29
No. Curr. Courses	3.52	2.24	0-15
No. Jobs last 4 Yrs	2.40	1.65	0-10
Rel Length weeks	85.78	83.44	2-469
Hrs together/wk	28.21	30.92	0.13-168
No. Past yr prttnrs	1.02	1.4	0-20
No. Life prttnrs	2.038	2.56	0-26

Table 3

Demographic and Mental Health Participant Descriptives

Variable	n(%)	Percentage
Gender		
Men	75	25.4
Women	218	73.9
Other	2	0.6
Sexual Orientatio.		
Hetero.	262	88.8
Other	23	7.8
Ethnicity		
White	65	22.0
Black	41	13.9
East Asian	39	13.2
S. Asian	81	27.5
Other	60	20.3
Disorders		
Anxiety	39	13.2
Depression	29	9.8
Visually	4	1.4
Imp		
ABI	14	4.7
ADHD	9	2.83
Other	4	1.4
neuro		

Note. Missing data not entered.

Table 4

Study and Work Status and Experience

University Status			
Part-time	28		9.5%
Full-time	266		90.2%
Work ability			
Yes	259		87.8%
No	35		11.9%
Job Status			
Emp.	184		62.3%
Not emp.	108		36.6%
Hours worked/wk			
5-14	84		28.5%
15-24	59		20.0%
25-34	29		9.8%
35+	13		4.4%
Type of Work Experience			
Paid	225		76.3%
Volunt.	45		15.3%

Note. Missing data not entered.

Table 5

Relationship Characteristics

Relationship Status			
Single	147		49.8%
Involved (or broken up < 2 months)	132		44.7%
Lifetime Relationship Status			
Never	63		21.4%
Yes	231		78.3%
Motivated for a Relationship			
No	50		16.9%
Yes	234		79.3%

Satisfied w.			
Dating Status			
No/little	63		21.4%
Smwt/Very	217		73.5%
Current Dating			
Commitment			
Group	5		1.7%
Casual	23		7.8%
Committed	54		18.3%
Engaged	29		9.8%
Marr/coh	11		3.7%
Past Y. Highest			
Dating Commitment			
Rarely	21		7.1%
Group	33		11.1%
Casual	25		8.5%
Excl.	128		43.4%
Engag.	60		20.3%
Marr/coh	19		6.4%

Note. Missing data not entered.

3.3.2 Measures

Participants completed survey measures of inhibition and emotional regulation to assess self- and emotional regulation EDF, and a performance measure of cognitive flexibility and inhibition to assess performance-based EDF. To assess ToM, they completed performance measures of social cue recognition from stories and eye expressions, as well as a survey measure of perspective-taking. They completed measures of peer social functioning in general settings, as well as in campus and work settings, to assess peer social adjustment. To assess academic occupational adjustment, they completed a measure of academic satisfaction and self-reported their cumulative grade point average (CGPA). To assess their work occupational adjustment, they completed a measure of work task performance. Romantic adjustment was assessed through measures of positive relationship qualities and dating aggression.

Covariates

The Background Questionnaire (BQ) Measure of Demographics, Mental Health Status, and Academic and Work Characteristics. In this questionnaire, participants provided self-reported demographics information such as age, gender, ethnicity, and sexual orientation. They also indicated their educational and employment status, number of courses at university, number of hours spent working per week, employment, and employment termination characteristics and history. They also indicated their health status for psychiatric, neurological, and neurodevelopmental disorders, including for acquired brain injury, and ADHD. An example item was “What is your educational status (please circle one)?”. The Background Questionnaire contained 13 items with no subscales. Response options differed for each question. Questions were scored individually.

The Dating Questionnaire (Connolly, Craig, Goldberg, & Pepler, 2004) Measure of Relationship Characteristics. The main scale of this measure assesses one’s self-reported level of romantic commitment and development. It contains nine items assessing dating activities over the past year. For example, one item is “I had a boy/girlfriend and I only dated him/her”. Each item is rated *false* or *true*. For the current study, participants are given one final score commensurate with the highest level of romantic commitment they reached (i.e., rated *true*) over the past year. Response options were 1-*rarely participated in dating activities*, 2-*went on heterosexual excursions with members of both sexes*, 3-*went on romantic dates but with groups of people*, 4-*dated more than one person casually*, 5-*engaged in exclusive but casual dating*, 6-*dated only a boy/girlfriend*; 7-*was in a serious relationship*, 8-*was engaged*, and 9- *was married or cohabiting*. Another single item asked participants for their current level of commitment and

dating activities. Response options for the single item were similar as for the past year scale. Higher scores on these two variables represented greater romantic commitment.

Participants were also given a number of single items assessing other relationship characteristics. These included categorical questions on their current dating status and dating motivation. These also included quantitative questions on their dating status satisfaction, length of current relationship, how many people they dated over the past year, how many people they dated over the course of their lives, how often per week they saw a romantic partner, and how many hours per week they spent with a romantic partner. The dating status satisfaction question was “How happy are you with your current dating status” and response options ranged from 1-*not at all*, to 4-*very happy*. A categorical lifetime dating status variable was created by awarding participants 0 for never having dated, and 1 for having dated before.

Independent Variables

Neurological Status. Single items were used to assess participants’ neurological status. They were asked three respective questions on whether they had been diagnosed with an acquired brain injury (ABI), ADHD, or an unspecified other neurological condition. In addition to considering the variables separately, a combined variable of neurological insult was created encompassing whether someone had been diagnosed with an ABI, ADHD, or another neurological condition.

Family Functioning. *The McMaster Family Assessment Device General Functioning Subscale - Short Version (FAD; Boterhoven de Haan et al., 2015; Epstein, Baldwin, Bishop, 1983).* The short 6-item General Functioning subscale of the FAD is a self-report measure of family functioning. Response options range from 1-*Strongly Agree* to 5-*Strongly Disagree*. An example item is “In time of crisis we can turn to each other for support”. Final scores are

averages which range from 1 to 5. Higher scores represent greater family functioning. The test-retest reliability of the overall FAD is adequate. It demonstrated good convergent validity correlating with other family functioning measures. It demonstrated good divergent validity correlating poorly with social desirability. It demonstrated good criterion validity predicting clinician-ratings of family health (Miller, Epstein, Bishop, & Keitner, 1985). The short version of the General Functioning Subscale also shows comparable reliability and validity (Botelho et al., 2015). Internal consistency of this measure in the current sample was very good, $\alpha = .89$.

Chronic Anxiety. *The Trier Inventory for Chronic Stress – English version (TICS; Schulz & Schlotz, 1999)*. TICS is a standardized measure of chronic stress adapted from the German language. Of interest is the Chronic Worrying subscale containing four items. Internal consistency for this subscale has ranged from .87 to .88. Scoring comprises averaging over the four items (Ceccato et al., 2018). An example item is “Sometimes I am consumed by my worries”. Response options range from 1-*Strongly Disagree* to 5-*Strongly Agree* with final scores ranging from 1 to 5 and higher scores representing greater chronic anxiety. Petrowski, Paul, Albani, and Brähler (2012), demonstrated good internal consistency, construct validity and predictive validity of the overall scale. The internal consistency for the current sample was very good, $\alpha = .91$.

Survey-Based EDF. *Behaviour Rating Inventory of Executive Function-Adult Version - Inhibition and Emotional Regulation Subscales (BRIEF; Roth & Gioia, 2005), Measures of Self-reported EF*. The BRIEF is a self-report questionnaire measuring adults’ executive functioning difficulties in everyday settings. It was developed from norming samples of adults in clinical and general populations. Of particular interest to the current study were the Inhibition and Emotional Regulation subscales of the Behavioural Regulation Index, assessing self- and

emotional regulation difficulties, respectively. An example item from the Inhibition subscale is “I have problems waiting my turn”. Response options are 1-*Never*, 2-*Sometimes*, and 3-*Often*. Scores for each scale were obtained by averaging the responses across each scale’s items. Therefore, final scores ranged from 1 to 3 with higher scores representing greater EF difficulties. The overall scale showed strong psychometrics with internal consistency estimates ranging from .73 to .98 in normative self-report form samples. Test-retest reliability estimates for the self-report form ranged from .82 to .94. The BRIEF displayed strong construct validity with a rate of 35% to 98% agreement on the belonging of each item to each scale. It also showed strong convergent and divergent validity with other measures of executive functioning (Roth & Gioia, 2005). In the current study, internal consistency estimates were acceptable to very good, namely $\alpha = .69$ for the inhibition scale, and $\alpha = .87$ for the emotional regulation scale.

Performance-Based EDF. *Color-Word Interference Test (CWIT; Delis, 2001) Measure of Performance-based EDF, Inhibition and Inhibition-switching Trials.* The CWIT is an individually-administered performance-based measure of inhibition, selective attention, and cognitive flexibility from the Delis–Kaplan Executive Function System (D-KEFS). It operates through measurement of the Stroop effect. The Stroop effect is measured when one sees words of colours printed in contrasting colour ink (e.g., if the word “blue” was printed in red ink), where the goal is to inhibit reading the word while selectively attending to and naming the colour in which the ink is printed (e.g., “red” in the just mentioned example). This illustrates the Inhibition Trial, which is contrasted against two control trials in which participants simply reads words all printed in black ink, or name patches of colors, respectively. In the Switching-Inhibition trial, participants switch between reading words of colours, and inhibiting automatized reading to name ink colors. In keeping with the D-KEFS manual, inhibition scores were computed by

subtracting the color-naming trial completion time from the inhibition trial completion time. Cognitive flexibility was computed by subtracting the Inhibition completion time from the Switching-Inhibition completion time (Delis, 2001; pp. 98-104). An inhibition error variable was computed by adding the self-corrected and uncorrected errors made during the Inhibition trial. Similarly, a cognitive flexibility error variable was computed by adding the self-corrected and uncorrected errors made during the Inhibition-Switching trial. Higher completion time and error scores represent greater inhibition, and cognitive flexibility difficulties. The CWIT shows strong internal consistency metrics, ranging from .75 to .86 for adults (Delis, 2001, p. 28), and good construct validity with good intercorrelations between trials (Delis, 2001, p. 66). Internal consistency between the four trials for the current study was acceptable, $\alpha = .72$.

ToM. *Reading the Mind in the Eyes Test-Revised (RMET; Baron-Cohen, Wheelwright, Hill, & Plumb, 2001) Measure of Social Cue Recognition From Eye Expressions.* This popular experimental measure is considered by its authors to be an advanced test of ToM. Respondents are asked to interpret 36 different eye-expressions, each presented individually, and to identify the mental state behind the target eye-expression from a choice of four descriptors (e.g., cautious, fantasizing, preoccupied, incredulous). Each item is presented in series and marked correct or incorrect. A glossary of possible responses is available to reduce the impact of verbal fluency and vocabulary. Scores range from 0 to 36 and higher scores reflect more developed ToM. Most studies find it has good convergent validity with other ToM tests such as the Strange Stories and Faux Pas tests, and good test-retest reliability (Olderbak et al., 2015). However, it is most valid as a measure of affective ToM, or the ability to interpret emotional expressions to infer mental states (Vellante et al., 2013).

Social Stories Questionnaire (SSQ; Lawson, Baron-Cohen, & Wheelwright, 2004)

Measure of Social Cue Recognition From Story Characters. The SSQ is a written vignette questionnaire test featuring 10 stories. It assesses participants' understanding of social cues present in conversational dialogue. The 10 stories are separated into three sections each for a total of 30 sections, with at least four pieces of dialogue within each of the 30 sections. Among the 30 sections are 10 containing an obvious faux-pas amidst the dialogue, 10 containing a more subtle faux-pas, and 10 containing no faux-pas. An example of part of an obvious faux-pas dialogue is "You should try looking where you're going you stupid cow". Participants were tasked with indicating whether or not each section contained a faux-pas, and if so, to identify which one of the parts of dialogue contained the faux-pas. Scores were the number of the 20 faux-pas that were correctly identified. Higher scores indicated greater ToM. Interrater reliability was demonstrated when a group of six judges, including men and women, agreed unanimously on which pieces of dialogue contained obvious or subtle faux-pas. This measure also demonstrated good concurrent criterion validity, in that scores differentiated between groups of adults with and without an ASD, a disorder characterized by some as a ToM disorder (Lawson et al., 2004). Internal consistency across all 30 items in the current sample was acceptable, $\alpha = .74$.

Interpersonal Reactivity Index - Perspective Taking Subscale (IRI-PT; Davis, 1980)

Measure of Perspective Taking. The IRI is a measure of empathy consisting of the four subscales perspective-taking, empathic concern, fantasy, and personal distress. The focus of the current study is on the perspective-taking subscale which contains five items. An example item is "I sometimes try to understand my friends better by imagining how things look from their perspective". Item responses ranged from 1-*does not describe me well* to 5-*describes me very well*. Final scores were mean scores ranging from 1 to 5 with higher scores representing greater

perspective-taking ability. The IRI has shown good internal consistency and test-retest reliability (Fernández Dufey, & Kramp, 2011). It also shows strong construct validity with good intercorrelations between subscales and convergent validity (Fernández et al., 2011). The perspective taking subscale demonstrates good convergent validity with a number of empathy scales (Davis, 1983; Jolliffe & Farrington, 2006; Melchers, Montag, Markett, & Reuter, 2015). In the current study it showed acceptable internal consistency, $\alpha = .74$.

Dependent Variables

Peer Adjustment. *Behavioural Assessment System for Children, 3rd Edition – Self-Report of Personality (BASC-3)-Interpersonal Relations Items From Adolescent and College Forms (Reynolds & Kamphaus, 2015) Measure of Peer Adjustment Difficulties.* The BASC-3 SRP Interpersonal Relations items assess participants' perceptions of their own level of social skill important for interacting with peers and making friends. The adolescent form is appropriate for youth aged 12 to 21, whereas the college form is appropriate for college students/youth aged 18 to 25. Given the overlap of both forms for participants aged 18 to 21, the current study included the six items common to the adolescent and college forms. These were three true or false questions, and five questions rated on a 4-point Likert scale ranging from *Never* to *Almost Always*. An example item is "I feel that nobody likes me". Participants were awarded 0 points for *False*, or 1 for *True*. They were awarded 0, 1, 2, and 3 points for *Never*, *Sometimes*, *Often*, and *Always*, respectively. Three items required reverse-scoring, for example "I am liked by others". The points were summed for a raw score and ranged from 0 to 14. Higher scores indicated more social peer difficulties. The BASC-3 demonstrates good internal consistency and test-retest reliability estimates in the literature. It also demonstrates strong construct validity, and convergent validity with a number of other prominent socioemotional functioning measures

(Reynolds & Kamphaus, 2015). In the current sample, Cronbach's alpha was poor, $\alpha = .54$.

When the three true or false items were assessed separately from the four 4-point Likert questions, internal consistency remained poor for the three items, $\alpha = .50$, but was very good for the Likert questions, $\alpha = .80$. However, to remain consistent with the original BASC-3 questions, all of these items were included.

Social Functioning Scale (SFS; Birchwood, Smith, Cochrane, Wetton, & Copestake, 1990) Measure of Peer Adjustment Functioning. The social functioning scale is a self-report questionnaire used to measure social adjustment among healthy or psychiatric populations of young adults. Two subscales were included to assess peer social adjustment. Two of these were the social engagement/withdrawal (i.e., frequency of time spent alone, frequency of initiating conversations at home, social avoidance), and interpersonal functioning (i.e., number of friends, quality of communication) subscales. Together they comprised nine items scored individually with varying response options. Lower scores represent greater peer adjustment difficulties. The SFS shows good internal consistency and interrater reliability ranging from .82 to .96. It also showed good concurrent validity in that people with schizophrenia (a disorder affecting social functioning) significantly differed on all scales from typically-developing individuals. The SFS full scale also correlated with positive and negative schizophrenia symptoms further demonstrating validity (Birchwood et al., 1990).

Student Adaptation to College Questionnaire – Social Adjustment Scale (SACQ-Social; Baker & Siryk, 1999), Measure of Peer Adjustment in Academic Settings. The SACQ Social Adjustment scale is a self-report measure of social adjustment at university. It contains 10 items. An example item is “I am very involved with college social activities”. Response options range from 1-*Strongly Disagree* to 5-*Strongly Agree*. Final scores were averages of the subscale items,

after certain items were appropriately reverse-scored. Final scores ranged from one to five, with higher scores representing greater social peer adjustment in college/university settings. The measure has demonstrated good criterion validity predicting college retention (Credé & Niehorster, 2012). Given that college adjustment develops over time, assessments of reliability are stronger in terms of internal consistency than in terms of test-retest reliability. Cronbach alphas of .89 have been reported (Taylor & Pastor, 2007). The reliability of this subscale in the current sample was $\alpha = .86$.

Work Personality Profile-Self Report – Social Skills Subscale (WPP-Social; Bolton & Roessler, 1986) Measure of Peer Adjustment in Employment Settings. The Social Skills subscale of the WPP-SR is a self-report measure of social skills with coworkers at the workplace. The scale contains 12 items. Participants are asked to rate themselves on a number of skills. An example from one item is the skill of being “supportive of others in group tasks”. Response options range from 1- *A problem area, will definitely limit my chance for employment* to 4- *A definite strength, an employability asset*. Scores were averages of ratings across all the items, with higher scores representing greater social skills contributing to work achievement and maintenance of employment. Internal consistency was .89 for the social skills subscale (p. 11, Bolton & Roessler, 1986). Interrater reliability between employers and employees across all five subscales ranged from .75 to .93 for the strong readers test group (p. 11, Bolton & Roessler, 1986), contributing to good construct validity. In the current sample, internal consistency was very good, $\alpha = .88$.

Academic Occupational Adjustment. Student Adaptation to College Questionnaire - Academic Adjustment Scale (SACQ-Academic; Baker & Siryk, 1999) Measure of Academic Adjustment. The Academic Adjustment Scale of the SACQ is a self-report measure of academic

satisfaction, and academic and study task performance. The subscale contains 13 items. An example item is “I am quite satisfied with my academic situation at university”. Response options range from 1-*Strongly Disagree* to 5-*Strongly Agree*. Final scores were averages of the subscale items, after certain items were appropriately reverse-scored. Final scores ranged from one to five, with higher scores representing greater academic adjustment. The measure has demonstrated good criterion validity predicting college retention (Credé & Niehorster, 2012). Cronbach alphas of .88 for the academic subscale have been reported (Taylor & Pastor, 2007). In the current sample Cronbach alpha was very good, $\alpha = .86$.

Cumulative Grade Point Average (CGPA). A single item was used to assess participants’ grades. They were asked on a scale of 0 to 9 to indicate their CGPA, with response options ranging from 0 - *A+* to 9 - *F*. This variable was subsequently reverse-scored so that higher scores indicated greater CGPA, for easier interpretation.

Employment Occupational Adjustment. Work Personality Profile-Self Report – Task Orientation Subscale (WPP-Task; Bolton & Roessler, 1986) Measure of Employment Adjustment. The WPP-SR Task Orientation subscale is a 21 item self-report measure of cognitive skills and work habits contributing to work adjustment. Participants are asked to rate themselves on a number of skills. An example of a skill from one of the items is “Learns new assignments quickly”. Response options ranged from 1- *A problem area, will definitely limit my chance for employment* to 4- *A definite strength, an employability asset*. Scores were averages of the items within the subscale. Internal consistency was .93 for the task orientation subscale for a strong readers test group (p. 11, Bolton & Roessler, 1986). Interrater reliability between employers and employees across all five subscales ranged from .75 to .93 for the strong readers

test group (p. 11, Bolton & Roessler, 1986), contributing to good construct validity. In the current sample, Cronbach's alpha was very good, $\alpha = .90$.

Positive Romantic Adjustment. *Network of Relationships Inventory - Positive Qualities Subscale (NRI; Furman & Burmester, 1985) Measure of Positive Relationship Qualities.* The nine items of this subscale measure youths' level of companionship, commitment, and interpersonal disclosure in their relationship (e.g., "I tell my boy/girlfriend everything."). Responses range from 1-*Never* to 5-*Always*. Furman and Buhrmester (1985) report excellent subscale validity, internal consistency, and test-retest reliability. Averages of the items comprised final scores ranging from 1 to 5, with higher scores representing greater positive relationship qualities. In the current sample, internal consistency was very good, $\alpha = .92$.

Dating Aggression Perpetration Romantic Adjustment. *Conflict in Adolescent Dating Relationships Inventory-Short (CADRI-S; Fernández-González, Wekerle, & Goldstein, 2012; Wolfe et al., 2001) Measure of Dating Aggression Perpetration.* The CADRI-S is a self-report measure of physical (P), relational (R), emotional (E), threatening (T), and sexual abuse perpetration and victimization in romantic relationships, assessed through five respective subscales. Of interest in the current study were only the physical, relational, emotional, and threatening subscales and perpetrating items in keeping with the more consistent effects of self- and emotional regulation on emerging adults' physical and psychological dating aggression perpetration. Fernández-González et al. (2012) examined the factor analysis of the original CADRI (Wolfe et al., 2001) and made suggestions for a shortened version. Eight of the 10 perpetration versions of the items from the shorter version were used in the current study. These corresponded to the shortened physical, verbal, relational, and emotional subscales. Each subscale contained two items. As with the full version, the shorter version also demonstrated

good reliability and validity (Fernandez et al., 2012). An example item is “I threatened to hurt my partner”. Participants rated each question on a 4-point Likert scale with response options ranging from 0-*Never* to 3-*Often*. Scores are averages ranging from 0 to 3, with higher scores indicating difficulties regulating emotion and behaviour in romantic relationships. Internal consistency was acceptable for the current sample, $\alpha = .66$.

3.3.3 Procedure

Advertisements for the study were posted on the York University Research Participant Pool website. Participants completed the aforementioned battery in the Desrocher laboratory. Up to three participants arrived at a time and were seated at private desks. This writer, or one of two undergraduate assessors took approximately one hour to administer the battery to each set of participants. Participants were presented with the Background Questionnaire, BRIEF, RMET, then SSQ. The remainder of the questionnaires came next, presented in the order of: PT, SFS, BASC-3, SACQ, WPP-SR, DQ, NRI, CADRI, FAD, then TICS. The assessor administered the CWIT to each participant at variable times throughout the administration hour. Varying the order in which the CWIT was administered within the battery allowed for counterbalanced effects of other measures on performance on this test. However, to avoid fatigue on completing key study variables, these were placed at the beginning of the battery, consistently in the order just specified, for each participant.

3.3.4 Analyses

Measurement Model

Measurement and structural models were specified using AMOS-version 26. BRIEF-Inhibit and BRIEF-Emotion were regressed onto latent survey-based EDF. Scores from the CWIT Inhibit and Cognitive Flexibility trials, as well as the error scores from each of these trials,

were regressed onto latent Performance-based EDF. Scores from the RMET, SSQ, and PT were regressed onto latent ToM. The reversed BASC-3, as well as SFS, SACQ-Social, and WPP-Social, were regressed onto latent peer adjustment. Latent academic functioning was indicated by SACQ-Academic and CGPA. Employment adjustment was indicated by the single indicator, WPP-Task. In keeping with the literature, positive relationship qualities, and dating aggression remained separate variables. Because the NRI is a single scale, it was used as an indicator for positive relationship qualities. However, latent dating aggression was indicated by the four separate subscales of the CADRI. See Figure 3.

Structural Model

Regression coefficients were calculated for respective peer, academic, employment, positive relationship qualities, and dating aggression adjustment regressions onto latent survey-EDF and latent ToM as per the specified model. Academic and employment adjustment were regressed onto latent performance-EDF. Latent ToM was regressed onto latent survey-EDF, as well as latent performance-EDF. The model also included EDF regressed onto chronic anxiety and family functioning, and chronic anxiety regressed onto family functioning. Survey-EDF and ToM were regressed onto neurological status. The five social adjustment variables were allowed to covary, as was survey-EDF with performance-EDF. See Figure 4.

After data screening and preparation, the study variables were analyzed for covariates that were associated to both an EDF or ToM independent variable, and a social adjustment dependent variable. Such variables were covaried with the independent variable in question, in their prediction of the particular dependent variable.

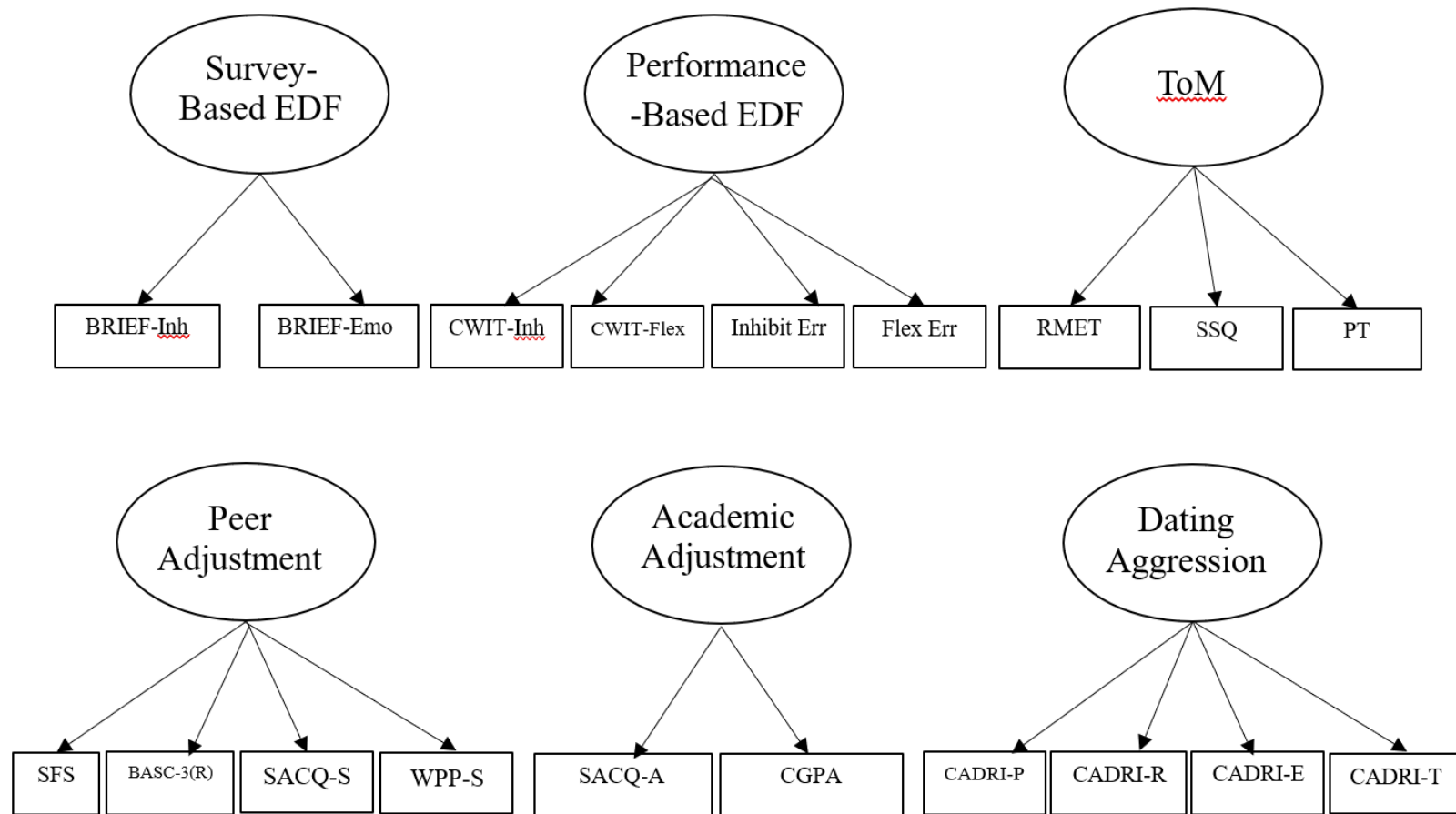
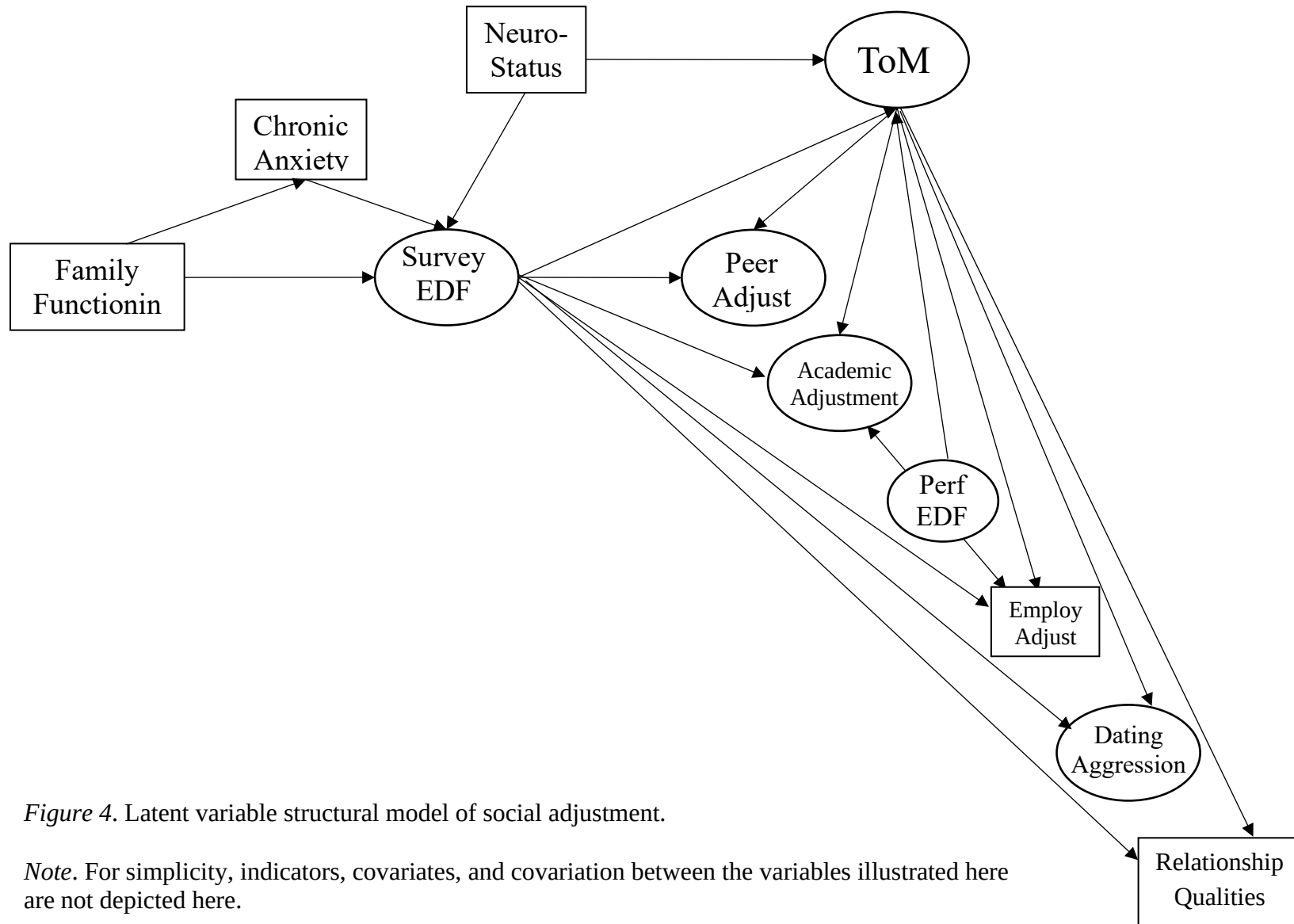


Figure 3. Measurement model. Only latent variables depicted here.

Note. R = reversed.



3.4 Results

3.4.1 Data Screening and Preparation

Missing Data

Individuals who attempted at least two items on any questionnaire were attributed a final score for that variable. Only individuals who attempted the RMET or SSQ ToM tasks by completing at least one item, received a final score for those measures. Participants indicating they had not had a romantic partner within the last year, were asked not to complete the positive relationship qualities or dating aggression measures. If they did, data on these measures for those participants were excluded.

A small subsample of 14 individuals with a history of head injury completed several study measures. They were recruited to take part in qualitative interviews for another chapter within this dissertation. Due to time-constraints, they only completed a portion of the measures other participants had completed. These were the background questionnaire (BQ), survey-based and performance-based measures of EDF (BRIEF and CWIT), the measure of social cue recognition from eye-expressions (RMET), the perspective taking measure (PT), all the peer adjustment measures (BASC-3, SFS, SACQ-Social, WPP-Social), the measure of academic adjustment (SACQ-Academic), and the CGPA and relationship characteristics questions included in the BQ. A 15th participant with a history of head injury completed the CWIT, but did not return their study measure questionnaires.

Little's Test of Data Missing At Random (1988) was used to assess the overall likelihood that data across the study measure items were missing in any systematic way. The test confirmed that data could not be shown to be missing systematically, $\chi^2(33, 693) = 33, 206.31, p = .97$.

3.4.2 Preliminary Analyses

3.4.3 Descriptives

Study Variable Descriptives

Descriptives for the study variables are reported in Table 6.

Table 6

Study Variable Descriptives

Study Variable	Mean	SD	Range
Psychosocial risk factors			
Family functioning (FAD)	3.066	.61	1 - 4
Chronic anxiety (TICS)	3.30	1.02	1 - 5
EDF			
Self-regulation EDF (BRIEF-Inhibit)	1.72	0.37	1 - 2.88
Emotional-regulation EDF (BRIEF-Emotion)	1.79	0.47	1 - 2.9
Performance-based inhibition EDF (CWIT-Inhibit)	19.81	9.78	-8 - 100
Performance-based flexibility EDF (CWIT-Flexibility)	6.67	11.74	-58 - 50
Performance-based inhibition errors (Inhibition errors)	1.83	2.61	0 - 25
Performance-based flexibility errors (Flexibility errors)	2.53	2.45	0 - 12
ToM			
Social-cue recognition from eye-expressions (RMET)	24.85	4.96	6 - 34
Social-cue recognition from story characters (SSQ)	6.25	3.42	0 - 16
Perspective taking (PT)	3.70	0.62	1.57 - 5
Peer adjustment			
Peer adjustment difficulties (BASC-3)	16.24	2.51	12 - 24
Peer adjustment functioning (SFS)	25.38	2.89	14 - 31
Peer adjustment in academic settings (SACQ-Social)	2.99	0.77	1 - 5
Peer adjustment in employment settings (WPP-Social)	3.35	0.50	1 - 4
Occupational academic adjustment			
Academic adjustment (SACQ-Academic)	3.14	0.62	1.47 - 4.73
CGPA	7.22	2.87	1 - 11
Occupational employment adjustment			
Employment adjustment (WPP-Task)	3.44	0.40	1.33 - 4
Positive romantic adjustment			
Positive relationship qualities (NRI)	3.98	0.77	1.78 - 5
Dating aggression romantic adjustment			
Physical dating aggression (CADRI-P)	1.07	0.24	1 - 2.5
Relational dating aggression (CADRI-R)	1.07	0.25	1 - 2.5
Emotional dating aggression (CADRI-E)	1.67	0.72	1 - 4
Threatening dating aggression (CADRI-T)	1.062	0.23	1 - 3

Group Analyses to Determine Suitable Covariates

Associations between candidate categorical covariates, and the cognitive or social adjustment variables were assessed using one-way ANOVA. Levene's test of equal variances was used to assess whether variances in the dependent variable were equal across levels of the independent variable. In cases of violations of equal variance, the Browne-Forsythe statistic was used as a robust test of group mean differences (B-F; Tomarken & Serlin, 1986). Described below are instances in which the same candidate covariate was associated with both a cognitive variable and a social adjustment variable. These candidate variables were used as covariates in the final model.

Gender. Analyses revealed that women ($M = 1.87$, $SD = 0.47$) had significantly higher scores in emotional-regulation difficulties than men ($M = 1.56$, $SD = 0.42$; $F(1, 292) = 26.48$, $p < .001$). Women also reported greater physical dating aggression perpetration ($M = 1.09$, $SD = 0.27$) than men ($M = 1.02$, $SD = 0.15$; $B-F(1, 138.21) = 4.20$, $p = .042$), and greater chronic anxiety ($M = 3.41$, $SD = 1.00$) than men ($M = 2.96$, $SD = 1.01$; $F(1, 275) = 9.88$, $p = .002$). Men had significantly higher scores in CGPA ($M = 7.88$, $SD = 2.29$) than women ($M = 6.99$, $SD = 3.02$; $B-F(1, 158.86) = 6.74$, $p = .010$).

Ethnicity. Participants identified as White had significantly higher scores in recognizing social cues from eye expressions ($M = 26.26$, $SD = 4.22$) than underrepresented participants not identifying as White ($M = 24.45$, $SD = 5.08$; $F(1, 292) = 6.94$, $p = .009$). White participants also scored higher in SFS peer adjustment functioning ($M = 26.49$, $SD = 2.35$) than participants from underrepresented groups ($M = 25.07$, $SD = 2.95$; $F(1, 287) = 12.40$, $p < .001$), were higher in peer adjustment in employment settings (WPP-Social; $M = 3.54$, $SD = 0.43$) than underrepresented participants ($M = 3.30$, $SD = 0.50$; $F(1, 279) = 10.869$, $p = .001$), were higher

in academic adjustment ($M = 3.31$, $SD = 0.66$) than underrepresented participants ($M = 3.09$, $SD = 0.60$; $F(1, 291) = 6.581$, $p = .011$), were higher in CGPA ($M = 8.20$, $SD = 2.49$) than underrepresented participants ($M = 6.95$, $SD = 2.92$; $F(1, 278) = 9.24$, $p = .003$), were higher in employment adjustment ($M = 3.61$, $SD = 0.31$) than underrepresented participants ($M = 3.39$, $SD = 0.41$; $B-F(1, 115.71) = 20.83$, $p < .001$), were higher in positive romantic relationship qualities ($M = 4.27$, $SD = 0.77$), than underrepresented participants ($M = 3.88$, $SD = 0.75$; $F(1, 191) = 9.90$, $p = .002$), and reported less physical dating violence ($M = 1.02$, $SD = 0.11$), than underrepresented participants ($M = 1.09$, $SD = 0.27$; $F(1, 164.73) = 4.72$, $p = .031$).

Sexual Orientation. Heterosexual individuals scored lower in self-regulation difficulties ($M = 1.70$, $SD = 0.37$) than underrepresented participants identifying as other than heterosexual or not identifying with their sex assigned at birth ($M = 1.91$, $SD = 0.31$); $F(1, 279) = 5.62$, $p = .018$). However, they scored lower in recognizing social cues from the eye-expressions ($M = 24.82$, $SD = 4.97$) than underrepresented participants ($M = 27.72$, $SD = 3.27$; $F(1, 278) = 5.93$, $p = .015$). Heterosexual individuals made more performance inhibition errors ($M = 20.03$, $SD = 10.01$) than underrepresented participants ($M = 14.89$, $SD = 6.52$; $F(1, 278) = 4.85$, $p = .028$). Underrepresented participants struggled more with peer adjustment difficulties ($M = 17.53$, $SD = 2.35$), than the heterosexual group ($M = 16.09$, $SD = 2.48$; $F(1, 264) = 17.76$, $p < .001$), scored lower in family functioning ($M = 2.68$, $SD = 0.67$) than the heterosexual group ($M = 3.10$, $SD = 0.61$; $F(1, 275) = 7.26$, $p = .007$), and reported greater chronic stress ($M = 3.96$, $SD = 0.67$) than the heterosexual group ($M = 3.28$, $SD = 1.02$; $B-F(1, 42.97) = 76.46$, $p < .001$).

Anxiety Disorder. Participants reporting an anxiety disorder scored higher in self-regulation difficulties ($M = 1.84$, $SD = 0.39$) than non-anxious participants ($M = 1.70$, $SD = 0.36$; $F(1, 293) = 4.62$, $p = .032$), and higher in emotion regulation difficulties ($M = 2.03$, $SD =$

0.48), than non-anxious participants ($M = 1.76$, $SD = 0.46$; $F(1, 293) = 11.74$, $p = .001$).

Participants reporting an anxiety disorder also scored higher in peer adjustment difficulties ($M = 17.71$, $SD = 2.90$) than other participants ($M = 16.03$, $SD = 2.38$; $F(1, 264) = 13.88$, $p < .001$), lower in family functioning ($M = 2.78$, $SD = 0.67$) than other participants ($M = 3.11$, $SD = 0.59$; $F(1, 275) = 9.75$, $p = .002$), and higher in chronic anxiety ($M = 4.06$, $SD = 0.94$) than other participants ($M = 3.18$, $SD = 0.98$; $F(1, 276) = 26.42$, $p < .001$).

Affective Disorder. Participants reporting depression or bipolar disorder scored higher in self-regulation difficulties ($M = 1.87$, $SD = 0.40$) than other participants ($M = 1.70$, $SD = 0.36$; $F(1, 293) = 5.52$, $p = .019$), higher in emotion regulation difficulties ($M = 2.11$, $SD = 0.55$) than other participants ($M = 1.76$, $SD = 0.45$; $F(1, 293) = 15.90$, $p < .001$), but higher in recognizing social cues from eye-expressions ($M = 27.50$, $SD = 4.48$) than other participants ($M = 24.57$, $SD = 4.93$; $F(1, 292) = 9.11$, $p = .003$), and higher in recognizing social cues from stories ($M = 7.69$, $SD = 3.32$) than other participants ($M = 6.11$, $SD = 3.40$; $F(1, 281) = 5.18$, $p = .024$). They also scored higher in peer adjustment difficulties ($M = 18.15$, $SD = 3.20$) than other participants ($M = 16.04$, $SD = 2.34$; $B-F(1, 27.97) = 10.78$, $p = .003$), and lower in peer adjustment in academic settings (SACQ-Social; $M = 2.71$, $SD = 0.86$) than other participants ($M = 3.02$, $SD = 0.76$; $F(1, 290) = 4.507$, $p = .035$). They also scored higher in emotional dating aggression perpetration ($M = 2.06$, $SD = 0.75$) than other participants ($M = 1.63$, $SD = 0.70$; $F(1, 173) = 5.56$, $p = .020$), and higher in chronic anxiety ($M = 4.31$, $SD = 0.57$), than other participants ($M = 3.19$, $SD = 0.99$; $B-F(1, 42.97) = 76.46$, $p < .001$).

University Full-time Status. Participants studying full-time scored higher on the RMET ($M = 25.05$, $SD = 4.79$) than part-time participants ($M = 22.85$, $SD = 6.10$; $F(1, 292) = 4.88$, $p =$

.028). However, part-time students perpetrated more physical dating violence ($M = 1.05$, $SD = 0.20$) than full-time students ($M = 1.29$, $SD = 0.44$; $F(1, 16.75) = 5.34$, $p = .034$).

Work Ability. Participants reporting the ability to work reported higher scores in perspective taking ($M = 3.73$, $SD = 0.62$), than other participants ($M = 3.50$, $SD = 0.60$; $F(1, 291) = 4.31$, $p = .039$), but performed worse on the performance cognitive flexibility task ($M = 7.17$, $SD = 11.90$), than other participants ($M = 2.86$, $SD = 10.04$; $F(1, 291) = 4.20$, $p = .041$). They also scored higher in peer adjustment in employment settings (WPP-Social; $M = 3.38$, $SD = 0.47$), than other participants ($M = 3.11$, $SD = 0.62$; $F(1, 278) = 8.27$, $p = .004$), and higher in employment functioning ($M = 3.47$) than other participants, ($M = 3.18$, $SD = 0.41$, $SD = 0.39$; $F(1, 278) = 14.71$, $p < .001$). Finally, they scored higher in emotional dating aggression perpetration ($M = 1.69$, $SD = 0.74$) than other participants ($M = 1.42$, $SD = 0.34$; $F(1, 22.23) = 5.69$, $p = .026$).

Paid Versus Volunteer Work. Participants predominantly volunteering reported fewer self-regulation difficulties ($M = 1.59$, $SD = 0.35$) than employed participants ($M = 1.75$, $SD = 0.37$; $F(1, 268) = 6.76$, $p = .010$). They also scored higher in academic functioning ($M = 3.30$, $SD = 0.48$) than employed participants ($M = 3.10$, $SD = 0.64$; $F(1, 266) = 3.94$, $p = .048$), worse in work functioning ($M = 3.33$, $SD = 0.49$) than employed participants ($M = 3.46$, $SD = 0.38$; $F(1, 268) = 4.22$, $p = .041$), lower in positive relationship qualities ($M = 3.63$, $SD = 0.94$) than employed participants ($M = 4.03$, $SD = 0.72$; $F(1, 184) = 6.11$, $p = .014$), and lower in emotional dating aggression perpetration ($M = 1.41$, $SD = 0.42$) than employed participants ($M = 1.71$, $SD = 0.75$; $B-F(1, 48.178) = 7.96$, $p = .007$).

Relationship Status

Participants in romantic relationships scored higher in emotion regulation difficulties ($M = 1.86, SD = 0.48$) than single participants ($M = 1.75, SD = 0.46; F(1, 277) = 3.86, p = .050$), and performed worse on the performance cognitive flexibility task ($M = 8.20, SD = 12.36$) than single participants ($M = 5.35, SD = 10.99; F(1, 276) = 4.125, p = .043$). They also scored higher in peer adjustment functioning ($M = 25.77, SD = 2.62$) than single participants ($M = 24.94, SD = 3.04; F(1, 271) = 5.67, p = .018$), higher in academic adjustment ($M = 3.21, SD = 0.61$) than single participants ($M = 3.05, SD = 0.60; F(1, 275) = 4.46, p = .036$), had higher GPA's ($M = 7.80, SD = 2.53$) than single participants ($M = 6.70, SD = 3.12; B-F(1, 261.23) = 9.95, p = .002$), and scored higher in employment adjustment ($M = 3.50, SD = 0.35$) than single participants ($M = 3.38, SD = 0.44; B-F(1, 262.71) = 5.47, p = .020$). They also scored higher in positive relationship qualities ($M = 4.16, SD = 0.68$) than single participants ($M = 3.47, SD = 0.76; F(1, 177) = 36.39, p < .001$).

Correlation Analyses to Consider Suitable Covariates

Pearson correlations were used to assess associations between the continuous candidate covariates and either EDF or ToM, and either of the social adjustment variables. Variables significantly correlating with both EDF or ToM, and a social adjustment variable, were selected as covariates for the final model

Hours Worked Per Week. Hours worked per week positively correlated with self-regulation difficulties, $r(185) = .16, p = .029$, yet negatively correlated with performance-cognitive flexibility errors, $r(185) = -.15, p = .046$. Hours worked per week also positively correlated with peer adjustment in employment settings, $r(176) = .18, p = .019$, and negatively correlated with academic adjustment, $r(183) = -.20, p = .007$.

Number of Jobs. Number of jobs were positively associated with self-regulation difficulties, $r(290) = .23, p < .001$, and positively associated with performance-based cognitive flexibility difficulties, $r(289) = .13, p = .025$. Number of jobs were also positively associated with work adjustment, $r(276) = .14, p = .017$.

Number of Lifetime Partners. Number of lifetime partners was positively associated with self-regulation difficulties, $r(294) = .12, p = .048$, and negatively associated with peer adjustment difficulties, $r(265) = -.13, p = .038$. It was also positively associated with peer adjustment functioning, $r(288) = .15, p = .013$, and was negatively associated with chronic anxiety, $r(277) = -.14, p = .022$. See Table 7 for correlation matrix of all study variables.

The covariates identified through their common associations with EF or ToM, and at least one of the social adjustment variables, were included in the model of emerging adult social adjustment.

Table 7
Correlation Matrix of Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1 Age	1	-0.08	.16*	.28**	.41**	.23**	.34**	.15**	.36**	.19**	-0.10	.21**
2 No. Courses	-0.08	1	-0.11	-0.03	0.07	-0.03	0.07	-0.06	-0.07	-0.01	-0.09	-0.02
3 Hours Worked	.16*	-0.11	1	0.14	0.17	.21**	.27*	0.04	.23**	0.06	-0.08	.21*
4 No. Jobs	.28**	-0.03	0.14	1	0.16	.20**	0.11	.15**	.17**	0.11	0.08	.22**
5 Rel Length	.41**	0.07	0.17	0.16	1	.27**	.44**	-.22*	0.00	.29**	-.23**	.28**
6 Past Y. Highest Dating Commitment	.23**	-0.03	.21**	.20**	.27**	1	.44**	.29**	.38**	.70**	-0.13	.25**
7 Current Dating Commitment	.34**	0.07	.27*	0.11	.44**	.44**	1	-.18*	0.04	0.14	-.33**	.36**
8 No. Past Yr Prtnrs	.15**	-0.06	0.04	.15**	-.22*	.29**	-.18*	1	.25**	.26**	0.09	0.02
9 No. Life Prtnrs	.36**	-0.07	.23**	.17**	0.00	.38**	0.04	.25**	1	.25**	-0.08	0.07
10 Avg Rel Length	.19**	-0.01	0.06	0.11	.29**	.70**	0.14	.26**	.25**	1	-0.06	-0.02
11 Freq. Together/Wk	-0.10	-0.09	-0.08	0.08	-.23**	-0.13	-.33**	0.09	-0.08	-0.06	1	-.31**
12 Hours Together/Wk	.21**	-0.02	.21*	.22**	.28**	.25**	.36**	0.02	0.07	-0.02	-.31**	1
13 FAD	-0.04	0.05	-0.05	-0.02	0.07	-0.00	0.04	-0.11	-0.00	0.03	-0.08	-0.02
14 TICS	-0.05	0.06	0.03	0.05	0.08	-0.01	0.02	-0.06	-.14*	-0.05	-0.06	0.03
15 BRIEF-Inhibition	-0.05	-0.04	.16*	.23**	-0.12	0.02	0.00	0.08	.12*	-0.07	-0.06	-0.01
16 BRIEF-Emotion	-0.07	0.00	0.01	0.07	0.01	0.09	0.03	-0.02	-0.05	0.02	-0.04	0.04
17 CWIT-Inhibit	0.02	0.01	0.01	0.01	-0.07	0.04	0.12	0.00	-0.07	0.03	.14*	0.01
18 CWIT-Flexibility	0.04	-0.02	0.02	.13*	0.06	-0.03	-0.11	0.02	0.02	-0.02	-0.04	0.04
19 CWIT-Inhibit Errors	-0.09	0.03	0.00	-0.02	0.13	0.09	0.10	0.00	-0.08	0.07	0.04	-0.05
20 CWIT-Flexibility Errors	-0.09	0.04	-.15*	-0.06	0.06	0.02	-0.04	-0.02	-0.07	0.05	0.01	-0.01
21 RMET	0.07	0.04	0.08	0.05	0.03	-0.02	0.18	0.02	-0.03	0.03	-0.03	0.02
22 SSQ	-0.06	0.05	0.02	0.04	-0.10	-0.09	0.17	-0.08	-0.04	0.02	-0.06	-0.11
23 PT	0.02	-0.04	-0.01	-0.02	0.00	0.07	0.08	0.03	0.08	0.07	0.02	-0.01
24 BASC-3	-0.08	-0.04	-0.13	-0.01	0.08	-0.04	0.02	0.01	-.13*	-0.08	0.02	-0.07
25 SFS	-0.05	0.06	0.00	0.10	-.25**	0.10	-.25**	0.07	.15*	.14*	-0.07	-0.12
26 SACQ-Social	-.17**	0.07	-0.09	-0.05	-0.14	-0.04	-0.09	-0.02	-0.02	-0.02	0.01	-0.08
27 WPP-Social	-0.03	0.09	.18*	0.10	-0.13	0.08	-0.03	-0.02	0.09	.13*	-0.04	0.02

28	SACQ-Academic	0.00	0.06	-.20**	-0.10	0.12	0.01	0.01	0.04	-0.05	0.08	-0.01	-0.04
29	CGPA	0.04	0.06	-0.08	-0.06	0.06	0.02	-0.00	0.03	0.05	0.06	-0.08	-.15*
30	WPP-Task	-0.05	-0.05	0.07	.14*	0.07	0.06	.19*	-0.06	0.02	.13*	-0.04	0.01
31	NRI	-0.01	0.00	0.02	0.01	.25**	.29**	.52**	-0.11	-0.02	.32**	-.30**	.22**
32	CADRI-P	0.02	-0.08	0.04	0.08	0.03	0.13	0.12	-0.07	-0.02	-0.02	-0.14	.22**
33	CADRI-R	-0.07	0.08	0.00	-0.06	-0.03	0.03	-0.16	-0.06	-0.01	-0.04	0.06	0.00
34	CADRI-E	0.02	0.00	0.06	0.04	0.06	0.00	0.13	-0.08	-0.01	.20**	-.24**	0.11
35	CADRI-T	0.02	-0.03	-0.09	0.13	0.04	0.07	0.03	0.01	0.07	-0.04	-.16*	0.11
		13	14	15	16	17	18	19	20	21	22	23	24
1	Age	-0.04	-0.05	-0.05	-0.07	0.02	0.04	-0.09	-0.09	0.07	-0.06	0.02	-0.08
2	No. Courses	0.05	0.06	-0.04	0.00	0.01	-0.02	0.03	0.04	0.04	0.05	-0.04	-0.04
3	Hours Worked	-0.05	0.03	.16*	0.01	0.01	0.02	0.00	-.15*	0.08	0.02	-0.01	-0.13
4	No. Jobs	-0.02	0.05	.23**	0.07	0.01	.13*	-0.02	-0.06	0.05	0.04	-0.02	-0.01
5	Rel Length	0.07	0.08	-0.12	0.01	-0.07	0.06	0.13	0.06	0.03	-0.10	0.00	0.08
6	Past Y. Highest Dating Commitment	-0.00	-0.01	0.02	0.09	0.04	-0.03	0.09	0.02	-0.02	-0.09	0.07	-0.04
7	Current Dating Commitment	0.04	0.02	0.00	0.03	0.12	-0.11	0.10	-0.04	0.18	0.17	0.08	0.02
8	No. Past Yr Prtnrs	-0.11	-0.06	0.08	-0.02	0.00	0.02	0.00	-0.02	0.02	-0.08	0.03	0.01
9	No. Life Prtnrs	-0.00	-.14*	.12*	-0.05	-0.07	0.02	-0.08	-0.07	-0.03	-0.04	0.08	-.13*
10	Avg Rel Length	0.03	-0.05	-0.07	0.02	0.03	-0.02	0.07	0.05	0.03	0.02	0.07	-0.08
11	Freq. Together/Wk	-0.08	-0.06	-0.06	-0.04	.14*	-0.04	0.04	0.01	-0.03	-0.06	0.02	0.02
12	Hours Together/Wk	-0.02	0.03	-0.01	0.04	0.01	0.04	-0.05	-0.01	0.02	-0.11	-0.01	-0.07
13	FAD	1	-.31**	-.21**	-.18**	0.07	-0.10	0.01	-0.02	-0.03	-0.05	.15*	-.28**
14	TICS	-.31**	1	.40**	.56**	-0.05	0.03	0.08	0.00	0.06	.17**	-0.05	.33**
15	BRIEF-Inhibition	-.21**	.40**	1	.41**	-0.04	0.03	0.08	0.10	-0.08	-0.04	-.13*	.24**
16	BRIEF-Emotion	-.18**	.56**	.41**	1	0.03	-0.01	-0.03	-0.01	-0.05	.15*	-.13*	.32**
17	CWIT-Inhibit	0.07	-0.05	-0.04	0.03	1	-.55**	.30**	0.11	-.19**	-0.07	-0.08	0.05
18	CWIT-Flexibility	-0.10	0.03	0.03	-0.01	-.55**	1	-.19**	.19**	.18**	0.02	0.10	-0.04
19	CWIT-Inhibit Errors	0.01	0.08	0.08	-0.03	.30**	-.19**	1	.36**	-.17**	-0.10	-0.07	-0.03
20	CWIT-Flexibility Errors	-0.02	0.00	0.10	-0.01	0.11	.19**	.36**	1	-.27**	-.12*	-0.03	0.04

21	RMET	-0.03	0.06	-0.08	-0.05	-.19**	.18**	-.17**	-.27**	1	.32**	.14*	-0.06
22	SSQ	-0.05	.17**	-0.04	.15*	-0.07	0.02	-0.10	-.12*	.32**	1	0.05	0.04
23	PT	.15*	-0.05	-.13*	-.13*	-0.08	0.10	-0.07	-0.03	.14*	0.05	1	-.16**
24	BASC-3	-.28**	.33**	.24**	.32**	0.05	-0.04	-0.03	0.04	-0.06	0.04	-.16**	1
25	SFS	.19**	-.15*	-0.10	-0.10	-0.07	0.01	-0.08	-0.05	0.01	0.10	0.06	-.46**
26	SACQ-Social	.27**	-.39**	-.19**	-.28**	0.03	-0.07	-0.01	0.04	-0.03	0.03	-0.02	-.37**
27	WPP-Social	.27**	-0.09	-.12*	-0.04	0.06	-0.06	0.03	-0.08	0.11	.17**	0.06	-.32**
28	SACQ-Academic	.19**	-.32**	-.39**	-.28**	-0.01	-0.04	-0.08	-0.10	0.05	0.11	-0.01	-.22**
29	CGPA	0.11	-.14*	-0.07	-0.03	-0.09	0.06	-0.11	-0.07	0.10	0.07	-0.03	-0.06
30	WPP-Task	.25**	-.12*	-.23**	-0.10	-0.03	0.07	-0.04	-0.07	.23**	.19**	.13*	-.24**
31	NRI	.29**	-0.02	-0.06	0.14	-0.11	-0.06	-0.11	-0.08	0.13	0.11	0.08	-.23**
32	CADRI-P	-0.02	0.11	0.07	.19*	-0.03	0.02	-0.12	-0.04	-.23**	-0.10	-0.03	0.06
33	CADRI-R	-0.06	0.08	0.00	0.09	-0.11	0.00	-0.08	-0.01	-0.15	-0.06	-0.06	0.14
34	CADRI-E	-0.00	.20**	.18*	.31**	-0.10	0.02	-.22**	-0.11	0.08	.18*	-0.13	.20*
35	CADRI-T	0.03	-0.02	.17*	.17*	-0.02	0.03	-0.09	-0.03	-.21**	-0.13	-0.04	-0.05
		25	26	27	28	29	30	31	32	33	34	35	
1	Age	-0.05	-.17**	-0.03	0.00	0.04	-0.05	-0.01	0.02	-0.07	0.02	0.02	
2	No. Courses	0.06	0.07	0.09	0.06	0.06	-0.05	0.00	-0.08	0.08	0.00	-0.03	
3	Hours Worked	0.00	-0.09	.18*	-.20**	-0.08	0.07	0.02	0.04	0.00	0.06	-0.09	
4	No. Jobs	0.10	-0.05	0.10	-0.10	-0.06	.14*	0.01	0.08	-0.06	0.04	0.13	
5	Rel Length	-.25**	-0.14	-0.13	0.12	0.06	0.07	.25**	0.03	-0.03	0.06	0.04	
6	Past Y. Highest Dating Commitment	0.10	-0.04	0.08	0.01	0.02	0.06	.29**	0.13	0.03	0.00	0.07	
7	Current Dating Commitment	-.25**	-0.09	-0.03	0.01	-0.00	.19*	.52**	0.12	-0.16	0.13	0.03	
8	No. Past Yr Prtnrs	0.07	-0.02	-0.02	0.04	0.03	-0.06	-0.11	-0.07	-0.06	-0.08	0.01	
9	No. Life Prtnrs	.15*	-0.02	0.09	-0.05	0.05	0.02	-0.02	-0.02	-0.01	-0.01	0.07	
10	Avg Rel Length	.14*	-0.02	.13*	0.08	0.06	.13*	.32**	-0.02	-0.04	.20**	-0.04	
11	Freq. Together/Wk	-0.07	0.01	-0.04	-0.01	-0.08	-0.04	-.30**	-0.14	0.06	-.24**	-.16*	
12	Hours Together/Wk	-0.12	-0.08	0.02	-0.04	-.15*	0.01	.22**	.22**	0.00	0.11	0.11	
13	FAD	.19**	.27**	.27**	.19**	0.11	.25**	.29**	-0.02	-0.06	-0.00	0.03	

14	TICS	-.15*	-.39**	-0.09	-.32**	-.14*	-.12*	-0.02	0.11	0.08	.20**	-0.02
15	BRIEF-Inhibition	-0.10	-.19**	-.12*	-.39**	-0.07	-.23**	-0.06	0.07	0.00	.18*	.17*
16	BRIEF-Emotion	-0.10	-.28**	-0.04	-.28**	-0.03	-0.10	0.14	.19*	0.09	.31**	.17*
17	CWIT-Inhibit	-0.07	0.03	0.06	-0.01	-0.09	-0.03	-0.11	-0.03	-0.11	-0.10	-0.02
18	CWIT-Flexibility	0.01	-0.07	-0.06	-0.04	0.06	0.07	-0.06	0.02	0.00	0.02	0.03
19	CWIT-Inhibit Errors	-0.08	-0.01	0.03	-0.08	-0.11	-0.04	-0.11	-0.12	-0.08	-.22**	-0.09
20	CWIT-Flexibility Errors	-0.05	0.04	-0.08	-0.10	-0.07	-0.07	-0.08	-0.04	-0.01	-0.11	-0.03
21	RMET	0.01	-0.03	0.11	0.05	0.10	.23**	0.13	-.23**	-0.15	0.08	-.21**
22	SSQ	0.10	0.03	.17**	0.11	0.07	.19**	0.11	-0.10	-0.06	.18*	-0.13
23	PT	0.06	-0.02	0.06	-0.01	-0.03	.13*	0.08	-0.03	-0.06	-0.13	-0.04
24	BASC-3	-.46**	-.37**	-.32**	-.22**	-0.06	-.24**	-.23**	0.06	0.14	.20*	-0.05
25	SFS	1	.48**	.38**	.22**	.20**	.14*	0.08	0.07	-0.06	0.12	.21**
26	SACQ-Social	.48**	1	.29**	.44**	.13*	.15*	0.14	-0.10	-0.02	-0.14	-0.01
27	WPP-Social	.38**	.29**	1	.14*	0.06	.53**	.20**	-0.03	-0.05	0.08	-0.05
28	SACQ-Academic	.22**	.44**	.14*	1	.21**	.25**	0.10	-0.14	-0.06	-.16*	-0.04
29	CGPA	.20**	.13*	0.06	.21**	1	0.02	0.14	-0.08	-0.11	0.07	-0.04
30	WPP-Task	.14*	.15*	.53**	.25**	0.02	1	.27**	-0.13	-0.13	0.05	-0.11
31	NRI	0.08	0.14	.20**	0.10	0.14	.27**	1	0.14	-0.09	0.12	0.11
32	CADRI-P	0.07	-0.10	-0.03	-0.14	-0.08	-0.13	0.14	1	.49**	.31**	.58**
33	CADRI-R	-0.06	-0.02	-0.05	-0.06	-0.11	-0.13	-0.09	.49**	1	.23**	.30**
34	CADRI-E	0.12	-0.14	0.08	-.16*	0.07	0.05	0.12	.31**	.23**	1	.26**
35	CADRI-T	.21**	-0.01	-0.05	-0.04	-0.04	-0.11	0.11	.58**	.30**	.26**	1

Note. FAD = Family Assessment Device, TICS = Trier Inventory for Chronic Stress, BRIEF = Behaviour Rating Inventory of Executive Function, CWIT = Color-Word Interference Test, RMET = Reading the Mind in the Eyes Test, SSQ = Social Stories Questionnaire, PT = Perspective Taking, BASC = Behavioural Assessment System for Children, SFS = Social Functioning Scale, SACQ = Student Adaptation to College Questionnaire, CGPA = Cumulative Grade Point Average, WPP = Work Personality Profile, NRI = Network of Relationships Inventory, CADRI = Conflict in Adolescent Dating Relationships Inventory.

* $p < .05$, ** $p < .01$, *** $p < .001$

3.4.4 Hypothesis Testing and Main Findings

Initial Identification

The original measurement and structural models displayed measurement and identification challenges. The loading coefficient for emotional dating aggression perpetration regressed onto latent dating aggression was low, at .27. Similarly, the coefficient for perspective taking regressed onto latent ToM was low at .12. As these indicators' coefficients did not exceed .4, the indicators were removed (Stevens, 2002). Including these indicators would prove to reduce the fit of the model. Barring CGPA, each indicator in the final measurement model loaded to a value of at least .4 on their respective latent variables. CGPA only loaded to a value of .3 on latent academic adjustment. However, it was not removed because it was only one of two indicators for latent academic adjustment. Removing it would preclude the ability to specify a latent academic adjustment variable. A final check revealed that including CGPA in the measurement model did not significantly alter final model fit statistics. See Figure 5 for final measurement model.

There were also issues with identifying the overall model. The model was not identified until removing performance-based cognitive flexibility and performance-based inhibition as indicators of latent performance-based EDF. This left only performance inhibition errors and performance cognitive flexibility errors as indicators of latent EDF. Also, the model was not identified when using the combined neurological status variable encompassing those with ADHD, those with histories of head injuries, and those possessing another unspecified neurological problem. Individual neurological or neurodevelopment variables were explored one at a time until it was found that ADHD status alone resulted in an identified model.

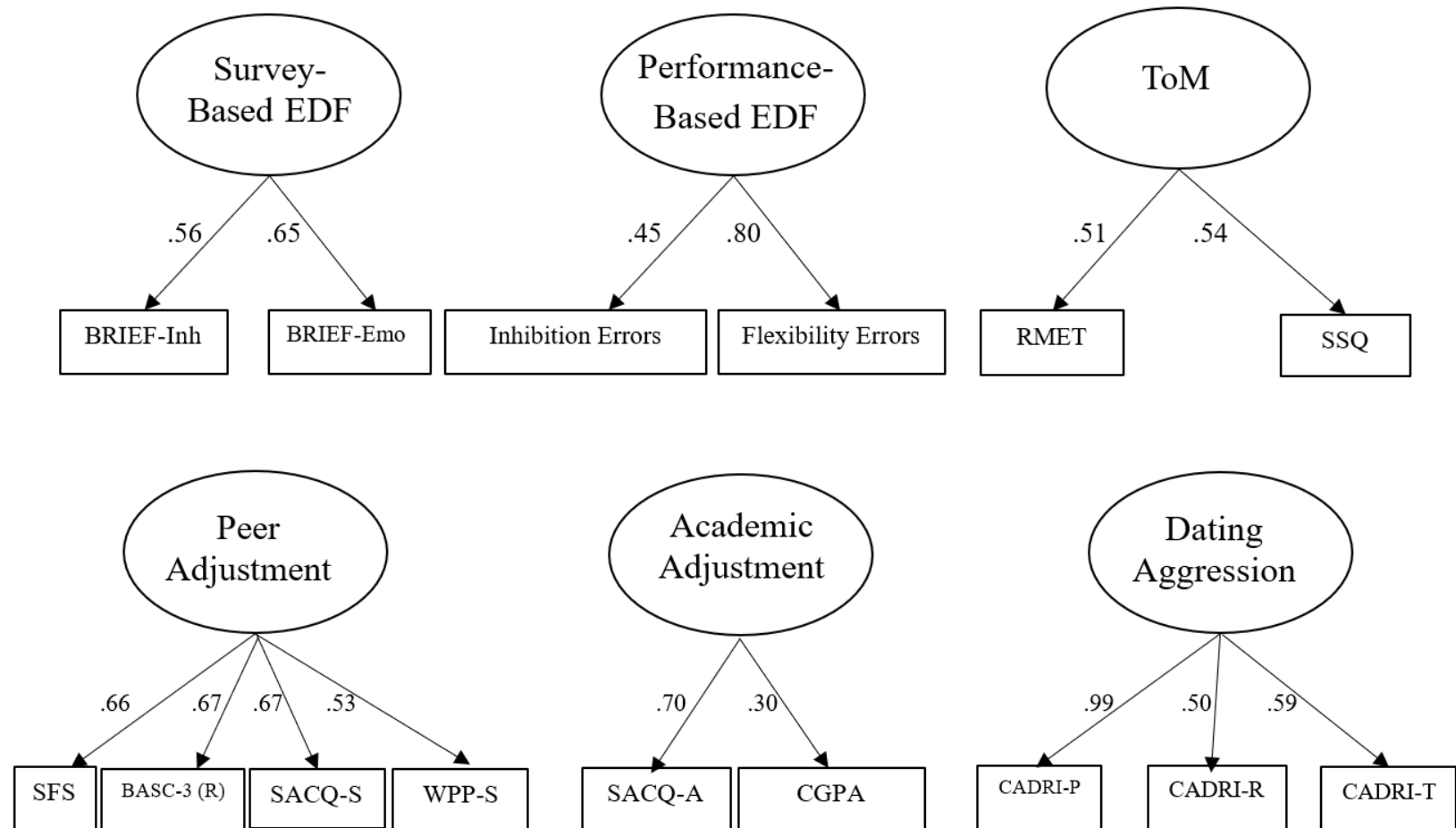


Figure 5. Final measurement model with standardized regression coefficients, all $p < .05$.

Note. All $p < .05$

R = reversed.

Normality and Outliers

Individual variables were assessed for normality. ADHD status, family functioning, self-regulation, performance inhibition errors, and performance cognitive flexibility errors; peer adjustment difficulties, CGPA, physical dating aggression, relational dating aggression, threatening dating aggression, ethnicity, and hours worked per week, were positively skewed. Reading social cues from eye expressions, peer adjustment functioning, peer adjustment in employment settings, employment adjustment, positive relationship qualities, and work ability, were negatively skewed. There was positive kurtosis on the ADHD status, reading social cues from eye expressions, performance inhibition errors, performance cognitive flexibility errors, peer adjustment in employment settings, employment adjustment, physical dating aggression, relational dating aggression, threatening dating aggression, and work ability variables. There was negative kurtosis on the relationship status variable. The multivariate model was not normal with a significantly positive kurtosis, and there were 18 multivariate outliers as determined by Mahalanobis Distance.

Remediation Strategies

To address the issues of data non-normality all final reported estimates were bias-corrected bootstrapped estimates derived from maximum likelihood estimation (Sharma & Kim, 2013). In order to do so, the data first underwent regression single imputation to fill in missing data. However, all model fit statistics were based on the original data that included missing data, using full-information maximum likelihood (FIML) estimation. FIML is an appropriate model fit estimation method when working with data missing completely at random, as is the case with the current sample (Enders & Bandalos, 2001).

Covariates in the Model

For the structural model, all control variables with significant associations to both an EDF or ToM indicator, as well as a social adjustment indicator, were entered into the model as covariates. The covariates were only allowed to covary with the latent EDF or ToM variable it was associated with through at least one of its indicators. For predictors of peer adjustment, these covariates were ethnicity, sexual orientation, anxiety disorder, affective disorder, work ability, hours worked per week, relationship status, and number of lifetime partners. For predictors of CGPA, covariates were gender, ethnicity, volunteer status, hours worked per week, and relationship status. Controls for predicting employment adjustment were ethnicity, work ability, volunteer status, number of jobs, and relationship status. Controls for predicting positive relationship qualities were ethnicity, volunteer status, relationship status, and frequency of time spent together with partner. Finally, controls for predicting dating aggression were gender, ethnicity, part-time university status, work ability, and volunteer status.

Full Model of Peer, Occupational, and Romantic Adjustment Variables

After the covariates were all entered into the model, the initial model met with very poor fit, RMSEA = .068, 90% C.I. .063, .074, CFI = .609, TLI = .497. The model was trimmed, entailing deleting non-significant associations one by one beginning with the smallest coefficients (O’Conner et al., 2011), and as guided by theory. After model trimming, ethnicity remained as a covariate with ToM to predict CGPA, work ability remained as a covariate with ToM and performance-based EDF to predict employment adjustment, and relationship status remained as a covariate with performance-based EDF to predict positive relationship qualities. Several non-significant covariances between the social adjustment variables were removed until only relationship status covaried with performance-based EDF to predict positive relationship

qualities. The covariance between survey-based EDF and performance-based EDF was not significant and was removed. While ADHD status significantly predicted EDF, it did not predict ToM, and this path was removed. Although trimming slightly improved the model, fit statistics remained poor, RMSEA = .066, 90% C.I. .058, .074, CFI = .756, TLI = .680. Next, model-building was engaged using modification indices to add theoretically plausible paths to the model (O’Conner et al., 2011). A path was added from ToM to relationship status and from White ethnicity to relationship status. ADHD status was also made to predict chronic anxiety (see discussion for rationale). However, model fit was only slightly improved, and remained poor, RMSEA = .064, 90% C.I. .056, .072, CFI = .772, TLI = .698.

3.4.5 Exploratory Model Respecification

In order to better assess the effects of EF and ToM on social adjustment variables, a strategy was developed to explore equally plausible high-fit alternative models. The strategy entailed re-assessing the original model as five different models, one for each social adjustment variable. This was justified by the absence of covariation between most of the different forms of emerging adult social adjustment. Therefore, separate peer, academic, employment, positive relationship qualities, and dating aggression models were assessed one at a time. Although each model was generally in keeping with figures 3 and 4, the regression of chronic anxiety on ADHD status was added to each model at the outset. The path from ADHD status to ToM was also removed for all models.

Respecification

Peer Adjustment Model. The peer adjustment model was specified as peer adjustment regressed onto both survey-based EDF and ToM, and ToM regressed onto EDF. ADHD status was included as a neurological status variable, and family functioning, and chronic anxiety were

also included in the model (see Figure 4 for configuration). However, as mentioned the path from ADHD status to ToM was removed, and a path from ADHD status to chronic anxiety was added. After re-adding all covariates relevant to the peer adjustment model, the peer adjustment model met with poor fit, RMSEA = .089, 90% C.I. .079, .098, CFI = .634, TLI = .482. After model trimming (O’Conner et al., 2011), no covariates remained to include in the model. EDF did not significantly predict ToM ($B = 2.312$, $SE(B) = .042$, $p = .889$, $\beta = .030$), and the regression coefficient between these variables was also removed. It was replaced with a covariation association which was ultimately non-significant, $r = -.140$, $p = .385$. Model fit was improved, RMSEA = .081, 90% C.I. .064, .098, CFI = .860, TLI = .763.

After reviewing the correlation matrix (see Table 7) and the literature, additional covariates predicting peer adjustment were explored and added to the model. It was noted that there was a significant negative association between current dating commitment and peer adjustment functioning, $r(119) = -.25$, $p = .006$, and a positive association approaching significance between current dating commitment and the ability to read social cues from eye-expressions, $r(122) = .18$, $p = .054$. After confirming theoretical plausibility, current dating commitment, but also past year dating commitment, were introduced to the model as covariates with ToM. Model fit was slightly improved, but remained poor, RMSEA = .075, 90% C.I. .061, .090, CFI = .831, TLI = .735. See Table 8 for final bias-corrected bootstrapped estimates.

Table 8
Regression Coefficients for the Model of Peer Adjustment

Y Variable	X Variable	B	SE(B)	p	β
Peer adjustment	Survey-EDF	-4.328	1.111	.001**	-.525
Peer adjustment	ToM	.261	.423	.024*	.267
Survey-EDF	ADHD	.216	.109	.046*	.180
Chronic anxiety	ADHD	.653	.232	.007**	.106
Chronic anxiety	Family function.	-.518	.108	.002**	-.299

Survey-EDF	Chronic anxiety	.151	.021	.001**	.738
Survey-EDF	Family function.	-.058	.027	.021*	-.157
Peer adjustment	Curr date commit	-.971	.590	.002**	-.304
Peer adjustment	Past date commit	.149	.096	.009**	.143

Note. * $p < .05$, ** $p < .01$

Indirect Effects Model. There were several statistically significant indirect effects. ADHD status predicted EDF via chronic anxiety, $B = .099$, 95% CI [.034, .188], and peer adjustment via EDF, $B = -1.365$, 95% CI [-2.536, -.280]. Family functioning predicted EDF through chronic anxiety, $B = -.078$, 95% CI [-.117, -.047], and peer adjustment through EDF, $B = .591$, 95% CI [.234, 1.016]. Chronic anxiety predicted peer adjustment through EDF, $B = -.655$, 95% CI [-.898, -.410].

Academic Adjustment Model. The academic adjustment model was specified as ToM regressed onto both survey-based EDF and performance-based EDF. Academic adjustment was regressed onto survey-based EDF, performance-based EDF, and ToM. ADHD status as a neurological status variable, family functioning, and chronic anxiety were also included in the model as per Figure 4. However, the path from ADHD status to ToM was removed at the outset, and a path from ADHD status to chronic anxiety was added. Survey-based EDF and performance-based EDF were not specified to covary. After re-adding covariates relevant to academic adjustment, the model met with poor fit RMSEA = .066, 90% C.I. .054, .078, CFI = .769, TLI = .651. The model was trimmed for non-significant paths. Only relationship status remained as a covariate with performance-based EDF, while hours worked remained as a covariate with survey-based EDF and performance-based EDF. The paths from ToM to ADHD status, ToM to academic adjustment, survey-based EDF to ToM, and family functioning to survey-based EDF were not significant. These three paths involving ToM were removed (e.g.,

ToM predicting academic adjustment, $B = .002$, $SE(B) = .042$, $p = .889$, $\beta = .030$. Retaining or removing the path from family functioning to survey-based EDF did not change the final results, so the path was retained. Survey-based EDF was allowed to covary with ToM, but this covariation was ultimately not significant, $r = -.252$, $p = .053$. The trimmed model was an improvement and no modification indices of theoretically plausible pathways improved the fit, $RMSEA = .057$, 90% C.I. $.042$, $.071$, $CFI = .859$, $TLI = .778$. See Table 9 for final bias-corrected bootstrapped regression weights.

Table 9

Regression Coefficients for the Model of Academic Adjustment

Y Variable	X Variable	B	SE(B)	p	β
Academic Adj.	Survey-EDF	-1.151	.192	.001**	-.666
Academic Adj.	Perform.-EDF	-.052	.027	.002**	-.249
ToM	Perform.-EDF	-.648	.348	.003**	-.430
Survey-EDF	ADHD	.170	.109	.114	.131
Chronic anxiety	ADHD	.658	.234	.008**	.106
Chronic anxiety	Family function.	-.507	.109	.002**	-.298
Survey-EDF	Chronic anxiety	.166	.019	.000***	.710
Survey-EDF	Family function.	-.029	.029	.319	-.085
Academic Adj.	Ethnicity	.292	.079	.001**	.268
Academic Adj.	Hours worked	-.225	.046	.001**	-.341
Academic Adj.	Relation. Status	.197	.063	.003**	.239

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Indirect Effects Model. A number of indirect effects emerged. ADHD status indirectly predicted survey-based EDF through chronic anxiety, $B = .109$, 95% CI [.036, .200], and indirectly predicted academic functioning through survey-based EDF, $B = -.321$, 95% CI [-.609, -.055]. Family functioning indirectly predicted survey-based EDF through chronic anxiety, $B = .084$, 95% CI [-.123, -.049] and indirectly predicted academic adjustment through EDF difficulties, $B = .130$, 95% CI [.051, .234]. Finally, chronic anxiety predicted academic functioning indirectly through EDF, $B = -.191$, 95% CI [-.260, -.138].

Employment Adjustment Model. The model of employment adjustment was specified as the employment adjustment indicator regressed onto latent survey-based EDF, latent performance-based EDF, and latent ToM. ToM was regressed onto both survey-based EDF and performance-based EDF. ADHD status as a neurological status variable, and family functioning and chronic anxiety were included in the model (see Figure 4). However, no path was included from ADHD status to ToM, and a new path from ADHD status to chronic anxiety was included. Survey-based EDF was not specified to covary with Performance-based EDF. After re-adding only those covariates appropriate to the employment adjustment model, the model met with poor fit, RMSEA = .085, 90% C.I. .073, .098, CFI = .680, TLI = .502. After model trimming of non-significant pathways, only number of jobs continued to covary with EDF, and ability to work continued to covary with ToM. The non-significant path from performance-based EDF to employment adjustment was removed ($B = .017$, $SE(B) = .042$, $p = .471$, $\beta = .067$), as was the non-significant covariation between work ability and performance-based EDF, and number of jobs and performance-based EDF. Survey-based EDF did not significantly predict ToM, but these variables were allowed to, and were ultimately found to, covary, $r = -.145$, $p = .016$. Following the model trimming, the model was slightly improved, RMSEA = .065, 90% C.I. .048, .082, CFI = .853, TLI = .756. The modification indices were consulted to guide the addition of theoretically-sound pathways to the model. A path was added from ADHD status to number of jobs. A path was also added from work ability to number of jobs. Family functioning was made to predict employment functioning. ToM was made to covary with work ability, and FAD predicted work functioning. Current dating commitment was introduced to the model and co-varied with ToM, given its significant association with employment adjustment, $r(116) = .19$, $p = .045$, and marginally significant association with reading social cues from eye expressions,

$r(122) = .18, p = .054$. These theoretically-sound additions to the model (see |Discussion)

substantially improved fit, establishing good model fit, RMSEA = .043, 90% C.I. .023, .060, CFI

= .927, TLI = .878. See Table 10 for final bias-corrected bootstrapped regression weights.

Table 10

Regression Coefficients for the Model of Employment Adjustment

Y Variable	X Variable	B	SE(B)	P	β
Employment Adj.	Survey-EDF	-.283	.127	.024*	-.165
Employment Adj.	ToM	.030	.013	.004**	.286
ToM	Perform.-EDF	-.963	.338	.001**	-.462
Survey-EDF	ADHD	.252	.130	.082	.184
Chronic anxiety	ADHD	.657	.233	.007**	.106
No. jobs last 4 yrs	ADHD	1.654	.827	.048*	.162
Chronic anxiety	Family function.	-.511	.109	.002**	-.300
Survey-EDF	Chronic anxiety	.166	.019	.000***	.707
Survey-EDF	Family function.	-.028	.029	.293	-.073
Employment Adj.	Family function.	.131	.041	.001**	.201
No. jobs last 4 yrs	Work ability	.901	.288	.006**	.176
Employment Adj.	Work ability	.253	.066	.001**	.207
Employment Adj.	No. jobs last 4 yr	.030	.017	.083	.132
Employment Adj.	Curr date commit	.071	.035	.041*	.101

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Indirect Effects Model. The indirect effects model revealed several mediation pathways. ADHD status predicted survey-based EDF indirectly through chronic anxiety, $B = .110$, 95% CI [.038, .203]. Family functioning also indirectly predicted survey-based EDF through chronic anxiety, $B = -.086$, 95% CI [-.124, -.048], and employment adjustment through survey-based EDF, $B = .033$, 95% CI [.008, .086]. Chronic anxiety predicted employment adjustment, through survey-based EDF, $B = -.048$, 95% CI [-.094, -.010]. Finally, ToM significantly mediated the association between performance-based EDF and employment adjustment, $B = -.029$, 95% CI [-.086, -.010].

Positive Romantic Adjustment Model. The model of positive relationship qualities was specified as positive relationship qualities regressed on survey-based EDF, and ToM. As per Figure 4, ADHD status as a neurological status variable, family functioning, and chronic anxiety were included in the model. However, ADHD status was not made to predict ToM. Because the model was not identified after adding a path from ADHD status to chronic anxiety, this path was not added to the model. The model met with poor fit after re-adding covariates relevant to positive relationship qualities, RMSEA = .075, 90% C.I. .055, .096, CFI = .842, TLI = .701. After model-trimming, only ethnicity remained as a covariate with ToM. EDF did not predict ToM. EDF and ToM were allowed to covary and ultimately did so significantly, $r = -.242$, $p = .032$. Model fit did not change as a result of model-trimming, RMSEA = .083, 90% C.I. .061, .106, CFI = .848, TLI = .688. To further improve the model, additional variables were introduced to the model. Relationship status and current dating commitment were added as predictors. Relationship status was made to covary with both EDF and ToM, while current dating commitment covaried with ToM only. Using the modification indices and theory as a guide, family dysfunction was made to predict positive relationship qualities. Model-fit greatly improved, RMSEA = .049, 90% C.I. .023, .073, CFI = .943, TLI = .833. However, EDF and ToM were no longer significant predictors of positive relationship qualities over and above relationship status and current dating commitment. See Table 11 for final bias-corrected bootstrapped coefficients.

Table 11

Regression Coefficients for the Model of Positive Romantic Adjustment

Y Variable	X Variable	B	SE(B)	P	β
Relation Qualities	EDF	.266	.181	.105	.081
Relation Qualities	ToM	-.003	.017	.830	.037

Relation Qualities	Curr date comm.	.405	.061	.001**	.450
Relation Qualities	Relation Status	.654	.059	.001**	.404
Survey-EDF	ADHD	.183	.130	.155	.147
Relation Qualities	Family function.	.315	.049	.001**	.258
Chronic anxiety	Family function.	-.508	.109	.002**	-.299
Survey-EDF	Chronic anxiety	.154	.021	.001**	.709
Survey-EDF	Family function.	-.020	.025	.393	-.054

Note. * $p < .05$, ** $p < .01$

Indirect Effects Model. The indirect effects model revealed an indirect effect from family functioning to survey-based EDF, through chronic anxiety, $B = -.078$, 95% CI [-.117, -.042].

Dating Aggression Adjustment Model. The dating aggression model was specified as dating aggression regressed onto survey-based EDF, and ToM. As per Figure 4, neurological status in the form of ADHD status, as well as family functioning, and chronic anxiety, were included in the model. The path from ADHD status to ToM was removed. A new path from ADHD status to chronic anxiety was included. After adding covariates relevant to dating aggression to the model, it originally met with poor fit, RMSEA = .064, 90% C.I. .051, .076, CFI = .803, TLI = .704. Model trimming resulted in the removal of gender, work ability, volunteer work status, and ethnicity. Only part time university status remained as a covariate to predict dating aggression while it covaried with ToM. Before generating bootstrapped estimates, current dating commitment was added to the model but removed after failing to significantly predict dating aggression. However, EDF and ToM were noted to predict dating aggression over and above current dating commitment. EDF did not significantly predict ToM ($B = 3.065$, $SE(B) = 2.345$, $p = .189$, $\beta = .217$). This path was removed, however, EDF and ToM were allowed to covary and they ultimately did so significantly, $r = -.226$, $p = .031$. The end result was superb

model fit, RMSEA = .039, 90% C.I. .012, .060, CFI = .954, TLI = .923. See Table 12 for bias-corrected bootstrapped regression weights.

Table 12

Regression Coefficients for the Model of Dating Aggression Adjustment

Y Variable	X Variable	<i>B</i>	<i>SE(B)</i>	<i>p</i>	β
Dating aggression	Survey-EDF	.167	.058	.000***	.236
Dating aggression	ToM	-.010	.005	.001**	-.260
Survey-EDF	ADHD	.169	.122	.163	.142
Chronic anxiety	ADHD	.656	.233	.007**	.106
Chronic anxiety	Family function.	.507	.109	.002**	.298
Survey-EDF	Chronic anxiety	.152	.021	.001**	.705
Survey-EDF	Family function.	.018	.025	.425	.054
Dating aggression	Part time study status	-.162	.056	.000***	-.327

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Indirect Effects Model. There were several significant indirect effects. ADHD status indirectly predicted survey-based EDF through chronic anxiety, $B = .101$, 95% CI [.034, .193], and indirectly predicted dating aggression through survey-based EDF, $B = .041$, 95% CI [.007, .101]. Family functioning indirectly predicted survey-based EDF, through chronic anxiety, $B = -.078$, 95% CI [-.117, -.042], and indirectly predicted dating aggression through survey-based EDF, $B = -.078$, 95% CI [-.117, -.006]. Finally, chronic anxiety indirectly predicted dating aggression through survey-based EDF, $B = .023$, 95% CI [.012, .042].

3.4.6 Summary

The full social adjustment model displayed poor fit. Therefore, each of five different social adjustment models were exploratorily modeled separately to assess the effects of EDF and ToM on emerging adult social variables. Summaries of the results are found in Tables 13 and 14.

Table 13

Fit Statistics for all Models of Emerging Adult Social Adjustment

Social Adjustment Model	RMSEA point estimate	RMSEA 90% CI lower bound	RMSEA 90% CI lower bound	CFI	TLI
All	.064	.056	.072	.772	.698
Peer	.075	.061	.090	.831	.735
Academic	.057	.042	.071	.859	.778
Employment	.043	.023	.060	.927	.878
Relationship Qualities	.049	.023	.073	.943	.833
Dating Aggression	.039	.012	.060	.954	.923

Table 14

Study 2 Results Summary

Hypothesis	Summary	Statistics
1. a.	Survey-EDF negatively predicted peer adjustment	$\beta = -.525^{**}$
	Survey-EDF negatively predicted academic adjustment	$\beta = -.666^{**}$
	Survey-EDF negatively predicted employment adjustment	$\beta = -.165^{*}$
	Survey-EDF did not predict positive relationship qualities	$\beta = .081$
	Survey-EDF positively predicted dating aggression	$\beta = .236^{***}$
1. b.	Performance-EDF negatively predicted academic adjustment	$\beta = -.249^{**}$
	Performance-EDF did not predict employment adjustment	$\beta = .067$
2.	ToM positively predicted peer adjustment	$\beta = .267^{*}$
	ToM did not predict academic adjustment	$\beta = .030$
	ToM positively predicted employment adjustment	$\beta = .286^{**}$
	ToM did not predict positive relationship qualities	$\beta = .037$
	ToM negatively predicted dating aggression	$\beta = -.260^{**}$
3.	Survey-EDF did not predict ToM. Example provided from dating aggression model.	$\beta = .217$
	Performance-EDF negatively predicted ToM in academic, employment models. Example provided from aca. model	$\beta = -.430^{**}$
4.	ToM only mediated the association between performance-based EDF and employment adjustment	$B = -.029$, 95% CI [-.086, -.010]
5.	Peer adjustment model fit statistics lower than other models	See Table 13
6.	Only relationship qualities covaried with dating aggression	$r = .205^{*}$

7.	Family functioning negatively predicted survey-EDF in peer adjustment model only	$\beta = -.157^*$
8.	Family functioning indirectly predicted survey-EDF through chronic anxiety in all models. Peer model example provided.	$B = -.321$, 95% CI [-.609, -.055]
9.	ADHD status positively predicted survey-EDF in peer adjustment model only	$\beta = .180^*$
10.	All results reported after controlling for important confounds	

3.5 Discussion

The goal of Study 2 was to assess the effects EF difficulties and ToM on emerging adult social adjustment variables, in a new sample of healthy emerging adults. This entailed using the systematic review of Study 1 to specify an SEM model of emerging adult peer, occupational, and romantic adjustment, based on EF and ToM predictors. Another goal was to draw from the multi-level social competence model (Yeates et al., 2007), based in developmental-systems theory (Sameroff, 2010) to predict EF difficulties or ToM from biopsychosocial risk and resilience factors. These factors included one's neurological status, degree of chronic anxiety, and level of family functioning.

Poor model fit resulted when the social adjustment variables were modeled simultaneously. During exploratory analyses, the individual variables were modeled one at a time. Findings from the peer, academic, employment, positive relationship qualities, and dating aggression models are each discussed below.

3.5.1 Link Between Current Findings and Previous Research

Peer Adjustment

Despite poor fit, the peer adjustment model in the current study showed a large negative effect of EF difficulties on peer adjustment. There was also a moderate positive effect of ToM on peer adjustment. The results held after controlling for level of commitment in past year, and

current relationships. The large effect of EF on peer adjustment is in keeping with the small to large effects of self- or emotional-regulation difficulties on social functioning and externalizing symptoms (e.g., Barkley & Fischer, 2010; Cohn et al., 2010; Situ et al., 2011). Meanwhile, the moderate effect of ToM on peer adjustment is an improvement on emerging adult studies failing to confirm any such theorized effect (Hao & Liu, 2016; McLeary et al., 2011).

Control Variables. Interestingly, current relationship commitment had a moderate negative effect on social difficulties, while past-year commitment had a small positive effect on social difficulties. Interference from a romantic relationship on peer group interactions is in keeping with romantic development theory (Brown, 1999; Connolly & Goldberg, 1999). This theory suggests that as one develops, there is an increasing trade-off between time spent with a romantic partner, and time spent with the platonic peer group. However, it is not clear why the current study findings are in line with this theory in the current context, but not the past year context. It is possible that only the most highly involved *current* relationships interfere with current peer adjustment because they are occurring at the same time. However, if some of the most involved romantic relationships began in the past, then time may have allowed for the relationship to mature, along with the development of a neutral, or facilitatory effect of the relationship on broader peer connections.

Occupational Adjustment – Academic Adjustment

This model produced poor model fit. There were large negative effects of self-reported EF difficulties on latent academic adjustment. There was also a moderate negative effect of errors from performance-based inhibition and cognitive flexibility tasks, on academic adjustment. In addition to inhibition which allows one to focus on study material, cognitive flexibility predicts academic achievement through facilitating the learning of new concepts

(Kercood et al., 2017). This was an interesting pattern of results. In keeping with previous research, only academic adjustment was predicted by performance-based cognitive flexibility and inhibition (Kercood et al., 2017; Klipfel, 2015; Sanders et al., 2015). Academic settings are highly structured, which perhaps accounts for why performance measures of EF in highly structured lab settings, predict academic achievement which also takes place in structured academic settings (Toplak et al., 2013). Research has also found that self-reported inhibitory skills predict academic achievement (Kercood et al., 2017), and that was also found in the current study.

ToM did not predict academic adjustment in the current study. This was surprising given the number of social demands placed on students in the forms of study groups, class presentations, tutor sessions, and other scholastic activities. According to social-information processing models, the ability to read social cues is important for guiding social behaviour in any context (Crick & Dodge, 1994; Perez-Edgar, 2012). However, the empirical literature is scarce on findings directly linking ToM to academic achievement. This may explain the lack of findings in the current study.

Covariates. Not surprisingly, more hours in employed work per week had a negative effect on academic adjustment, in keeping with prior findings (Staff et al., 2010). White ethnocultural identification (compared to non-White status) also predicted greater academic adjustment. This finding aligns with prior research linking socio-economic disadvantages among some non-White communities with poorer academic adjustment (Fletcher & Tienda, 2010). Research also shows that a reduction in negative experiences in one's romantic relationship is associated with a reduction in negative experiences in one's occupation (Shulman et al., 2014). This positive "spill-over" association between romantic relationship and occupational

experiences may explain the facilitatory effect of relationship status on academic adjustment in the current study.

Occupational Adjustment -Work Adjustment

The work adjustment model was one of the three models of advanced social adjustment demonstrating strong model fit. There was a small negative effect of EF difficulties on employment adjustment, and a moderate positive effect of ToM on employment adjustment. The effect of EF difficulties on employment adjustment align with previous research finding an effect of self-reported self-regulation and goal pursuit on work adjustment (Lanaj et al., 2012). ToM has rarely been investigated in relation to work adjustment, however the current findings align with one study of adults suggesting that ToM acts as a social tool to facilitate employment (Bly et al., 2012). Unlike prior findings that found a significant association between performance-based EF and work adjustment (Cairns et al., 2017; Lanaj et al., 2012), performance-based EF in the form of errors on inhibition and cognitive flexibility tasks, did not predict work adjustment in the current study. Thus, the current study results partially align with previous research.

Covariates. Not surprisingly, one's self-reported ability to currently work, and one's number of historical jobs in the last 4 years positively predicted work adjustment. Being in a position to work and having relevant work experience is associated with more jobs and better work adjustment (Sagen et al., 2000). There were also spill-over effects linking greater current relationship commitment, and also greater family functioning, to greater work adjustment. While these connections were suggested by the computer modification indices, they were deemed theoretically sound. There is a growing literature of work-family spill-over effects, which when applied to emerging adults includes spill-over from work to romantic relationship domains. Adjustment in one domain is positively associated with adjustment in the other (Shulman et al.,

2014). ADHD status also directly positively predicted number of jobs as suggested by the computer modification indices. This is in line with Barkley et al. (2010) who also found a positive moderate effect of hyperactivity-impulsivity symptoms on number of jobs since high school, among emerging adults with ADHD.

Romantic Adjustment

The model of positive relationship qualities was among the highest fitting models. This was owing to the large effects of relationship status and current dating commitment on positive relationship qualities. EF difficulties and ToM did not significantly predict positive relationship qualities over and above these covariates. Therefore, being in a relationship and being in one of a certain level of commitment says more about one's relationship qualities, than their EF or ToM abilities. This would seem to contradict small but significant associations between emotion regulation difficulties and positive relationship qualities (Chan, 2019), or small to moderate associations between emotion regulation difficulties and relationship satisfaction (Yarkovsky, 2016) found in the literature. Also, perspective-taking, which depends on ToM, has positively predicted the maintenance of healthy romantic relationships in the literature (Arriaga & Rusbult, 1998; Courtain & Glowacz 2018; Rusbult et al., 1991). However, at least as it concerns Chan (2019) and Yarkovsky (2016), their associations were zero-order correlations that did not take covariates into account. After doing so, one finds that the relatively small associations are no longer significant.

Covariates. Modification indices suggested adding family functioning as a covariate to predict positive relationship qualities. The resulting positive association was in line with the negative effect of family conflict on romantic maturity among teenagers (Heifetz et al., 2010), which is a predictor of positive relationship qualities (Brown, 1999; Connolly & Goldberg,

1999). It is also supported by the romantic attachment literature which associates family of origin characteristics with qualities of adult relationships.

Dating Aggression

Dating aggression represented the best-fitting model of emerging adult social adjustment based on EF difficulties and ToM. Although current level of dating commitment was not retained in the final model, the effects of EF difficulties and ToM on dating aggression remained after controlling for this variable. These were moderate-sized effects in keeping with the small to moderate effects of EF difficulties on dating aggression in the literature (Baker et al., 2018; Caiozzo et al., 2016; Farrell & Vaillancourt, 2019; Gover et al., 2011; Guzman-Gonzalez et al., 2016; Yarkovsky, 2016). This was not surprising given the relatively larger representation of dating aggression studies in the literature on emerging adult social adjustment outcomes. That literature is based on a firm neuropsychological theoretical foundation associating social and dating aggression with self- and emotional regulation difficulties (Finkel, 2014; Heatherton & Wagner, 2011). Given the role of ToM in maintaining healthy romantic relationships (Arriaga & Rusbult, 1998; Courtain & Glowacz 2018; Rusbult et al., 1991), it is not difficult to see why it negatively predicted dating aggression. A strong measurement model also contributed to model fit after sexual and emotional dating aggression were removed based on theoretical and empirical grounds. Based on past research which focused on physical and emotional dating aggression perpetration, the current study excluded sexual dating aggression from latent dating aggression. Emotional dating aggression was removed based on a poor factor loading with latent dating aggression.

Gender Covariate. Contrary to expectations, gender was not a significant covariate predicting dating aggression. This was surprising as gender is an often-researched predictor of

dating aggression. In keeping with reviews of gender differences on dating aggression, the young women of this sample reported higher rates of physical dating aggression perpetration than men (Wincentak et al., 2017). However, in the current sample gender did not have as significant an impact as EF difficulties, ToM, or part time university status, in predicting dating aggression.

Covariates

Part-time university status was added to the model as a covariate because it was associated with both a model predictor and a model outcome. Specifically, part-time students displayed more difficulties in reading social cues from eye-expressions and perpetrated more physical dating violence. Although not originally envisaged to predict dating aggression, part-time university status was also retained for theoretical reasons. Researchers investigating risk and protective factors of dating aggression have debated whether less university engagement is a protective or risk factor for dating aggression perpetration (see Kaukinen, 2014, for a review). They acknowledged that greater engagement in university, such as with full-time studies, can increase stress putting one at risk for perpetrating dating violence. However, they concluded that decreased university engagement, as is the case with part time studies, creates more opportunity for dating aggression, making it a risk factor (Kaukinen, 2014; Mason & Smithey, 2012). This justified the post-hoc inclusion of part time university status in the dating aggression model.

Effect of EF Difficulties on ToM

Contrary to Hypothesis 3, survey-based EF difficulties did not predict ToM in any models, failing to contribute unique variance to ToM over and above model covariates. This contradicts developmental theories establishing causal connections between these variables such as the emergence account of EF and ToM (see Devine & Hughes, 2014 for meta-analysis; Marcovitch et al., 2015; Razza & Blair, 2009). While survey-based EF difficulties did not predict

ToM in the current sample, McCleary et al. (2012) did find that EF correlated with ToM in their emerging adult sample. For this reason, EF difficulties and ToM were specified to covary in all the models. They did so over and above covariates in three of the five models in keeping with McCleary et al. (2012). Note that without an association between survey-based EF difficulties and ToM, ToM could not mediate the association between survey-based EF difficulties and any of the social adjustment variables.

In contrast to survey-based EF difficulties, there was a significant moderate-sized effect of performance-based EF difficulties on ToM. As expected, performance-based EF difficulties negatively predicted ToM. It is not clear why performance-based EF difficulties, but not survey-based EF difficulties predicted ToM. However, it is noted that like the performance-based EF tasks used in this study (Delis, 2001), the tasks to read social cues from eye expressions, or from story characters were similarly considered performance-based tasks, as opposed to survey or questionnaire measures. In their review, Toplak et al. (2013) explain that performance- and survey-based tasks are not necessarily interchangeable. Performance-based tasks and survey-based measures created for the same construct, may be measuring different things. In the current study, both the performance-based EF and performance-based ToM tasks measure participants' abilities in structured lab settings. This commonality may be what allowed their regression to be significant. In contrast, the self-report questionnaires of self- or emotional regulation measuring EF in everyday settings (Toplak et al., 2013), are not matched with the performance-based ToM tasks for the structured setting, perhaps precluding significant regression. Future research should further investigate regressions of ToM on performance-based and survey-based measures of EF difficulties to assess this possibility.

Given the significant associations between performance-based EF difficulties and ToM, and between ToM and employment adjustment, it was possible to test mediation of an EF/social adjustment link by ToM. As hypothesized, ToM mediated the effect of EF difficulties on employment adjustment. This was in keeping with both social information processing models (Crick & Dodge, 1994; Perez-Edgar, 2012) and multi-level social competence models (Yeates et al., 2007). These models implicate inhibitory executive functions in the ability to access ToM. They also highlight the important role of ToM in guiding appropriate social behaviour across a variety of contexts, including the employment context.

Relative Strengths of Models

Another hypothesis was that the effects of EF and ToM on social adjustment would be greater for advanced developmental tasks, than for less salient social peer adjustment. In reviewing the findings, effects of EF and ToM ranged from small to large across the range of social adjustment outcomes, with no discernible pattern. However, greater model fit for the employment and romantic adjustment models, relative to the peer adjustment model, supports this hypothesis. This is in line with developmental task theory (McCormick et al., 2011) which states that certain tasks will be challenging or salient for particular stages of development. The implication is that skills and abilities contributing to those social tasks, such as EF and ToM, will play a greater role in success in those salient tasks, than in less salient tasks. This explains why the advanced social adjustment task models fit better in this emerging adult sample, than the less advanced peer, more basic peer adjustment tasks.

Developmental task theory also suggests that occupational and romantic adjustment each depend on having reached peer adjustment. Given these relationships, it was hypothesized that all three forms of social adjustment would significantly covary. However, contrary to

expectations, only positive relationship qualities and dating aggression significantly covaried in the full model, and no social adjustment domains covaried with any other social adjustment domain. The lack of covariation between the social adjustment domains was also likely responsible for the poor fit of the model containing all five forms of social adjustment.

The lack of covariation between social adjustment domains may not be incompatible with developmental task theory (McCormick et al., 2011). While many young people reach appropriate emerging adult milestones on time, they may do so in different ways. One emerging adult may choose not to pursue post-secondary education, then move in with a romantic partner and begin working. Another emerging adult may decide to continue to remain single and live with their parents while they complete a university degree (McCormick et al., 2011; Shulman & Connolly, 2013). Being well-adjusted as an emerging adult depends on being engaged in at least one developmentally salient emerging adult task, even if being engaged in one social adjustment domain, may not provide much information on engagement in another domain.

ADHD Status

None of the models could be identified when pooling participants with either ABI, ADHD, or a non-specified neurological condition into a singular neurological status indicator. However, when ADHD status alone was used, it positively predicted EF difficulties in the peer adjustment model. It was also found, post-hoc, to positively predict chronic anxiety across four of the five models. These findings align with the understanding of ADHD as a neurodevelopmental disorder affecting frontostriatal circuitry. Such frontostriatal disruption is associated with attention, impulse, and emotional regulation difficulties, and other EF problems among those with ADHD (Barkley 2015; Bora & Pantelis, 2016; Chahín-Pinzón, 2015; Jiménez-Figuerora et al. 2017; Nigg 2006; Vaqueno-Madrid & Estevez-Díaz, 2006). Neurologically-

based emotional regulation difficulties are also partly responsible for co-morbid anxiety disorders among those with ADHD (Faraone et al., 2019). Although it was also hypothesized that neurodevelopmentally impaired participants would struggle with ToM, this hypothesis was not supported. While ADHD has been known to affect social cognition, this effect is understood to be mild, resulting indirectly from EF difficulties (Sinzig et al., 2008; Uekermann et al., 2010). Effects have also mainly been found among children (Bora & Penttilä, 2016; Uekermann et al., 2010). The mild nature of the effects of ADHD on social cognition explain why no effect of ADHD on ToM was found in the current study.

Family Functioning

Also as expected, family functioning indirectly predicted EF difficulties through increased chronic anxiety across all five models. Family dysfunction and anxiety represent social and psychological factors influencing social adjustment, as outlined in Yeates et al.'s (2007) multi-level social adjustment model. Moreover, other neuropsychological models such as the cortical/sub-cortical balance (Heatherton & Wagner, 2011) and I³ (Finkel, 2014) models account for how a stressful family environment can put one at risk for chronic anxiety and EF difficulties. Unsupportive environments can lead to hyperactivation of subcortical structures responsible for anxiety, and reduce the efficiency with which frontal connections responsible for EF manage and coordinate our thoughts and feelings.

3.5.2 Limitations

The first limitation was the failure to use alternatives to self-report of emerging adults' social adjustment outcomes, such as other informants. Social desirability, and self-serving biases may have led to inaccurate reporting of socially unacceptable behaviours such as poor work performance, or dating aggression. When assessing participants' CGPA, another preferable

alternative source of information to self-report would have been the students' transcripts.

Second, while latent peer adjustment was included in the current study models, it would have been preferred to include indicators of externalizing and aggressive behaviour with peers. Peer social difficulties, or low peer functioning scores, cannot be equated to aggression or externalizing symptoms. The literature indicated that EF mainly predicted aggression, as opposed to social difficulties. Note, however, that while a measure of aggression or externalizing symptoms was not included in the peer context, the dating aggression measures were included for inclusion of an externalizing measure. Third, final models of social adjustment were based on exploratory model trimming and building and did not reflect the hypotheses precisely as originally specified. However, note that when exploratory models were explored, full disclosure was provided and such explorations were carefully guided by the literature (see O'Connor et al., 2011). Fourth, the sample would have ideally consisted of a larger subsample of individuals with frontal brain injuries. Despite best efforts, only 14 individuals reporting histories of head injuries were recruited and contributed data. Among those recruited, time constraints precluded them from completing all important study measures. This led to power issues in attempting to determine the effect of their neurological status on social adjustment. Fifth, ideally all outcome variables would have been latent variables, however this was not always the case. The work adjustment and positive relationship qualities variables were single indicators of work adjustment and positive relationship qualities. These would have been inappropriate to regress on occupational academic adjustment, or latent dating violence, respectively. Sixth, in order to satisfy software requirements for bootstrapped estimates and modification indices, it was necessary to use single-imputation to fill in missing data. Consistently using original data would have been preferred. Note, however, that the final model fit statistics were obtained through

using FIML and the original data that included missing data. Seventh, this study was based on a convenience sample. While a truly random sample is ideal, it would have involved costly methods of recruitment such as paying participants randomly solicited from telephone directories. Finally, it would have been preferable to obtain measures of academic performance such as reading, writing, and math achievement tests, however this was not done in the interest of participants' time.

3.5.3 Future Research

Future research should replicate these results using other imputation techniques, such as Bayesian multiple imputation (Nielsen, 2003). Researchers should further explore the nature of gender differences in the association of EF difficulties with dating aggression (Gratz, Paulson, Jakupcak, & Tull, 2009). Future research should also recruit more men to see if that might lead to greater power in finding gender differences. Such future studies may opt to use online as opposed to in person assessment of dating aggression to reduce social desirability issues (Fernández- González, O'Leary, & Munoz-Rivas, 2013). Future research should also determine whether transgender identification influences any of the study variables included in this chapter. Better inclusion or understanding of non-heterosexual or transgendered individuals is of increasing priority in today's society. Such research and should engage community members in the research designs (Reuter & Whitton, 2018). Similarly, greater subsample sizes of participants from varying ethnocultural groups would allow for better assessment of ethnocultural differences (West, 2012). Future research may also employ different types of study designs to investigate these topics. For example, Cohn et al. (2010) included an experimental paradigm that allowed them to induce aggression victimization in dating partners (in the forms of uncomfortable blasts of white noise), to measure retaliatory dating aggression. Neuroimaging research may also be of

interest, to test cortical/sub-cortical balance models that account for effects of EF on social adjustment through differential activation of cortical and sub-cortical structures. Future research should also investigate these issues in clinical samples of individuals with other neurological issues including epilepsy, and stroke (e.g., Kim, Choi, Kwon, & Seo, 2002). If lacking the ability to recruit large clinical subsamples, future research could focus on qualitative methods appropriate for smaller sample sizes.

3.5.4 Implications

The findings have important implications for neuropsychological models of self and emotional regulation and social and dating aggression (e.g., Finkel, 2014; Heatherton & Wagner, 2011), developmental task theory (McCormick et al., 2011), as well as contextual-developmental systems theory (Sameroff, 2010) and multi-level social competence models (Yeates et al., 2007). Neuropsychological models such as I³ (Finkel, 2014) and the cortical-subcortical balance model (Heatherton & Wagner, 2011) argue that social adjustment is predicted by biological, as well as psychosocial predictors. Significant findings of ADHD status on EF and chronic anxiety in the current study, support these models. That is because disruption to frontostriatal circuitry characteristic of ADHD (Barkley & Fischer, 2006) acts as a biological disinhibition factor, and comorbid anxiety (Faraone et al., 2019) as a psychological factor, for increased risk for aggressive behaviour. Significant influences of family functioning and chronic anxiety on EF difficulties and on social adjustment, also support the psychosocial aspects of developmental-systems theory (Sameroff, 2010), and the multi-level social competence model (Yeates et al., 2007).

The findings also have implications for Developmental Task Theory (McCormick et al., 2011). The finding that the best fitting models were those of employment and romantic

adjustment, suggest that findings were strongest for developmental tasks salient at the emerging adult stage, as predicted by the theory (McCormick et al., 2011).

Finally, the nature of this study being SEM, has implications for future research with ToM. Past research findings were mixed regarding the effects of ToM on social adjustment variables in emerging adulthood (Hao & Liu, 2016; McCleary et al., 2012; Perrone-McGovern et al., 2012). Some authors suggested conceptual reasons behind not finding significant effects between ToM and social adjustment (Hao & Liu, 2016; McCleary et al., 2012) such as emerging adults' disinterest in using ToM to guide actual social behaviour (Hao & Liu, 2016). Meanwhile, others offered measurement-based reasons, citing the low correlation between various measures of ToM (McCleary et al., 2012). Ultimately, two conceptually and empirically correlated measures of ToM were retained in the current study's models. These were social-cue reading from stories, and from eye-expressions, respectively. Finding significant results between these variables and the study outcomes suggested that latent versions of ToM variables may provide a certain advantage in ToM research by reducing measurement error (Ulman & Bentler, 2012). It is hoped that using SEM to overcome some of the issues around ToM measurement will attract more researchers to investigate associations between ToM and social adjustment in emerging adults.

3.5.5 Applications

There are many applications of the current findings to emerging adult well-being. Emerging adulthood is fraught with complex challenges in coordinating friendships, work, studies, and romantic relationships (McCormick et al., 2011; Shulman & Connolly, 2013). The current study findings were also complex, featuring interacting developmental-systems, and multi-level variables, as well as spill-over effects between different domains of social

adjustment. Understanding the full range of complex biopsychosocial predictors of social adjustment and how they interact can help clinicians address the full range of contributors potentially impacting emerging adults. In addition to addressing social issues, clinicians can recognize biological and cognitive risk factors that may be impairing clients' abilities to adjust socially. Understanding these risk factors would be important for guiding treatment. For example, EF coaching, which is used to help many young people with ADHD, works under the assumption that EF difficulties are biologically, in addition to psychologically mediated. Therefore, appropriate approaches to helping these youth may involve helping them compensate for and manage their EF difficulties. Such an approach can be used to help young people with other neurological and neurodevelopmental conditions who struggle with EF, ToM, and social adjustment, such as those with head injuries or stroke (Yeates et al., 2007), schizophrenia (McCleary et al., 2011), or autism (Baron-Cohen et al., 2001). Understanding the effects of the brain on behaviour, and how even mild brain damage interacts with psychosocial variables such as one's developmental stage, is important. It can help clinicians be more sensitive to biologically-mediated issues their clients may face, while still facilitating their progress.

3.6 Conclusion

One of the strengths of the current study was the large sample size, allowing for the assessment of a complex quantitative model of social adjustment. However, the study was still limited by the low number of individuals with neurological issues to quantitatively test for their effect on EF, ToM, and social adjustment outcomes. A study featuring interviews with 15 individuals with histories of mild traumatic brain injuries, was designed to address this issue using qualitative methods.

Chapter Four: Study 3 Qualitative Analysis of Responses From Emerging Adults With Mild Traumatic Brain Injury

In keeping with the systematic review of Study 1, the quantitative results from Study 2 demonstrated small to large effects of EF and ToM on a number of emerging adult social adjustment variables. Qualitative study of these effects would help explore these variables in depth and allow for further exploration of contextual variables influencing these associations (Patton, 2014, p. 98). The goal of Study 3 was to qualitatively study the associations between EF, ToM, emerging adult social adjustment, and biopsychosocial risk and resilience factors. To increase the chance for in-depth and broad discussions on these topics, only emerging adults with histories of head injuries were recruited for this study, given head injuries represent a biological risk factor for EF and ToM difficulties (Beauchamp & Anderson, 2010; Yeates et al., 2007).

Note that given their head injury histories, generalizability to the typical population is limited. These individuals may differ from emerging adults in the general population in important ways. For example, as head injuries in this population are likely to result from motor-vehicle accidents and sports injuries (McKinlay et al., 2008), individuals from this population may be more likely to be athletic. Notwithstanding, all the emerging adults recruited for this study were university students. The reader is asked to note the many similarities these individuals share with university students in general. Limitations of generalizing findings from university student samples to the general population are discussed in Studies 1, 2, and 3.

As mentioned in Study 2, 30% of young people have sustained a brain injury by the time they reach age 25, and emerging adults aged 15-25 experience the largest incidence rate of these injuries of any age group (McKinlay et al., 2008). Between 70% and 90% of brain injuries are concussions, or mild traumatic brain injuries (Cassidy et al., 2004) primarily caused by motor-

vehicle accidents, and sports injuries (McKinlay et al., 2008). Greater cognitive and social dysfunction result from more severe, or more numerous injuries (Ietswaart et al., 2008; Karr et al., 2014; Milders et al., 2008). However, even single mild injuries can result in dysfunction, though likely peaking and resolving within seven to 90 days of the injury (Karr et al., 2014).

Research continues to associate TBI with cognitive, social-cognitive, social interaction, and social adjustment problems (Rosema et al., 2012; Yeates et al., 2007). Yet the majority of these studies focus on young school age youth (Rosema et al., 2012; Yeates et al., 2016). Adult studies of acquired brain injuries tend not to restrict eligibility criteria to emerging adulthood (e.g., Moreno, Arango-Lasprilla, & McKerral, 2015). One exceptional study of adults with moderate to severe TBI did demonstrate that EF, in the form of planning and organization, and ToM in the form of mentalizing, predicted favourable employer ratings of job performance (Yeates et al., 2016). However, the overall literature on social adjustment and TBI fails to adequately address the range of social adjustment variables salient at the emerging adult stage (Rosema et al., 2012; Yeates et al., 2016). These include academic and romantic adjustment in addition to employment adjustment (McCormick et al., 2011). Given that this is an emerging topic of interest, qualitative responses on these issues from emerging adults with histories of TBI, may be particularly informative.

4.1.1 Brain Injury and Non-Injury Related Risk and Resilience Factors

The multi-level social competence model (Yeates et al., 2007) predicts that a number of risk and resilience factors influence EF, and cognitive and social functioning in the brain injury population. Accordingly, research demonstrates fewer problems with social participation in this population in the context of a warm and nurturing parenting style, and in the absence of family dysfunction (Anderson et al., 2013; de Kloet et al., 2015; Ryan et al., 2016). Having close

friendships also promotes social competence skills, through perceived social support and shared interests with particular friends (Heverly-Fitt et al, 2014). Research also demonstrates greater social participation in this population, when members of the greater community extend warmth and acceptance to those affected by TBI (de Kloet et al., 2015). These risk and resilience factors are likely to directly impact on emerging adults' social experiences, as well as indirectly impact them through EF and ToM difficulties.

4.1.2 Childhood Brain Injury

Despite the larger likelihood of head injury during emerging adulthood, injuries among children aged 5-10 still occur at about half the emerging adult rate (McKinlay et al., 2008). When researchers follow-up on these children one to two decades later, they are studying childhood traumatic brain injury among emerging adults (e.g., Rosema et al., 2015; Ryan et al., 2013; Ryan et al., 2014). Research demonstrates that when children's frontal structures are injured, they are at risk for failing to gain social skills at an age-appropriate rate (Beauchamp & Anderson, 2010; Yeates et al., 2007). More severe injuries may have the longest-lasting effects. For example, one study found that emerging adults with histories of moderate to severe childhood brain injury, demonstrated emotional perception difficulties. These indirectly predicted externalizing symptoms through social communication impairments (Ryan et al. 2013).

However, another study demonstrated that while emerging adults with mild to severe childhood TBI displayed less social skills, or more internalizing symptoms than controls, these all still fell within normal ranges (Rosema et al., 2014). There were also no differences in externalizing symptoms between those with childhood TBI and controls, and psychosocial developmental trajectories were within normal limits. Therefore, it is not clear whether emerging adults would experience long-term social adjustment effects from childhood injuries.

Together, these findings suggest there is a rich set of biopsychosocial factors influencing the successes and challenges of emerging adults with TBI at risk for poor social adjustment.

Those with histories of recent head injuries, occurring in emerging adulthood, are likely to differ from those with childhood injuries from prior developmental stages. Despite acute effects on cognitive and social functioning, moderate to severe childhood injuries may fail to result in significantly impaired social functioning beyond the acute stage, reaching into emerging adulthood (Rosema et al., 2014). Separate analyses between emerging adults reporting childhood versus recent head injuries were therefore indicated.

4.2 Current Study

The goal of the current study was to qualitatively explore concussed emerging adults' experiences of their executive, social-cognitive, and social functioning. Questions and discussion topics for semi-structured interviews were based on this writer's understanding of the neuropsychological multi-level social competence model (Yeates et al., 2007). A deductive thematic analysis based on this model, couched in realist and reality-testing frameworks (Braun & Clarke, 2006; Patton, 2014, p. 98), biased interpretation of interview responses. Analysis may have also been influenced by this writer's clinical neuropsychological practicum experiences. Advantages and disadvantages of these approaches and biases are reviewed in a positionality section in the Methods and Discussion Limitations sections.

4.3 Methods

4.3.1 Participants

Among 15 participants recruited for the study, 10 reported recent head injuries, and six reported childhood head injuries. One participant was interviewed twice, on separate occasions, to discuss their childhood and recent injuries.

Sample 1: Recent Head Injury

The 10 participants in the recent head injury sample were 18 to 29 years old ($M_{\text{age}} = 23.6$; $SD = 4.45$). There were six men and four women. Two participants reported severe injuries, two reported mild injuries, two reported moderate injuries, and four reported having multiple injuries including having all mild or one or more moderate injuries. All participants were York University students including two graduate students, one law student, two students completing their MBA, and five students completing undergraduate studies. Four participants were single, one was casually dating, two were in a committed relationship, one was cohabiting with their partner, and two were married. Participants had their injuries from zero to seven years prior ($M = 2.15$; $SD = 2.38$), when they were 17 to 27 years old ($M_{\text{age}} = 21.5$; $SD = 3.077$).

Sample 2: Childhood Head Injury

The six participants in the childhood head injury sample ranged from 17 to 25 years of age ($M_{\text{age}} = 2.15$; $SD = 2.38$). There were four men, and two women. One injury was reported to be single and mild, two cases were of multiple injuries where there was at least one minor injury, and three participants could not report on the severity of their head injury. All participants were attending York University. While one was attending law school, the rest were enrolled in undergraduate studies. Four participants were single, and two participants were in a relationship. Their injuries occurred between three and 13 years prior ($M = 7.083$; $SD = 3.44$) when participants were seven to 16 years old ($M_{\text{age}} = 12.6$; $SD = 3.6$). See tables 15 and 16 for participant characteristics.

Table 15

Participant Characteristics – Sample 1: Recent Head Injury Sample

Participant	Gender	Age	Age of Injury (yrs)	Yrs Since Injury	Injury Severity	Study Major	Relationship Status	No. Codes
2.	M	25	15, 16.5, 22	3	Mild-Mod. (Multi)	Law School	Relationship	41
3.	W	19	19	0	Mild	Kinesiology	Single	54
8.	M	27	23	4	Mild (Multi)	MBA	Single	31
9.	W	18	18	0	Severe	Theatre	Relationship	77
10.	M	28	Latest 21	7	Mod. (Multi: 7 injuries)	Graduate Social Theory	Married	73
11.	M	28	27	1	Severe	Video-Editing	Single	71
12.	M	29	24.5	4.5	Mild	MBA	Married	51
13.	W	20	20	0	Moderate	Comp. Sci.	Cohabiting	70
14.	M	24	23	1	Moderate	Biology	Single	75
15.	W	18	17	1	Mild (Multi)	Commerce	Dating	30

Table 16

Participant Characteristics – Sample 2: Childhood Head Injury Sample

Participant	Gender	Age	Age of Injury (yrs)	Yrs Since Injury	Injury Severity	Study Major	Relationship Status	No. of Codes
1.	W	23	16	7	IDK	Psychology	Relationship	78
2.	M	25	15, 16.5	9.5, 10	>=1 minor	Law School	Single	55
4.	W	20	7	3	IDK	Marketing	Single	47
5.	M	17	10	7	Minor	Schulich iBBA	Relationship	25
6.	M	20	12	8	IDK	Law and Society	Single	48
7.	M	19	13, 15.5	3.6, 6	Minor	Kinesiology	Single	83

4.3.2 Measures

Structured Interview Questions

Structured interview questions guided by Yeates et al.'s (2007) multilevel social competence model, and this writer's clinical neuropsychological experience, were used to generate qualitative data (see Appendix C). The questions were designed to assess the successes and challenges of emerging adults with mTBI in the areas of cognitive and executive functioning and ToM; as well as peer interactions and friendships, academia, employment, romantic relationships, and dating. Questions also focussed on the people, and community programs and institutions, possibly influencing their successes and challenges. Additional questions probed for insights into any connections participants perceived between their cognitive and social-cognitive abilities, social adjustment outcomes, and external risk and resilience factors. The set of questions generated were discussed with the principal supervisor of the project. Revisions were made from the first to the last draft to include more specific questions targeting the variables of interest including the neuropsychological and social adjustment variables of interest. An example question was "Have you ever experienced problems with attention or concentration, as a result of your injury?". See Appendix C for the full set of questions.

4.3.3 Researcher Positionality

Framework

This project used reality testing, and realist inquiry frameworks, based in philosophy (Patton, p. 98) to guide the research. This project also used thematic deductive analysis. As it was a deductive analysis, it was guided by neuropsychological theory underlying Yeates et al.'s (2007) multi-level social competence model.

The reality testing framework assumes that scientific knowledge is limited to what can be deduced from theory. It is used to test whether a theory corresponds with reality. It is acknowledged that its limitations include the inseparability of scientific inquiry from judgment, the imperfection of measurement, the situation of knowledge within particular historical paradigms, and the element of uncertainty in causal conclusions. Like the reality-testing framework, the realist framework is based in empiricism. Yet, it also seeks to understand the causal mechanisms explaining how and why reality operates in the particular contexts of interest. It assumes that both concrete and invisible phenomena such as cognitive abilities or social adjustment are “real”, and its purpose is to explain the causal associations between phenomena. Like the reality testing framework, it is useful for testing and refining theory. These frameworks are contrasted against popular inductive approaches, such as grounded theory, in which analysis is for generating, as opposed to testing theory.

Thematic analysis (Braun & Clark, 2006) allows one to identify and analyse patterns or themes from qualitative data. Given its flexibility and compatibility with a range of qualitative inquiry frameworks (Braun & Clark, 2006), it was used for the deductive analysis of the successes and challenges of emerging adults with TBI, in relation to peer, occupational, and romantic adjustment.

Justification of Sample Size

Boddy (2016) suggests that qualitative analyses based in empiricist frameworks should seek either relatively large samples which can represent the population of interest, or saturation of themes. The latter is achieved when analyses of additional participants fail to uncover unique themes. The original goal was 10 participants. A total of 15 were recruited in order to conduct separate analyses based in childhood versus recent head injuries. Saturation of themes was

assessed by comparing the themes from the separate analyses. The sample size would be deemed sufficient for the reality testing and realist frameworks if one sample did not substantially add to the themes derived through the other sample. To the extent that no additional major themes would emerge from Sample 2, the analysis focused mainly on results from Sample 1.

4.3.4 Transcription and Coding

Transcription

The interviews were transcribed verbatim by the primary researcher or one of three undergraduate volunteers. After a polished draft was created, this writer checked the transcript from each interview back against the original audio recording to ensure fidelity (Braun & Clark, 2006, p. 96). Participant 10's interview was lost during the transfer of audio files from the recording device to the transcription laptop. The participant was offered compensation to redo the interview. The new interview was guided by and compared to this writer's notes from the original interview. It was judged to be a good representation of the original interview.

Coding

Data Set. The data set was generated by the interviews on participants' neuropsychological outcomes, social adjustment, and sources of support. These were part of a larger body of interview questions including questions on how participants' injuries may have changed the values they placed on peer, occupational, and romantic goals from before to after their injury. The questions on participants' potential value changes involved prompting participants to deeply reflect on their lives and the social adjustment domains in the few months leading to, and months following their injuries. These questions were originally designed to provide context for any reported changes in neuropsychological or social adjustment outcomes reported across the injury. This would help later interpretation. It would allow for the separation

of changes in social adjustment outcomes due to neuropsychological changes, from changes in values or interest placed on those particular social adjustment outcomes due to development, maturity, or other factors. The larger body of questions also served to build rapport between the examiner and the participant and helped the examiner tailor questions for probing for changes in neuropsychological or social functioning. Because the knowledge gained about each participant's social domain values were reflected in the specific probing questions the examiner asked them during neuropsychological questioning, pertinent information was not lost by limiting the analysis to the answers to the neuropsychological interviews.

Coding Procedure

Coding was exhaustive from the answer to the first question from the neuropsychological interviews, to the answer to the last question (Braun & Clarke, 2006). The primary researcher investigator coded the data through the deductive reality testing and realist lenses (Patton, 2014, p. 98), as guided by Yeates et al.'s (2007) neuropsychological multilevel social competence model. Generation of initial codes led to an overall coding framework. Each code was then systematically checked to ensure they were populated by appropriate data extracts, and that the data extracts were coded to as many relevant codes as necessary. Themes and sub-themes of the codes were then generated, guided again by the neuropsychological multi-level social competence model.

Coding Verification

Three undergraduate volunteer assistants were trained on the qualitative Study 3 proposal, deductive analysis, and realist and reality-testing frameworks during a laboratory presentation, and during a separate meeting. Guided by Patton (2014, p. 555) they were deemed competent judges to (a) verify the plausibility of the overall coding and thematic structure, and

(b) verify the codes were populated by appropriate data extracts (Patton, 2014, p. 555). At least two volunteers provided feedback on these points across two meetings and rounds of revisions. The overall structure was deemed plausible by the undergraduate volunteers from the outset. The first round of revisions resolved minor disagreements on the suitability of specific data extracts to particular codes and the names of the codes and themes. The second round of revisions resolved remaining minor disagreements on the names of the codes and themes.

4.4 Results

4.4.1 Summary of Themes From Sample 1: Participants With Recent Head Injury

Major Themes and Sub-Themes

The major themes at the broadest level were the reporting of problems and the reporting of a lack of problems, in relation to the examiners' questions on the outcomes of participants' head injuries (see inner Problems sub-themes versus peripheral No Problems sub-themes in Figure 6).

Using lay terms co-created between the examiner and the participants, all participants reported at least one problem related to EF, ToM, or other cognitive problems; social adjustment problems, physical symptoms, or long-standing temperament-related characteristics; or unsupportive others, or problems coping (see bottom half of Figure 6). Resilience sub-themes also emerged in relation to the Problems theme, including the presence of social support, success with coping strategies, and the short duration of symptoms (see top half of Figure 6).

On the other hand, all participants also reported not having a problem in at least one of the aforementioned areas. Six participants also reported a neutral effect of potential sources of support, on their functioning (see peripheral No Problems and No Effect sub-themes in Figure 6).

Connection Sub-Themes

Participants reported connections between many of these sub-themes (see solid arrows in Figure 6). These connections were deemed sub-themes in their own right. Participants made direct causal connections from their EF, ToM, and other cognitive problems, to their social adjustment outcomes. They also discussed the direct causal impact of supportive or unsupportive others, on either their EF, ToM, or other cognitive problems, or on their social adjustment problems. Furthermore, they made causal connections from their physical symptoms and problems coping to their social adjustment problems—although, they did not produce a theme of causal connections from physical symptoms or problems coping to EF, ToM, or other cognitive problems. In another theme, participants related the short-lived nature of their head injury symptoms to the resolution of their problems. Finally, some participants even drew complex three-node connections, discussing how supportive others, or successful coping, indirectly alleviated problems with social adjustment, by first affecting EF, ToM, or other cognitive problems (see dotted arrows forming three node path in Figure 6).

Details of these sub-themes with data extract examples follow. Predetermined (P) themes assumed apriori based on the multi-level social competence model (Yeates et al., 2007) are distinguished from emergent (E) themes using the appropriate initials (see Butzer et al., 2017, for these distinctions). The letter (S) in data extract examples denotes the participant, and the letter (E), the examiner.

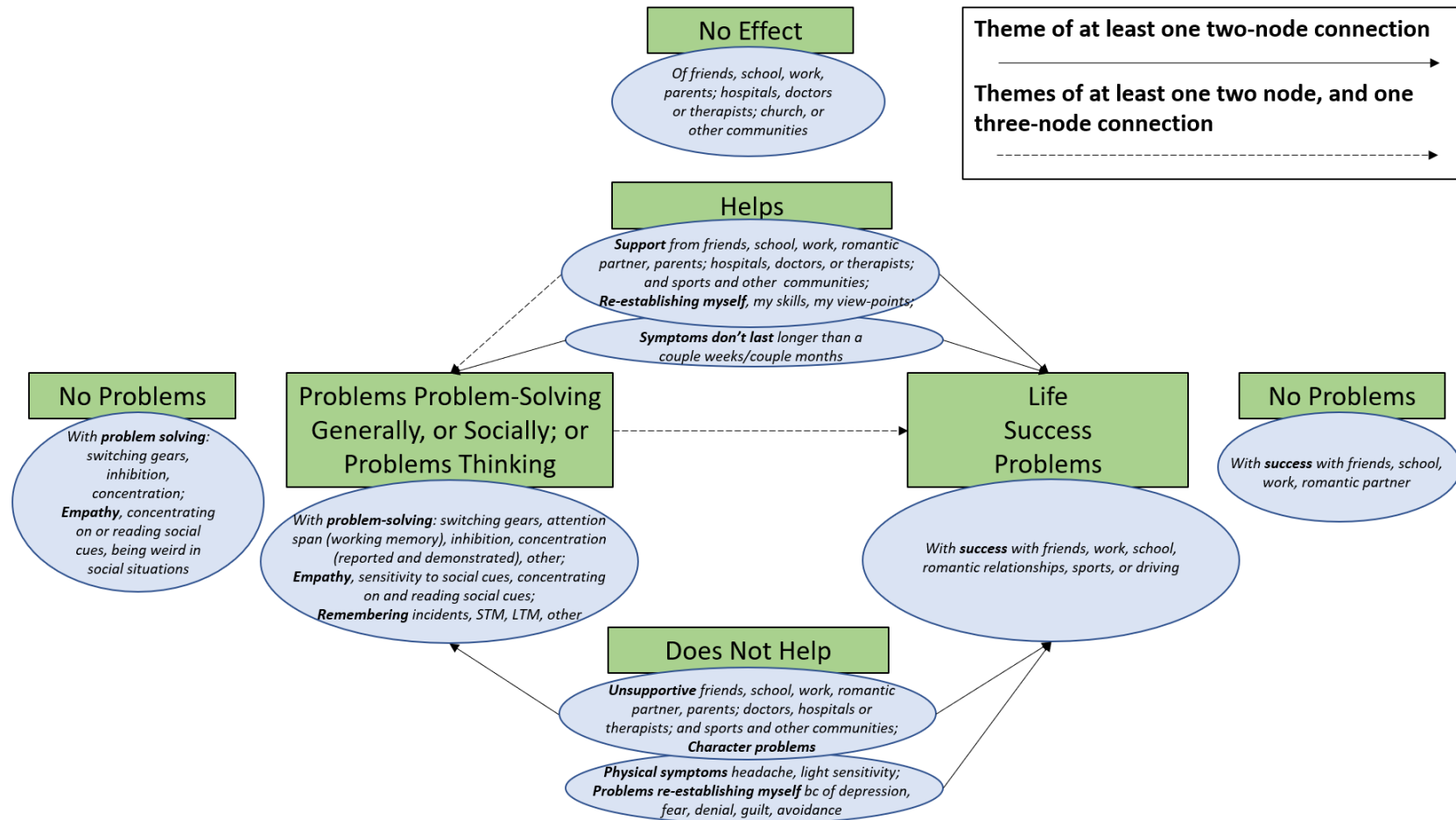


Figure 6. Thematic map for Sample 1: Recent brain injury sample

Problems With General Problem-Solving - EF Problems (P). Nine of 10 participants reported difficulties with problem-solving, representing EF problems. In lay terms co-constructed with the examiner, these included problems with switching gears, attention-span, inhibition, or concentration. Technically, these related to problems with cognitive flexibility, working memory, inhibition, or concentration, respectively. Participant 11, for example, discussed problems switching gears, as follows:

S: Maybe I'm inflexible because like - if something worked out a certain way before, like- I want to replicate it - I don't want to deviate from that.

E: Mmm...

S: Yeah

E: And is that something that's kind of like a personality trait of yours or is there a difference do you think from before, to after the injury?

S: I mean now like I'm more- like, if it works, just do it that way – don't deviate from that

E: Yeah

S: Yeah. I think I took more risks before.

Problems With Social Problem-Solving - ToM Problems (P). Five participants reported problems with problem-solving in social situations. Participants reported problems with empathy, being sensitive to social cues, concentrating on social cues, and reading social cues. These were elicited when the examiner probed using ToM questions for information on perspective-taking, social perception, social encoding, and reading social cues, respectively. For example, Participant 14 discussed their problems with reading social cues.

S: Yes- um, because I would not be able to accurately...read her- so if she was angry, I would not really understand it. So, I had to make a conscious effort of asking- "hey are you angry?" And she would say, "no" - I'd be like "ok! not angry".

E: Hehe

S: So I did not delve more into it- whereas before I would say "are you angry?", and she would say "no" I'm like "no, something is- uh, bothering you right now- do you want to talk about it?"

Problems Thinking - Other Cognitive Problems (E). Five participants reported problems thinking. These cognitive problems could not be categorized as EF or ToM difficulties. In their own words, participants reported problems remembering past incidents, and problems

with short-term memory, and long-term memory. Their descriptions of difficulties remembering past incidents represented episodic memory problems. Participant 9 recounted her experiences forgetting all incidents over a number of days.

S: Yeah. Injury in May, moved out in March. So, I have been told that I don't remember. So the injury happened like Monday night or Tuesday morning, I guess, if you want to be specific and from- I don't remember anything from Tuesday, Wednesday, Thursday, I want to say.

Life Success Problems – Social Adjustment Problems (P, E). *Predicted Themes.*

Participants were asked questions relating to peer, academic, employment, and romantic adjustment. All 10 participants discussed issues frustrating their attempts to achieve life success, in particular domains. These included problems interacting either with friends, or with the public in general; school classmates, professors, or school staff; work managers, co-workers, or other staff; or romantic partners. For example, Participant 14 stated that his injury kept him away from work for a time:

E: Ok- and do you feel that this, um- during this period of time, there's any effect on your work- or were you not at work?

S: Um- I had stayed away from work.

Emergent Themes. There were also several emergent life success sub-themes. Two students discussed their maladjustment in terms of a loss of driving abilities. Three student athletes discussed difficulties engaging in their athletic activities. Participant 9, for example, discussed her problems with driving following her injury:

S: Back home, before I moved, during, when I was driving I usually, obviously I couldn't drive for a hot minute 'cause I was concussed and didn't have a car, but when I did start driving it was kind of- I think I was a worse driver.

Connections Between Problems With General or Social Problem-Solving, or Thinking; and Life Success Problems (P). Interestingly, participants made statements connecting their EF,

other cognitive, or ToM problems with their social adjustment problems. All 10 participants made at least one such connection.

For example, Participant 10 connected his concentration difficulties, referred to as “spacing out”, to his academic problems.

S: ...Like I need the break, I'm kind of clocking out and spacing out. And kind of thinking "my mind's kinda going in different directions" ...and I find that it's somewhat of a disassociation with the class, if I'm in there for too long.

Similarly, Participant 9 linked her difficulties remembering incidents, to a romantic relationship problem.

S: ...In the first few days especially, I did not remember him and I didn't remember our relationship. And he said that that- it hurt, and it was frustrating. I can only imagine. He tells me that it took me a while to remember what he did for me for my birthday, and where we went for our 6 month anniversary.

Similarly, Participant 12 linked his concentration difficulties to problems with athletic activities.

S: ...just couldn't focus on the- what was going on... like I remember being really distracted by the headaches – I tried to push it for a little bit- to a few weeks after, but it wasn't just going- and I had to call out for a couple matches that I was playing- so – yeah.

Unsupportive Others (P). Five participants reported instances in which friends, school classmates or staff, co-workers or managers, romantic partners, parents, sports teammates or coaches, or medical personnel or therapists, were not supportive in helping them with their problems.

Participant 9, for example, expressed feeling unsupported in general, by a parent.

S: ...My mom and [my boyfriend] said that my dad came to visit me, it was either 3 days after or 5 days after the accident. And then after that he hasn't really, as far as I can remember, he hasn't really reached out to me about anything. So I guess that's an example of- not like a negative reaction, like obviously, he wasn't mad at me for getting a concussion, but it wasn't the reaction that I was hoping for, you know?

Connection Between Unsupportive Others and Problems With Problem-Solving

Generally or Socially, or With Thinking (P). Five participants described how individuals and institutions were not supportive in their dealing with EF, ToM, or other cognitive difficulties, in particular.

Participant 11, for example discussed how a perceived lack of support from a range of individuals negatively affected his ability to concentrate:

E: Yeah. And- what about some of the negative influences that you've experienced- like you mentioned your dad kind of seemed disappointed- your girlfriend when you had her - she was focused on her own needs- um- your coworkers, some of them were kind of not really empathetic with you- did that make some of the um difficulties with attention, and concentration, and problem-solving harder or easier for you?

S: It did because- harder- because um...you know there's like they're like evaluating me, and I'm evaluating myself and then- all that's in my head space and then I'm not like thinking of other things- feels like I'm juggling too many things in my mind.

Connection Between Unsupportive Others and Life Success Problems (P). Four

participants discussed how the lack of support from others negatively affected their social adjustment.

For example, Participant 15 reported how her hockey program failed to be a source of support for her following her injury. This negatively impacted on her adjustment in hockey, and in other domains of her life:

E: And what about, um... you know- just the fact that you're involved in the hockey program- do you feel that that made things at all easier to- to cope, or go through things like your coaches, your- or- no change, or harder?

S: Probably harder

E: Harder?

S: It's like - a lot more pressure

E: Mmm

S: Especially after a concussion

E: Mmm [soft] and would that be umm- harder to cope with hockey itself, or like with other areas like- like the pressure that you felt like for hockey- would that kinda make things harder with- school?

S: Umm-

E: Or just for the hockey?

S: Like for everything.

Character Problems (E). Five participants made comments about other influences on their EF, ToM, or other cognitive problems, or social adjustment problems. They discussed how problems in these areas were not necessarily related to their head injury, but to temperament-related characteristics they had always had. Participants always spoke of these character problems in direct relation to specific EF, ToM, or other cognitive problems, or to social adjustment problems.

Connections Between Character Problems and Problems With General or Social Problem-Solving, or With Thinking (E). For example, when asked if their difficulty with focusing had changed from before to after their head injury, three participants replied it had not, relating that it had always been an issue.

For example, Participant 8 discussed how his attention issues were long-standing, from before his injury:

E: I was wondering do you feel that difficulty, holding that in mind, do you think that affects your ability to pursue higher education? Succeed in higher education in your program?

S: I think I would have to put in more effort, but yes for sure. I haven't always had a really good attention spans. And this I remember. This I know since, like a while. Like when I was young I haven't had a really strong attention spans.

Connections Between Character Problems and Life Success Problems (E). Participants also related how temperamental characteristics, not their injury, negatively affected their social adjustment. Participant 15, for example, related how in-tune dynamic social behaviour was never her strong suit:

E: Ok. And what about knowing what to do in the- um- in the social situation as it's unfolding? And being able to kinda dynamically respond, back and forth—

S: Uh- that' I've never...been good at-

E: Hehe

S: So...in that, and uh I'm pretty bad at- like responding with like, tough situations, or like knowing what to say...

E: And...in terms of it being any different, before or after? What would you say?

S: Mmm...you know like -it's about the same.

E: It's been a challenge? Equally. Before-

S: Yeah. I was just like, uh - never been one for like talking, so...

E: Mmm[soft]

S: Knowing what to say's never been like a strong suit.

Physical Symptoms (E). Although it was not the focus of this dissertation, four participants discussed the physical or sensory symptoms of their injury. For example, Participant 3 described pounding headaches:

S: I didn't even think I had a concussion. I didn't know until two days after. I didn't know the signs at all, but then after, we have Friday nights [Names event]-- which they play loud music and the lights--like strobe lights and all that. And my head started pounding, like a lot.

Connections Between Physical Symptoms and Life Success Problems (E). Four participants also drew connections between their physical symptoms and social adjustment difficulties.

For example, Participant 13 discussed how both her light sensitivity and headache difficulties affected her ability to carry out her academic responsibilities.

E: How did that um...how did these difficulties affect, like your grades and-

S: Um, I still did well- I just did, uh, drop one of my math classes, because of all the assignments were math online.

E: Mm-hmm

S: So, it was really hard for me to like look at screens and things like that, and then, um, I, didn't attend the midterm because I had a really bad migraine-

Problems Re-Establishing Myself, Skills, or View-Points – Problems Coping (E). Some participants revealed coping problems they were having as a result of their head injury, often in the form of mental health difficulties. As coping was an emergent theme, participants rarely gave it a specific label. However, one participant referred to coping in terms of “re-

establishing themselves”. Three participants discussed problems re-establishing themselves, due to issues with depression, fear, denial, guilt, or avoidance.

For example, Participant 10 confirmed having had depressive symptoms following his latest injury:

E: Right- and did you have any issues with sadness, or depression - in the months following your 21 year old concussion?

S: Yeah - with that concussion, I did.

Connections Between Problems Re-Establishing Myself, My Skills, My Viewpoints; and Life Success Problems (E). Two participants made connections between problems coping and their social adjustment outcomes. For example, Participant 14 stated the negative impact of his denial of his functioning deficits, on relationships with his coworkers, romantic partner and friends.

S: Yeah...I was still trying to manage right from the same as before - so putting as much time in work, in my relationship, in my friendship- it was obviously affected, and I did not want to acknowledge that at the time- I was still like, "I'm fine", and then, it was not fine.

Support From Others (P). Despite the existence of sub-themes of a lack of support and other risk sub-themes, several resilience sub-themes also emerged. Six participants spoke about the support they did receive from others. This included support from friends; classmates, professors, or school departments; co-workers and managers, romantic partners, parents; medical and psychology health professionals; sports institutions, or the community in general.

For example, Participant 2 discussed the support he was receiving from his therapist:

E: Okay. And, but, this therapist, he's been helping you or she's been helping you with that?

S: Yeah. I don't-- I've only-- I saw her for maybe 6, 7, 8 sessions and then the summer ended and she gave me a few additional resources I could pursue.

E: Just this past summer, sorry?

S: This past spring/summer. It was around that time.

E: Okay. 2019.

S: Yes, yes. I haven't followed up on them because you know I felt like I got what I needed out of that.

Connections Between Support From Others and Problems With Problem-Solving

Generally, or Socially; or Problems Thinking (P). Two participants discussed how the support they received from others helped alleviate some EF, ToM, and other cognitive problems they were experiencing.

For example, Participant 10 related how talking with his peers helped him cope with difficulties focusing, and following what was going on in class:

S: And then now, in the phenom course that I had just come out of - I remember it was going on and I was kind of able to ... be like, ok let's just take a second and breathe - and kind of maybe catch up - and if you don't catch up - just wait 'till the break, and then kind of reset, come back to class...I've spoken to 5 or 6 people about it. I'm really happy I had the conversation.

Connections Between Support From Others and Life Success Problems (P). Seven participants discussed positive effects the support from others had on alleviating social adjustment problems.

For example, Participant 13 discussed how her family doctor oriented her toward her university accessibility office to receive academic accommodations following her injury.

S: And then, just- not everyone knows to go to the accessibility office- the only reason why I knew about it, was 'cause my family doctor was, like- "Oh, um, like, does your school have accessibility office- like we need you registered-" and I was, like, "Oh, I should look into that"

Three-node Connections Between Support From Others; Problems With General or Social Problem-Solving, or With Thinking; and Life Success Problems (P). Two participants even made connections between their social support, EF, ToM, or other cognitive problems; and their social adjustment problems.

For example, Participant 11 endorsed having attention difficulties. He went on to explain that these difficulties affected his ability to follow-lectures, but that note-taking support from a peer was helpful with this problem:

E: So first, I wanted to know do you find that maybe the head injury had, uh, an influence on your ability to pay attention- or to focus / concentrate?

S: Yeah - like I get distracted easily now - it's like harder to pay attention in the moment.

E: Mmm

S: I think that's why I need the notetaker, 'cause like - you know the professor will- go on and on and then I can't follow what he's saying.

Re-Establishing Myself, My Skills, My View-Points - Personal Coping Strategies

(E). Nine of 10 participants discussed successfully using coping behaviours and strategies following their head injury. For example, Participant 3 discussed how she conducted internet searching to learn how to respond to having had an injury.

E: Did you also do any searching yourself like Google, or something?

S: Yeah, just the basics. What to do, what not to do.

Connections Between Re-Establishing Myself, Skills, or View-Points; and Problems

With Problem-Solving Generally, or Socially; or With Thinking (E). Four participants spoke about coping strategies in relation to EF, ToM, or other cognitive problems.

For example, Participant 14 talked about his strategy for coping with short-term memory problems, while trying to maintain a high-quality relationship.

S: I would not remember what she said- um to my face. So then, after she left, I would have to write them down on my notes- after, so we did talk about that- we did talk about um- how she wants me to be back next week. We did talk about what she likes to eat- um...we did talk about what, um- issues she was having - um...with a prof- or her families.

Connections Between Re-Establishing Myself, Skills, or View-Points; and Life Success

Problems (E). Five participants spoke about coping strategies that directly positively affected their social adjustment problems.

For example, Participant 13 coped with high academic demands, by rearranging her courses after her injury. She spoke positively about the effect of this on her school performance:

S: I changed my entire course schedule.

E: Oh- really?

S: To try to like, help me with my concussion- 'cause I was taking six courses, and they were really heavy- and I was like- 'I can't do this'.

E: Yeah

S: So I'd kinda change- I took, like, a social science class - I took like a maps class, so that I would just kinda be more like creative- reading, writing based and things like that, that like, I could write on a piece of paper, and then I could have someone type it for me.

E: Right

S: So, it's just a little bit more easier.

Three-node Connections Between Re-Establishing Myself, Skills, or View-Points;

Problems With General or Social Problem-Solving, or With Thinking; and Life Success

Problems (E). Four participants even expressed insight into complex associations, linking all three factors of coping, EF, ToM, or other cognitive problems; and social adjustment problems together.

For example, Participant 9 confirmed seeing a link between her forgetfulness for future scheduled dates, or her prospective memory problems, to the quality of her romantic relationship. However, she also told how coping strategies such as writing scheduled dates down on her chalkboard, compensated for prospective memory problems.

E: And in terms of your relationship, I was wondering if you see any connections between focus and attention, and the things that are important to maintain your relationship with [Boyfriend]...

S: Um at this point, I think like yes and no. I think I can still have a good memory where it counts. Like for our anniversaries, I am never forgetting that. I'm- I actually have this little chalkboard that I got from Target, and it says "blank" days until "blank", I keep it updated in chalk like 6 days until [Boyfriend].

Symptoms Don't Last Longer Than a Couple Weeks/Couple Months (P). Although not originally expected, eight participants discussed the longevity of their symptoms to contextualize their discussions of their EF, ToM, and other cognitive problems; or social

adjustment problems. Only three participants spoke about deficits lasting in the long-term, and only in terms of impacting physical symptoms. However, five spoke about the peak of their symptoms lasting only a couple of weeks or a couple of months.

No Longer Than a Couple Weeks or a Couple Months in Regards to Problems With General or Social Problem-Solving, or With Thinking (P). Four participants spoke about symptoms lasting no longer than a couple of weeks or months with regards to EF, ToM, or other cognitive problems.

Participant 14, for example, spoke about the short-term effects of his head injury on his cognitive flexibility and other symptoms:

E: And then what about- difficulties with problem-solving, and so being able to, um, look at a certain problem, but from a different angle, if you were getting stuck- or being able to be flexibly minded so that you could-

S: Yeah

E: See outside the box.

S: That was still affected for- I would say a month, or two months. So everything that affected me, was between umm- the accident and three months.

No Longer Than a Couple Weeks or a Couple Months in Regards to Life Success Problems (P). Two participants similarly discussed short-term effects of their head injuries on their social adjustment problems.

For example, Participant 13 discussed the short-term effects of her head injuries, on her social life.

S: Well- the first couple months where my symptoms were, like, heightened, I didn't really- go out that much. I didn't really interact with people, apart from, like, just going to class and then going home-

E: Yeah

S: So, I just don't think I can speak to that one- but, um... now, like- months after the concussion, I'm totally fine with that- so...

No Problems (P)

Not all participants reported problems. When asked, a number of participants denied having EF, ToM, or other cognitive problems. Other participants denied having life success problems in particular domains. Some participants also denied any effect of potential sources of support on their functioning.

No Problems With General or Social Problem-Solving, or With Thinking (P). Seven participants reported not having EF, ToM, or other cognitive problems. These participants expressed having no problems switching gears, inhibiting impulses, or concentrating; or no problems empathizing, concentrating on, or reading social cues, or with being weird in social situations. Technically these related to a lack of problems with cognitive flexibility, inhibition, or attention; perspective-taking, social encoding or with reading social cues, or with social behaviour, respectively.

For example, Participant 2 states that although he may not use it to guide his behaviour, he does not perceive any problems with his empathy or social cue reading skills:

E: So...now, I want to shift to asking about, kind of qualities of thinking that have to do with like...social contexts. So the first question is - did you notice any difference in your ability to - or did you notice any difference in your awareness that other people have social cues coming from their body language, their voice tone, their facial expressions - were you paying any more or less attention to that type of thing- before to after?

S: Perhaps- maybe - I don't think my awareness of that sort of thing was affected, but whether I was empathetic or you know, cared about -my anxiety over these things wasn't there. I wasn't that overly concerned with the minute social cues, even if I'd recognized them?

E: Tell me more about that.

S: Talking to someone... I mean, for a long period of my time- of my life, especially in university and what not, I'd be very concerned with all these little- you know- how that person's feeling, or what not, and having anxiety over these little things - I think at that period, if they were disappointed or angry, at that period of time that I'm talking about now - I don't think I was any

less aware of it- but perhaps I was less likely to change my own behaviour based on it. Like consider it in my own behaviour.

No Life Success Problems (P). Nine participants reported not having social adjustment problems. These included no problems with work, school, friends, or romance.

For example, Participant 2 illustrated how his accident had no negative effects on his dating life:

S: It's a cool story that I definitely made use of, when I started going out on dates on Tinder, and that sort of thing- they'd ask me about my scar.

No Effects From Potential Sources of Social Support (P)

Six participants could not envision any effects from potential sources of support on either their EF, ToM, or other cognitive problems, or on their social adjustment problems.

Participant 12, for example, commented that the church they attended had neither positive nor negative effects on their ability to deal with their injury.

E: Ok, so now, I wanted to know- uh, about, uh, the um, the church for example, and if -anyone there was aware that you had that accident.

S: No. Ahem, ahem

4.4.2 Summary of Themes From Sample 2: Participants With Childhood Head Injury

Major Themes

The themes resulting from the analysis of the childhood brain injury sample, did not substantially add to the themes from the recent head injury sample. For this reason, the full description of the analysis will not be repeated here. Rather, only minor yet significant differences will be summarized in the following paragraphs.

Simplified Model

Given participants in the head injury sample were at younger developmental stages at the times of their injuries, their thematic maps were parallel, but relatively simpler than that of the

recent head injury sample. For example, the recent head injury sample reported problems with cognitive flexibility, working memory, inhibition, and attention; social perception, social encoding, and with reading social cues; episodic memory, and short-term and long-term memory. In comparison, participants in the childhood brain injury sample reported less of these problems, including only inhibition/cognitive flexibility, working memory, attention, and speech problems. Similarly, while the recent head injury sample reported on a number of social adjustment problems salient and relevant to emerging adults including problems with friends, work, school, romantic relationships, sports, and driving, those with childhood brain injuries reported only problems with friends, school, and romantic relationships but not work, sports, or driving. Participants from the childhood brain injury sample also did not report problems with coping strategies as the recent head injury sample did, and generally reported less differentiated forms of social support than did the recent head injury sample.

Growing up Theme (E)

The only significant difference in themes between the childhood brain injury sample, and the recent brain injury sample was the theme labeled Growing Up. This referred to a theme of healthy developmental changes. Through this theme, only participants in the childhood brain injury sample described *improvements* in some of their cognitive abilities. Specifically, they reported having made improvements in their skills empathizing, concentrating on social cues, and behaving in social situations. More technically, these mapped onto healthy developmental changes they perceived having made with perspective-taking, social encoding, and social behaviour skills (see Figure 7).

For example, Participant 6 discussed the improvements he made in his social behaviour since high school:

E: What about being able to know what to do in social situations as they're unfolding in real time? being able to keep up with-

S: Ah, I've gotten better at that over the years starting with university, 'cause definitely much more social interactions now, than I would've gone through in high school, and in high school - reading the room wasn't that big of a deal like- it didn't matter as much as it does now as in adult life.

Number of Codes by Injury Severity

The number of statements coded by participants per category of injury severity was calculated to investigate whether a certain injury level was associated with broader insights into the discussions of the effects of EF, ToM, and other cognitive problems, as well as risk and resilience and other factors, on social adjustment problems. Because more participants in the recent head injury sample knew the severity of their head injuries, only these participants were included in the analysis. Participants with a single mild head injury were coded on average 52.5 times. Participants reporting multiple injuries were coded 43.75 times on average. Participants reporting severe head injuries were coded 73.25 times on average. A one-way ANOVA with all three groups was significant, $F(2, 7) = 5.027$, $p = .044$, although contrasts between the three groups failed to reach significance.

See Table 17 for a summary of predetermined apriori themes, and emergent themes.

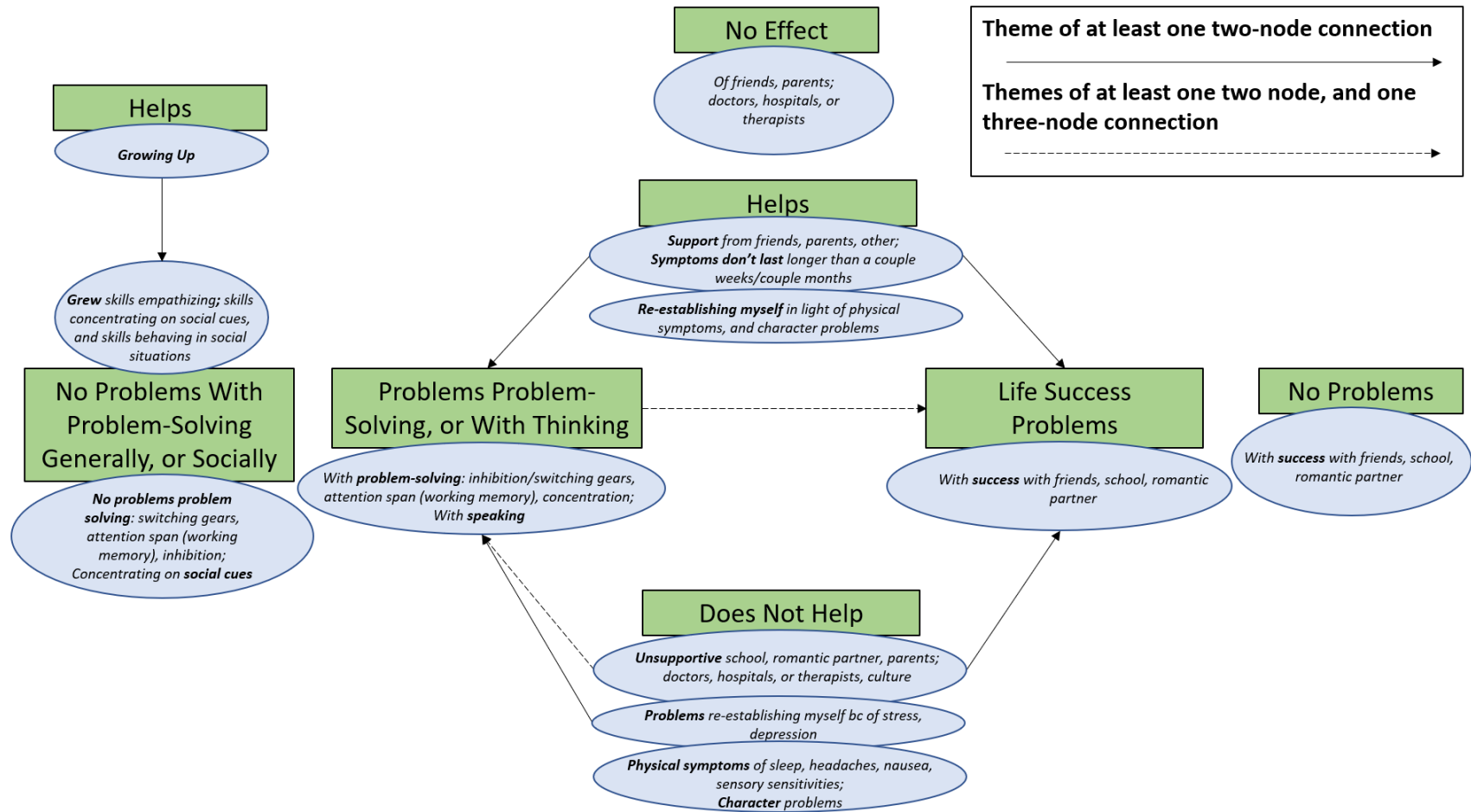


Figure 7. Thematic-map for Sample 2: Childhood brain injury sample.

Table 17

Study 3 Results Summary

Predetermined Themes Assumed Apriori	
1.	Problems with General Problem-Solving – EF Problems
2.	Problems With Social Problem-Solving – ToM
3.	Life Success Problems – Social Adjustment Problems
4.	Connections Between Problems With General or Social Problem-Solving, or Thinking; and Life Success Problems
5.	Unsupportive Others
6.	Connection Between Unsupportive Others and Problems With Problem-Solving Generally or Socially, or With Thinking
7.	Connection Between Unsupportive Others and Life Success Problems
8.	Support From Others
9.	Connections Between Support From Others and Problems With Problem-Solving Generally, or Socially; or Problems Thinking
10.	Connections Between Support From Others and Life Success Problems
11.	Three-node Connections Between Support From Others; Problems With General or Social Problem-Solving, or With Thinking; and Life Success Problems
12.	Symptoms Don't Last Longer Than a Couple Weeks/Couple Months
13.	No Longer Than a Couple Weeks or Couple Months in Regard to Problems With General or Social Problem-Solving, or With Thinking
14.	No Longer Than a Couple Weeks or a Couple Months in Regard to Life Success Problems
15.	No Problems
16.	No Problems With General or Social Problem-Solving, or With Thinking
17.	No Life Success Problems
18.	No Effects From Potential Sources of Social Support
Emergent Themes	
1.	Problems Thinking – Other Cognitive Problems
2.	Character Problems
3.	Connections Between Character Problems and Problems With General or Social Problem-Solving, or With Thinking Connections Between Character Problems and Life Success Problems

4.	Physical Symptoms
5.	Connections Between Physical Symptoms and Life Success Problems
6.	Problems Re-Establishing Myself, Skills, or View-Points
7.	Connections Between Problems Re-Establishing Myself, My Skills, My Viewpoints; and Life Success Problems
8.	Re-Establishing Myself, My Skills, My View-Points
9.	Connections Between Re-Establishing Myself, Skills, or View-Points; and Problems With Problem-Solving Generally, or Socially; or With Thinking
10.	Connections Between Re-Establishing Myself, Skills or View-Points; and Life Success Problems
11.	Three-Node Connections Between Re-Establishing Myself, Skills, or View-Points; Problems With General or Social Problem-Solving, or With Thinking; and Life Success Problems
12.	Problem-Solving, or With Thinking; and Life Success Problems
13.	No Problems
14.	No Problems With General or Social Problem-Solving, or With Thinking
15.	No Life Success Problems
16.	No Effects From Potential Sources of Social Support

4.5 Discussion

The goal of Study 3 was to explore how emerging adults would explain their successes and challenges with social adjustment, in light of any EF or ToM difficulties, and external risk or resilience factors. Head injuries represent a biological risk factor for EF and ToM difficulties (Beauchamp & Anderson, 2010; Yeates et al., 2007). Therefore, emerging adults with histories of TBI were recruited to better understand these issues. The two broadest themes were reports of problems, and reports of no problems. The problems sub-themes were of particular interest.

Several predetermined problems sub-themes resulted, based on the multi-level social competence model (Yeates et al., 2007). These included reports of problems with EF and ToM, and peer, occupational, and romantic social adjustment. These also included reports of supportive and non-supportive others. Other predetermined sub-themes included explicit

statements of connections between EF or ToM problems and social adjustment problems, and connections between support from others, or a lack thereof, and EF or ToM functioning or dysfunction, respectively; or between support from others, or a lack thereof, and social adjustment success, or problems, respectively. Also predetermined were participants' descriptions of how the connections between EF or ToM and social adjustment, were influenced by supportive or unsupportive others. Also predetermined was the sub-theme of symptoms lasting for a limited time.

Qualitative analysis revealed that the thematic map was more complex for the recent head injury sample than for the childhood injury sample. This suggested that insights on the effects of EF or ToM, and risk and resilience factors, on social adjustment in emerging adulthood are broader when injuries are more recent. Further analyses revealed that participants reporting more severe injuries were coded more often than participants reporting single injuries. This suggested that insights were broader when injuries were more severe. Note, however, that participants reporting multiple injuries were not coded more often than participants reporting single injuries.

Several sub-themes also emerged beyond predetermined ones. In addition to EF or ToM, participants discussed having other cognitive problems most often in the form of memory problems. Beyond peer, academic or work, and romantic adjustment, participants in the recent head injury sample listed sports and driving activities as social adjustment domains. Other emerging sub-themes of predictors of EF, ToM, or social adjustment problems included temperamental characteristics, physical symptoms, personal coping strategies, and sub-themes of connections between these variables.

A 'no problems' theme also emerged with several negation sub-themes. These included sub-themes of a lack of EF or ToM problems, a lack of social adjustment problems, and a lack of

perceived effects from potential sources of social support. In the childhood brain injury sample, a sub-theme emerged of developmental change toward *more* functioning in several domains despite participants having had an injury.

4.5.1 Link Between Current Findings and Previous Research

While every participant with a recent head injury denied problems in at least one domain of EF, ToM, other cognitive, or social functioning, they also each reported a problem in at least one of these domains. These included EF problems, suggesting dorsolateral prefrontal damage as a result of their injuries (Lipton, 2009). Almost every participant reported having at least one EF difficulty, including inhibition and attention, cognitive flexibility, and working memory difficulties. Note that attention depends on inhibition, as selective attention is only possible if the response to irrelevant information is inhibited (Milliken & Tipper, 1998). With the identification of attention or inhibition, cognitive flexibility, and working memory, these findings align with the tripartite classification of EF into these components, by Miyake and Friedman (2012).

Half the participants also reported problems with ToM (Adolphs, 2001; Amodio & Frith, 2006). These included difficulties with perspective-taking and difficulties being sensitive to, attending to, and accurately perceiving non-verbal social information. The participants reporting the most ToM deficits, participants 10, 11, and 14, were also those reporting moderate to severe injuries. This aligns with research showing that while ToM deficits following TBI are more subtle than EF deficits, they are more pronounced with more severe damage (Ietswaart, Milders, Crawford, Currie, & Scott, 2008; Milders et al., 2008). Given deficits related to ToM, such damage may have represented dorsomedial prefrontal damage (Ietswaart et al., 2008; Lipton et al., 2009).

Half the participants who experienced moderate to severe or multiple injuries, also reported a variety of memory impairments, including primarily short-term, and long-term episodic and semantic impairments. Memory impairments are well known in the literature, suggesting frontotemporal damage (Vakil, 2005). Note, however, that the nature of the current study precludes confirming direct connections between qualitative findings and reported head injuries. Specifics on brain injury localization were not obtained.

As predetermined by the multi-level social competence model (Beauchamp & Anderson, 2010; Yeates et al., 2007), all participants reported having had impairment in at least one social adjustment domain. This included difficulties with work, school, peer, and romantic relationship settings. Emergent themes were sports as an occupational outcome, and driving. Sports as an emerging occupational outcome sub-theme makes sense, given the connection between TBI and sports among emerging adults (McKinlay et al., 2008). Driving was also interpreted as a social adjustment outcome. While one does not need to be able to drive to be socially adjusted, it is not difficult to see how cognitive impairments can lead to loss of driving skills (Lundqvist & Alinder, 2009), and disrupt a young adult's functioning and sense of independence and autonomy (McCormick et al., 2011). Unlike with work or romantic adjustment in Study 2, no particular adjustment domains emerged as more salient than others. However, compared to emerging adults with childhood head injuries, emerging adults with recent head injuries developed unique themes of problems with certain advanced developmental tasks, namely work and driving tasks.

Reports of social adjustment outcomes were contextualized by reports of risk and resilience factors in the form of external social support, maladaptive premorbid temperamental traits, and internal psychological coping strategies (Yeates et al., 2007). Examples of external

support included general practitioners ensuring patients received academic accommodations, and school personnel relaxing expectations on participants suffering from post-concussion symptoms, among other examples. Participants also reported on personal coping and compensatory strategies, such as writing down notes to compensate for short-term memory loss. While coping and compensatory strategies certainly qualify as a resilience factor (Curtis & Cicchetti, 2003; Sameroff, 2010), and are routine procedure in rehabilitation efforts following TBI (Fleming et al., 2005; Ho et al., 1997; White et al., 1997), the multilevel-social competence model seems to focus on external social and familial environments (Rosema et al., 2012; Yeates et al., 2007). Endogenous characteristics are only given a brief mention. Therefore, coping strategies and temperamental characteristics should be indicated by the model as “internal” or endogenous risk and resilience factors (Yeates et al., 2007).

Despite the often rich illustrations of social adjustment difficulties participants provided, most indicated difficulties mainly lasting no more than a few weeks or months, with only a minority reporting long-term deficits. This is an important contextualization of the results to make, and constitutes a brain injury resilience factor (see Figure 2). Only three of the more severe cases of recent injuries were associated with long-term deficits, while five of the 10 recent injury cases reported problems which did not last for more than one or two months. This is in keeping with the literature demonstrating deficits peaking from seven to 90 days after mild-TBI before largely resolving (Karr et al., 2014). Every participant also reported a lack of problems in at least one area, again suggesting relatively mild symptoms and sequelae resulting from these types of injuries.

That being said, emerging adulthood can represent a developmental period of considerable stress in occupational and romantic domains (Connolly & Schmuel, 2013;

McCormick et al., 2011). There may be no convenient time for even two-month long temporary disruptions in functioning. Unfortunately, this may be ample time to strain and dissolve a romantic relationship, lose a competitive edge at work (Baum, 2002), or delay the entry to, or completion of an academic program. Further research is needed on the long-term social sequelae of even mild traumatic brain injuries.

Other insult-related factors beyond the specific physical damage to the brain, concerns the physical and sensory impairments associated with brain injuries. Participants often discussed pain and sensory difficulties that occurred at the time of their injury, including headaches and light sensitivity issues. Although these were not featured prominently in the multi-level social competence model which seems to define insult-related factors as localization of brain damage (Yeates et al., 2007), it seems plausible to include these as insult-related factors of brain injuries.

Pertinent to the realist and reality testing frameworks (Patton, 2014, p. 98), were participants' insights into the connections between their executive, cognitive, and ToM functioning, and risk and resilience factors. Several participants drew connections between domains of the multi-level social competence model throughout the data set. These included associating sensory difficulties, attention and concentration difficulties, and coping strategies with school adjustment, unsupportive coworkers or cognitive-flexibility difficulties with work; or associating perspective-taking difficulties, or difficulties remembering past relationship milestones, with romantic relationship difficulties. Participants occasionally made causal explanations for social adjustment difficulties using three variables: For example, one young woman saw the value in (a) compensating for (b) prospective memory challenges, by writing future dates with her boyfriend in a calendar, to protect her (c) romantic relationship. Such connections are made at multiple levels, such as compensatory strategies, cognitive-executive

skills, and social adjustment levels in the previous example. For this reason, they are aligned with the multi-level social competence model (Yeates et al., 2007).

Childhood Brain Injury Analysis and Developmental Theme

Owing partly to a smaller sample size, and partly to their injuries taking place at younger ages, the thematic map of social adjustment difficulties among emerging adults with childhood brain injury histories was less complex. While coping problems, and non-executive cognitive deficits repeated as emergent themes, other themes were absent including developmental tasks not suitable for younger youth such as driving. Fewer connections were made between domains, likely owing to the reduced complexity inherent in the earlier developmental stage, and reduced ability for sophisticated insights into the far distant past events. The only unique theme to emerge was reports of substantial development of some cognitive and social-cognitive skills despite having had the injury. The emergence of this theme can be accounted for by the fact that with greater time since the injury, participants have greater insights into the growth they had made since the more distal past, relative to the insights the other participants could make about the more recent past. Because the childhood brain injury sample did not add unique themes to the model, it helped demonstrate saturation of themes in the recent head injury sample. This helped justify the sample size of 10 participants (Boddy, 2016).

Accordance With Quantitative Results

The findings resulting from the qualitative study support the quantitative results from Study 2. Instead of being large, the quantitative effects of EF and ToM on social adjustment outcomes were mostly small to moderate. This averaged effect size is likely tempered by the mix of individuals with and without EF or ToM difficulties, that do or do not predict social

adjustment difficulties. Accordingly, this was what was found in the current study, which was a mix of themes of reported difficulties, and reported absences of difficulties.

Certain limitations of the quantitative study were overcome by the current study. Due to time constraints and the nature of quantitative research, the breadth of topics that could be covered by the quantitative study were limited. Only family dysfunction was included as a risk and resilience factor for executive functioning in the quantitative study. However, the qualitative methodology of the current Study 3 allowed participants to report on a broader range of risk and resilience factors including many different forms of external support, and coping mechanisms.

4.5.2 Limitations

Despite the strengths of the current study, there are key limitations that need to be addressed. First, the analysis possesses limitations inherent in the realist and reality-testing frameworks used. These include the inseparability of scientific inquiry from judgment, and the uncertainty of causal conclusions drawn. In qualitative projects, coding, analysis and interpretation of results are susceptible to researcher judgement. To mitigate researcher bias, three undergraduate volunteers independently reviewed the coding and thematic structure. Second, participants made several causal claims on the associations between cognitive functioning, social adjustment, and risk and resilience factors. While interpreting these at face-value is the goal of realist qualitative inquiry, in reality participant judgment of causal relationships is susceptible to the same causal fallacies researchers are susceptible to (Ahn et al., 1996). To mitigate potentially spurious claims made during interviewing, such as the connection between participants' injuries and cognitive changes, the author probed to establish, at a minimum, a temporal sequence of events that would support causality. Third, there was a reliance on participants' reports of the severity and nature of their injuries. Ideally, participants

would provide medical documentation to substantiate claims of the injury severities. The fourth limitation is related to the third, in that it would also be ideal to understand the precise nature and locations of participants' brain injuries. Given knowledge on brain-behaviour relationships, understanding participants' precise brain injury locations would promote a better understanding of their social adjustment difficulties. Fifth, findings may not be easily generalized to the general population. While all participants were university students, university students attending four-year undergraduate programs represent only 20% of emerging adults in the United States (Arnett, 2016). Caution should also be made in generalizing findings from the university head injury sample to university students without head injury histories. Some research suggests important differences among adults with head injury histories, such as a higher prevalence of psychiatric disorders, or lower quality of life (Silver, Kramer, Greenwald, & Weissman, 2001). Larger subsamples of participants from different ethnocultural backgrounds are also needed.

4.5.3 Implications and Future Directions for Research

The results of this qualitative analysis have implications for the multi-level social competence model (Yeates et al., 2007). An emergent theme in the current study was non-insult related, yet internal psychological coping. However, Yeates et al.'s explanation of the model typically centres on external family and other environmental variables as non-insult related risk and resilience factors (Rosema et al., 2012; Yeates et al., 2007). Personality factors are given very little attention and psychological coping and rehabilitation is not mentioned. The results of the current study suggest that internal psychological coping may represent a significant aspect of the model. Another theme that emerged in the current study was the developmental factor from the childhood brain injury analysis. With the advantage of time to reflect on the more distant past, childhood brain injury participants were able to comment on the effects of time and

opportunity for development, on the cognitive and social cognitive variables. It may be worthwhile to conduct review research to investigate and incorporate developmental factors into the multi-level social competence model given it is meant to apply to youth of different ages.

4.5.6 Clinical Applications

The process of conducting the structured interviews for this qualitative study, revealed some clinical applications of this research. Participant 10, in particular, commented on the therapeutic effects of using the interview with the examiner to identify not only his cognitive difficulties, but sources of support and coping strategies, following his head injuries. Clinicians equipped with the knowledge of sources of support and coping strategies generated in the current study, could provide therapeutic benefits to clients suffering head injuries. Future mixed-methods research is needed to confirm the generalization of these protective factors beyond the current sample, and to investigate their relative effectiveness on alleviating cognitive and social sequelae of head injuries. However, the current qualitative results are a significant first theoretical step toward identifying other protective factors useful for clinical applications that were not featured in the multi-level social competence model (Yeates et al., 2007).

Chapter Five: General Discussion

5.1.1 Overall Goals

The overall goal of this dissertation was to investigate the relationships between EF and ToM, and social adjustment outcomes among emerging adults. Studying the emerging adult stage was of interest given that young people are under pressure for rapid social development, while neurological substrates underlying EF and ToM are also in the process of rapid growth (Blakemore, 2012; Eslinger & Long, 2012; Hao & Liu, 2016; Riggs et al. 2006). Multiple study methodologies were employed to gain a deep understanding of these topics. Chapter 1 was a systematic review of previous research, to understand which aspects EF and ToM, predict which aspects of social adjustment among emerging adults. This served to inform the specification of the quantitative structural equation model of emerging adult social adjustment, which was the focus of Study 2. Another goal of Study 2 was to use S.E.M. to overcome previous research measurement limitations, which hampered previous efforts to study ToM. The goal of Study 3 was to conduct a qualitative analysis to test and refine theory on the full set of biopsychosocial risk and resilience factors influencing EF, ToM, and emerging adults' social adjustment.

5.1.2 Overall Summary of Results

Evidence of the respective associations between EF or ToM and social adjustment were found across the three chapters. The systematic review revealed differences in effect sizes between EF and social adjustment outcomes, depending on the nature of the variables investigated. As guided by neuropsychological models such as I³ (Finkel, 2003) and the cortical-subcortical balance model (Heatherton, 2000), the largest effect sizes were found between survey-measures of self- and emotional-regulation and externalizing symptoms in peer and dating contexts. Survey-based self- and emotional regulation best predicted measures of peer and

romantic adjustment. However, in addition to survey measures, performance-based measures of EF, namely of cognitive flexibility and inhibition, predicted academic and work adjustment variables. Previous literature was severely limited in investigations of ToM effects on social adjustment outcomes possibly due to ToM measurement issues. In Study 2, SEM was used to overcome measurement issues (McCleary et al., 2012), through the creation of a latent ToM variable from more highly correlated ToM measures. This resulted in significant effects of ToM on peer and work adjustment, and dating aggression. As expected from the systematic review, results demonstrated small to large effects of survey-based EF on peer, academic and work functioning, and dating aggression. Performance-based measures of cognitive flexibility and inhibition additionally predicted academic functioning, while ToM uniquely did not predict academic functioning. Interestingly, as predicted, models were strongest for two of the most developmentally advanced social adjustment tasks, work functioning, and dating aggression, as opposed to the less developmentally advanced peer interaction social adjustment task.

The final models also contained ADHD status, family functioning, and chronic anxiety as risk and resilience variables, as well as key control variables, to fully specify the model. While these contextual variables contributed to an improved understanding of social adjustment outcomes among emerging adults, a qualitative study was needed to reveal the full range of contextual variables of importance. Study 3 consisted of this qualitative study. Saturation of themes and an adequate sample size were demonstrated. Analyses revealed themes of both successes and challenges across each level of the multi-social competence model, and connections between EF and ToM difficulties and emerging adult social outcomes, in addition to themes of connections perceived between levels of the multi-social competence model (Yeates et

al., 2007). A richer set of themes of risk and resilience factors including an internal psychological coping factor was revealed by the analysis.

5.1.3 Common Themes

A common theme throughout studies 1, 2, and 3, was the discovery of significant, but limited effects of EF and ToM on social adjustment among emerging adults. Studies 1 and 2 demonstrated quantitative EF effects which were significant, but small to moderate in size. These effects were smaller or larger, depending on the context of outcome variables, such as aggression or non-aggression based outcome variables. Study 3 revealed several themes of insights into the effects of EF and ToM on success in social adjustment domains. However, also prominent were themes of no such effects suggesting that not everyone with an injury will experience cognitive problems, and not everyone with cognitive problems will suffer social problems.

Another theme was the discovery of biopsychosocial risk and resilience factors influencing EF and ToM effects on social adjustment. The Study 1 systematic review listed covariates, mediators, and moderators contextualizing these effects. Main examples included gender moderators. For example, the positive effect of self-control on reducing dating aggression was more prominent among women (Baker et al., 2018), and the positive longitudinal effect of emotional control on positive development was more prominent among boys maturing into men (O’Conner, 2011). Study 2, under the multi-level social competence model (Yeates et al., 2007), explored the psychosocial contexts of emerging adult social adjustment models, finding anxiety and family functioning to improve model fit. Study 3 gave participants space to expound on the contextual factors influencing their challenges and successes in cognitive and social-cognitive skills, and social adjustment following brain injuries. In addition to social support, specifically stated as a protective factor in Yeates et al.’s (2007) social competence model, participants

discussed coping mechanisms they used to temper the effects of their injuries and cognitive problems on their social adjustment. Together, the three studies paint a rich picture of the contextual factors influencing the effects of EF and ToM on emerging adult social adjustment.

5.1.4 General Implications

The study findings have separate implications for the social information processing (Crick & Dodge, 1994; Perez-Edgar, 2012), I³ (Finkel, 2003), cortical-subcortical balance (Heatherton, 2000), and multi-level social competence (Yeates et al., 2007) models, and developmental task theory (McCormick et al., 2011). However, the application of these diverse models to the same integrated project, has implications for the collaboration between developmental theorists, neuroscientists, and neuropsychologists. While developmental theorists understand the psychosocial risk and resilience factors predicting youth social adjustment, neuroscientists understand the biological and cognitive risk factors (McCormick et al., 2011). With the common interest in accounting for the full range of biopsychosocial factors responsible for emerging adults' social adjustment (Sameroff, 2010), additional projects like the current study will likely become more common. This particular dissertation is an indication of the potential for such projects.

5.1.5 General Future Directions

ToM

The research limitations revealed by studies 1, 2, and 3, point to gaps in our understanding of the effects of EF and ToM on social adjustment, that should be addressed by future research. Across multiple chapters, findings relating ToM to social adjustment, were less clear than those involving EF. Research reviewed in Study 1 was mixed between significant and null findings on the effects of ToM on peer adjustment. Aware of this, authors explicitly stated

the need for more ToM research (McCleary et al., 2012; Warnell & Redcay, 2019), recommending improvements in ToM measurement. Measurement difficulties may have been partly responsible for the lack of investigations of ToM on academic or employment adjustment. Although Study 2 addressed measurement issues by combining correlated ToM measures into latent ToM, certain findings were still difficult to explain. ToM predicted employment adjustment, but not academic adjustment. It predicted dating aggression, but not positive relationship qualities. Future research with alternative measures of academic functioning and positive relationship qualities, as well as ToM, should be used to untangle this set of mixed results.

In addition to measurement issues, Hao and Liu (2016) stated conceptual reasons behind the inconsistent effects of ToM on emerging adult social adjustment. They reasoned that emerging adults may be less likely than younger youth—who lack guile—to use ToM to guide prosocial behaviour. In Study 3, this issue was explored through qualitative analysis. Some participants did discuss that despite possessing ToM abilities, depending on the context they might not use ToM to guide their behaviour. Future qualitative and quantitative research should explore the extent to which conceptual issues may temper the effect of ToM on social adjustment.

Demographic Contexts

More research is also needed on the effects of demographic variables on associations found in the current study. Research exists on gender differences in the effects of self- or emotional-regulation on dating aggression, but less so on other demographic differences.

Gender. Reviews have also been conducted on gender differences in dating aggression (Wincentak et al., 2017) and specifically on gender differences in effects of emotional regulation

on dating aggression (Shorey, Brasfield, Febres, & Stuart, 2011). One study on college students suggested that emotional dysregulation plays a larger role in dating aggression for men, than it does for women (Shorey, Brasfield, Febres, & Stuart, 2011). This makes sense in light of previous research on emotional regulation. Such research demonstrates that women are generally more expressive than men, but men generally feel and express anger more than women (Brody & Hal, 2008). O’Conner et al. (2011) showed that the longitudinal positive effect of emotional regulation on peer adjustment is greater for boys than for girls. However, research reviewed in Study 1 suggests that women respond significantly more aggressively to men’s emotional regulation difficulties than vice-versa (Yarkovsky, 2016). In another Study 1 article using an experimental paradigm, women also responded more aggressively than men when depleted of self-regulation (Watkins et al., 2013). More research is needed to untangle this conflicting set of results. More research is also needed on gender differences for the effects of other predictors on social adjustment, such as ToM, and on other outcomes, such as academic or employment occupational adjustment.

Ethnocultural Identification. Other important demographic variables should also be examined in relation to social adjustment. Research has established differences in the rules behind emotional expression across cultures. Some collectivist cultures, for example, may generally discourage more extreme emotional expressions, relative to individualist cultures (Markus & Kitayama, 1991). These cultural factors may not only influence emotional expressivity, but emotional regulation and its role in social adjustment. Future research should determine whether emotional dysregulation plays a greater role on social adjustment outcomes in particular cultures.

Developmental Effects. Citing growth of prefrontal connections, neuroscientific research explains why emotional regulation and EF improves with age (Blakemore, 2012; Hao & Liu, 2016; Riggs et al., 2006; Taylor et al., 2013). Few studies in the review in Study 1 examined age or developmental effects on EF or ToM effects on social adjustment. Longitudinal studies revealed small effects of emotional regulation on social adjustment across time, predicting emerging adult positive youth development from mid/late adolescent emotional control (O’Conner et al., 2011). However, future research should examine whether the effects of EF or ToM on social adjustment are greater among younger or older emerging adults, varying in emotional regulation abilities.

Clinical Interventions. Finally, future research should examine the effects of interventions on coping and EF regulation strategies on both emerging adult EF, and social adjustment. One intervention showed that both cognitive and coping skills training, significantly reduced EF difficulties, stress, and anxiety among college students, and that the cognitive training program helped improve behavioural regulation and ADHD symptoms (Bettis et al., 2017). This research is relevant for Study 2, and articles reviewed in Study 1 (e.g., Barkley & Fischer, 2010; Owens & Hinshaw, 2016), revealing the impact of ADHD symptoms on social adjustment. It is also relevant for Study 3, which revealed the emergent theme of coping mechanisms for EF problems. Bettis et al.’s (2017) line of research is promising, but in its infancy. Future research will be needed to further assess the impact of such trainings on indirectly improving social adjustment among emerging adults.

5.1.6 General Clinical Applications

Clinical applications of the findings involve equipping clinicians with the full understanding of biopsychosocial factors potentially impacting emerging adult clients. Studies 1

and 2 included themes of the prominence of EF difficulties in the ADHD population. Being a neurodevelopmental disorder, having ADHD means finding ways of coping with, and managing symptoms, including EF difficulties, as opposed to treating them directly. Themes from Study 3 revealed that in addition to EF and ToM, emerging adult social adjustment could depend on psychological factors such as coping strategies. Fortunately, individuals from the general or ADHD populations can learn coping strategies from therapists (Bettis et al., 2017). Because a stressful environment can also undermine the strength of one's EF skills (Blair, 2002), as seen with family dysfunction in Study 2, clinicians should also be trained to recognize and probe for signs of family or relationship stressors exacerbating EF skills or ADHD symptoms. Many therapists and clinicians already engage in EF coaching with clients from a range of populations, to help them gain coping strategies (Bettis et al., 2017). Given Crick and Dodge's (1994) social information processing sequence, improvement in EF should have cascading effects on improved ToM and improved social adjustment among emerging adults. The contribution of all three chapters to clinical practice in counselling for youth social adjustment, is the confirmation that comprehensive treatment, taking into account biopsychosocial factors influencing youths' happiness and social adjustment, are needed.

5.2 General Conclusion

The topic of social adjustment among emerging adults is important given the stressful nature of this particular stage of development. Emerging adults are navigating new levels of independence, and trying on different roles in education, work, and romantic relationships (Shulman & Connolly, 2013). A degree of cognitive sophistication is needed not only to pursue success in each area, but to coordinate and manage alternative competing demands on one's time. For that reason, the goal of the current study was to understand how EF and ToM relate to

social functioning, in the event that cognitive functioning interventions might also positively influence emerging adults' social adjustment. A variety of study methodologies across three studies was used to investigate these topics. As each study built on the weaknesses of the previous chapter, the information gathered provided convincing evidence for a positive effect of EF and ToM on social adjustment in this age range, as well as the rich contextual conditions in which these associations manifest. It is hoped that the results of this dissertation will contribute to further research on social adjustment among emerging adults, and help clinicians and researchers working with this population, to promote their cognitive functioning, social adjustment, and life satisfaction.

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Appendices

Appendix A: Study Quality Scoring and Ratings

Table 1. *Study Quality Scoring and Ratings*

St	Refere nce	1. Ob ject ive	2. Stud y Desi gn	3. Partici pant Selecti on	4. Partic Chara cterist ics	5. Exp: Random Allocati on	6. Exp: Investiga tor Blinding	7. Exp: Partici pant Blinding	8. Outcome and predictor measures	9. Sa mpl e size	10. Analy tic metho ds	11. Estima tes of varianc e	12. Cov aria tes	13. Re sul ts	14. Concl usions suppo rted	Perce ntage Score
1	Baker et al. (2018)	2	2	1	1	N/A	N/A	N/A	2	2	2	2	2	2	2	90.9%
2	Barkle y & Fischer (2010)	1	2	1	1	N/A	N/A	N/A	2	2	1	2	0	2	2	72.7%
3	Bradbu ry & Shaffer (2012)	2	2	1	1	N/A	N/A	N/A	2	2	1	2	2	2	2	86.4%
4	Caiozz o et al. (2016)	2	2	1	2	N/A	N/A	N/A	2	2	2	0	2	2	2	86.4%
5	Cairns et al. (2017)	2	2	1	2	N/A	N/A	N/A	2	1	1	2	2	2	1	81.8%
6	Chan (2019)	2	2	1	2	N/A	N/A	N/A	1	2	2	0	1	2	2	77.3%
7	Ciaracc o et al. (2011)	1	2	1	2	1	2	2	2	0	1	0	1	2	2	67.9%
8	Cohn et al. (2010)	1	2	1	2	N/A	N/A	N/A	1	2	1	0	1	2	1	63.6%

9	Côté et al. (2011) study 1	1	2	1	2	N/A	N/A	N/A	2	2	2	0	2	2	2	81.8%
10	Daly et al. (2015) emerging adult cohorts studies 1 and 2	2	2	2	2	N/A	N/A	N/A	2	2	1	2	2	2	2	95.5%
11	Farrell & Vaillancourt (2019)	1	2	2	2	N/A	N/A	N/A	2	2	2	2	2	2	2	95.5%
12	Flandermeyer (2019)	2	1	1	2	N/A	N/A	N/A	2	2	2	0	1	2	2	77.3%
13	Fosco et al. (2012)	2	2	2	2	N/A	N/A	N/A	2	2	2	0	0	1	2	77.3%
14	Francoeur et al. (2019)	2	2	1	2	N/A	N/A	N/A	1	2	2	2	2	2	2	90.9%
15	Gover et al. (2011)	2	2	1	2	N/A	N/A	N/A	2	2	1	2	2	2	2	90.9%
16	Guilmette et al. (2019)	2	2	1	2	N/A	N/A	N/A	2	2	2	2	2	2	2	95.5%
17	Guzman-Gonzalez et al. (2016)	2	2	1	2	N/A	N/A	N/A	2	2	2	2	1	2	2	90.9%

18	Hao & Liu (2016)	1	1	1	2	N/A	N/A	N/A	1	2	1	2	0	2	1	72.7%
19	Kercood et al. (2017)	2	2	1	1	N/A	N/A	N/A	1	1	2	0	0	1	2	59.1%
20	Klipfel (2015)	1	2	1	2	N/A	N/A	N/A	2	2	2	2	2	2	1	86.4%
21	Langeslag & van Strien (2016) study 2	2	2	1	1	N/A	N/A	N/A	2	1	1	0	N/A	2	2	71.4%
22	Lopes et al. (2011) study 3	2	2	1	2	N/A	N/A	N/A	2	0	1	2	2	2	2	81.8%
23	Lopez (2015)	2	2	1	2	N/A	N/A	N/A	2	2	1	0	0	2	2	72.7%
24	Malatras & Israel (2012)	1	2	1	2	N/A	N/A	N/A	2	2	1	0	0	2	2	68.2%
25	McCleary et al. (2012)	2	2	1	2	N/A	N/A	N/A	2	1	1	0	0	2	1	72.7%
26	Moilanen & Manuel (2017)	2	2	1	2	N/A	N/A	N/A	2	2	1	2	2	2	1	86.4%
27	Moilanen & Manuel (2018)	2	2	1	2	N/A	N/A	N/A	2	2	1	2	2	2	1	86.4%
28	Moilanen & Manuel (2019)	2	2	1	2	N/A	N/A	N/A	2	2	1	2	2	2	1	86.4%

29	O'Conn or (2011)	2	2	1	2	N/A	N/A	N/A	2	2	0	0	2	0	2	68.2%
30	Owens & Hinsha w (2016)	2	2	2	2	N/A	N/A	N/A	1	2	1	2	2	2	2	90.9%
31	Perrone - McGov er et al. (2013)	2	2	1	2	N/A	N/A	N/A	2	0	2	0	0	0	2	59.1%
32	Ramen zoni et al. (2012)	1	2	1	2	N/A	N/A	N/A	2	0	1	0	N/A	2	2	66.7%
33	Sander s et al. (2015)	1	2	1	2	N/A	0	N/A	2	1	1	0	2	1	1	56.5%
34	Situ et al. (2016) sample 2	2	2	1	2	N/A	N/A	N/A	2	2	1	2	1	1	2	81.8%
35	Véronn eau et al. (2014)	2	2	2	2	N/A	N/A	N/A	2	2	2	2	2	2	2	100.0 %
36	Watkin s et al. (2013)	1	2	1	2	N/A	0	N/A	2	2	1	2	2	1	1	69.2%
37	Wymbs et al. (2012)	2	2	1	2	N/A	N/A	N/A	2	1	1	0	2	2	1	72.7%
38	Yarkov sky (2016)	1	2	1	2	N/A	N/A	N/A	2	2	2	2	2	1	1	86.4%

Appendix B: Predictor and Outcome Study Measures With Citations

Study	Reference	Predictors of interest	Outcomes of interest
1	Baker et al. (2018)	Self-reported self-control (Low Self-Control Scale; Grasmick et al., 1993)	Self-reported and experimenter-observed emotional and verbal dating aggression (Conflict in Adolescent Dating Relationships Inventory; CADRI; Wolfe et al., 2001)
2	Barkley & Fischer (2010)	Self-reported ADHD symptoms of inattention, hyperactivity-impulsivity, or emotional impulsivity (Adult ADHD Symptoms Scale, Barkley et al., 2006; Emotional Impulsiveness Scale; Barkley & Murphy, 2010)	Self-reported impairment in social, academic, work, and romantic domains (Adult ADHD Symptoms Scale, Barkley et al., 2006; Hollingshead Job Index, Hollingshead, 1975; Structured Interview of Impairment, Barkley et al., 2008; employer-rated job performance, DSM-III-R ADHD items, nine ODD items; GPA from high school transcripts)
3	Bradbury & Shaffer (2012)	Difficulties in emotion regulation (DERS; Gratz & Roemer, 2004)	Relationship satisfaction (Relationship Assessment Scale; Hendrick, 1998)
4	Caiozzo et al. (2016)	Time 1 (T1): Difficulties in emotion regulation (Difficulties in Emotion Regulation Scale, DERS; Gratz & Roemer, 2004)	Time 2 (T2, 2 months after T1): verbal and physical dating aggression perpetration (CADRI; Wolfe et al., 2001)

5	Cairns et al. (2017)	Performance EF (spatial working memory, impulsivity, decision-making; Computerised Cambridge Neuropsychological testing Automated Battery, CANTAB – Sahakian & Owen, 1992)	Vocational engagement rate (questions by author); Vocational functioning (Global Functioning: Role Scale GFR; Cornblatt et al., 2007)
6	Chan (2019)	Self-reported cognitive emotional regulation strategies (acceptance, self-blame, rumination, positive reappraisal, catastrophizing subscales (Cognitive Emotion Regulation Questionnaire, CERQ; Garnefski & Kraaji, 2007); difficulties in emotion regulation (DERS; Gratz & Roemer, 2004)	Self-reported best friend or romantic partner relationship qualities (Network of Relationships Inventory – Relationship Qualities Version (NRI-RQV; Furman & Buhrmester, 1985)
7	Ciaracco et al.	Food taste depletion task condition vs. no depletion condition (Baumester et al., 1998)	Infidelity: Self-reported and observed coffee date agreement, phone number disclosure with confederate
8	Cohn et al. (2010)	Self-reported DERS, or DERS subscales: Nonacceptance, goal-directed, impulsive, strategies, awareness, or clarity problems (DERS; Gratz & Roemer, 2004)	Observed mean shock intensity measure of aggression (Response Choice Aggression Paradigm RCAP, Zeichner et al., 1999; Zichner et al., 2003)
9	Côté et al. (2011). Study 1	Emotion-regulation knowledge (Situational Test of Emotion Management, STEM, MacCann & Roberts, 2008)	Prosocial behavior (adapted social-dilemma situation from past research, Brewer & Gramer, 1986)

10	Daly et al. (2015) emerging adult cohorts studies 1 and 2	1. Teacher-reported childhood self-control (10 years; ; items from Disorganised Activity Subscale of the Child Developmental Behaviours Questionnaire, Conners, 1969; Rutter, 1967); 2. Teacher-reported childhood self-control (7 years, and 10 years; Bristol Social Adjustment Guide, Stott, 1969);	1. Unemployment at ages 21 and 26; 2. Unemployment at age 23 (questions by authors)
11	Farrell & Vaillancourt (2019)	Grade 6 inhibitory control (inhibitory control subscales of Early Adolescent Temperament Questionnaire – Revised, EATQ-R; Capaldi & Rothbart, 1992; Ellis & Rothbart, 2001)	Age 19 dating aggression (Conflict in Adolescent Dating Relationships Inventory, Fernandez-Gonzalez et al., 2012); age 19 number of dating partners (questions by authors)
12	Flandermeyer (2019)	Self-reported cognitive flexibility (Cognitive Flexibility Scale; CFS; Martin & Rubin, 1995)	Self-reported career indecision (My Vocational Situation – Vocational Identity Subscale, Holland et al., 1980); anxiety (Career Anxiety Scale, Thai, 2014), or confidence (questions by authors)
13	Fosco et al. (2012)	Age 17 effortful control (EATQ – Ellis & Rothbart, 2005) and age 22, and 23 effortful control (Adult Temperament Questionnaire, ATQ, Evans & Rothbart, 2007)	Age 23 hostility (self-reported Hostility Scale of Brief Symptom Inventory, Derogatis & Melisaratos, 1983); aggressive behaviour (parent-reported Aggressive Behaviour subscale of Adult Behaviour Checklist; ABCL, Achenbach, 2003)
14	Francoeur et al. (2019)	Self-reported emotional regulation (French CERQ, Acremont & Van der Linden, 2007;	Resilience (French Child and Youth Resilience Measure, Daigneault et al., 2001;

		Garnefski et al., 2001) or mentalization (Mentalization Scale, Dimitrijevic et al., 2017)	Ungar et al., 2008), or psychiatric symptoms (French Brief Symptom Inventory, BSI, Derogatis, 1993; Gosselin & Bergeron, 1993), or distress (questions by authors) after romantic break-up
15	Gover et al. (2011)	Self-control (additive scale items from Self-Control Scale, Grasmick et al., 1993)	Psychological or physical dating violence perpetration or victimization (Revised Conflict Tactics Scales, CTS2- Straus et al., 1996)
16	Guilmette et al. (2019)	Goal regulation persistence and reappraisal (respective instruments by same names adapted from Wrosch et al., 2000)	Academic performance or satisfaction (questions by authors)
17	Guzman-Gonzalez et al. (2016)	Emotion regulation difficulties (DERS, Gratz & Roemer, 2004)	Physical dating violence perpetration (CTS2, Ramirez, 2001; Straus et al., 1996)
18	Hao & Liu (2016)	ToM social-cue reading from story characters (Strange Stories, Happé, 1994)	Experimenter-observed prosocial behavior (Gin & Desai, 2012, experimental paradigm)
19	Kercood et al. (2017)	ADHD ratings (Conners Adult ADHD Ratings Scale, Conners et al., 1999); subjective cognitive flexibility (Cognitive Flexibility Scale, CFS, Martin & Rubin, 1995; Martin & Anderson, 1998) or objective cognitive flexibility (Wisconsin Card Sorting Test, WCST, Heaton, 1993)	Reading, writing, math skills (Woodcock Johnson Test of Achievement – Third Edition Standard Battery, Woodcock et al., 2001), and career confidence (questions by authors)

20	Klipfel (2015)	Performance-based difficulties with shifting (Plus-Minus tasks adapted from Jersild, 1927, and Spector & Biderman, 1976), updating (Letter-memory task adapted from Morris & Jones, 1990), inhibition (Go/No-Go Task, Rubia et al., 2001)	Emotional/ verbal; physical, or sexual dating aggression (CADRI, Wolfe et al., 2001)
21	Langeslag & van Strien (2016) Study 2	Intervention love regulation task: regulate love feelings up, or down (task by authors)	Infatuation, valence, arousal (Infatuation and Attachment Scales, Langeslag et al., 2013); Passionate Love Scale, (Ochsner & Gross, 2005)
22	Lopes et al. (2011). Study 3	Strategic emotion regulation ability (subscale of the Mayer-Salovey-Caruso Emotional Intelligence Test, v 2.0, Mayer et al., 2002)	Diary entries on qualities of interactions with friends, roommates, and acquaintances; conflict and tension in social interaction; importance of positive or negative social events (cite)
23	Lopez (2015)	Difficulties with EF: time management, organization/problem-solving, self-restraint, self-motivation, emotion self-regulation (Barkley Deficits in Executive Functioning Scale, BDEFS, for Adults, Barkley, 2011)	Relationship satisfaction (Couples Satisfaction Index, CSI, Funk & Rogge, 2007)
24	Malatras & Israel (2012)	Self-control (mediator; Self-Control Scale, SCS, Tangney et al., 2004)	Aggressive behaviours or rule-breaking (Adult Self-report – Achenback & Rescorla, 2003)

25	McCleary et al. (2012)	ToM social-cue reading from story characters (Strange Stories, Fletcher et al., 1995); Reading the Mind in the Eyes Task (Baron-Cohen et al., 2001)	Social functioning (Social Adjustment Scale-self-report; SAS-SR; Weismann & Bothwell, 1976)
26	Moilanen & Manuel (2017)	Self-regulation (Adolescent Self-Regulatory Inventory, ASRI, Moilanen, 2007, 2015)	“Same-sex” peer social competence; romantic social competence (Interpersonal Competence Questionnaire, ICQ, Buhrmester et al., 1988); current relationship status, lifetime romantic relationship experience (questions by authors)
27	Moilanen & Manuel (2018)	Self-regulation (Adolescent Self-Regulatory Inventory, ASRI, Moilanen, 2007, 2015)	Romantic competence (subscales and items from Interpersonal Competence Questionnaire, Buhrmester et al., 1998); last sexual partner relationship status (question by author)
28	Moilanen & Manuel (2019)	Self-control (Adolescent Self-Regulatory Inventory, ASRI, Moilanen, 2007)	Social competence (ICQ, Buhrmester et al., 1998), prosocial behaviour (Swisher et al., 1985)
29	O'Connor (2011)	Late childhood self-control (self control subscale of Social Skills Rating System, Gresham & Elliot, 1990); early adolescent emotional control or mid-late adolescent emotional control (ATP devised scale by Australian Temperament Project authors)	Latent positive development indicated by: social competence (3 subscales from Smart & Sanson, 2003 empathy, responsibility, self-control); life satisfact. (2 subscales National Survey of Families & Households, Sweet & Bumpass, 2002), trust and tolerance of others (3 items Stone & Hughes trust to neighborhood, Australians, tolerance of

			different ethnic groups); trust in authorities and organizations (Trust in Authorities, Flanagan & Longmire, 1995; trust in organizations, Stones & Hughes, 2002) and, civic engagement (three scales from Stone, 2001, and Stone & Hughes, 2002)
30	Owens & Hinshaw (2016)	Wave 1 self-control – SSRS (Gresham & Elliot, 1990)	Wave 4 internalizing/externalizing psychopathology (Adult Behaviour Checklist, Achenbach & Rescorla, 2003)
31	Perrone-McGovern et al. (2013)	Empathy/perspective-taking (Interpersonal Reactivity Index, IRI, Davis, 1983)	Interbeat interval (IBI); skin conductance level (SCL); relationship satisfaction (Relationship Assessment Scale, RAS, Hendrick et al., 1998)
32	Ramenzoni et al. (2012)	Experimental task condition: joint coordinative structure requiring interpersonal coordination(ToM), Vs. control condition (parallel behaviour) developed by authors	Number of principal components, or the percentage variance accounted for by the first component, in the PCA of movement trajectories of pairs of participants (developed by authors)
33	Sanders et al. (2015)	Condition for reading comprehension task: Focus on preventing mind-wandering (internal) VS. focus on what was read (external; Smallwood et al., 2013) VS. control: no instructions	Reading comprehension

34	Situ et al. (2016) Sample 2	Self-control, self-control squared-term (Brief Self-Control Scale, BSCS, Tangley et al., 2004)	Aggression (Aggression Questionnaire, Buss & Perry, 1992)
35	Véronneau et al. (2014)	Latent late adolescent effortful control (EC) indicated by self-reported, parent-reported, and teacher-reported late adolescent EC (EATQ, Ellis & Rothbart, 2005)	Self-reported emerging adult educational attainment (question by author)
36	Watkins et al. (2013)	Random assignment to dual-attention self-control depletion video-viewing task (DeWall et al., 2007; Schmeichel et al., 2003)	Observed trial 1 reactionary aggression white-noise imposition on partner; observed trial 2 retaliatory aggression white-noise imposition on partner (Taylor Competitive Reaction Time Test, Taylor, 1967; Wilkowski et al., 2010)
37	Wymbs et al. 2012	Parent- and teacher-reported childhood disruptive behaviour disorders ratings (Disruptive Behaviours Disorders Rating Scale; Pelham et al., 1992); averaged-maximum ratings of adult self- and mother-reported inattention and hyperactivity-impulsivity (ADHD Barkley Adult Scale, Barkley & Murphy, 1998)	Self-reported verbal and physical dating violence (CTS, Straus, 1979)
38	Yarkovsky (2016)	Actor emotion regulation difficulties (DERS, Gratz & Roemer, 2004)	Dating violence perpetration and victimization (CTS-2, Straus et al., 1996)

Appendix C: Full Set of Qualitative Interview Questions

Structured Interview Questions

ID Code:

Part I: Introduction - Purpose of Discussion

Build rapport

Demographic Questions:

Age:

Year of Study:

Age at head injury:

Severity of head injury if known (hospitalization, loss of consciousness):

Do you have documentation?:

Do you have any currently diagnosed Learning Disabilities?

Did you have any diagnosed Learning Disabilities before your head injury?

Do you have currently diagnosed ADHD?

Did you have diagnosed ADHD before the head injury?

Do you have any currently diagnosed mood problems?

Did you have any diagnosed mood disorders before sustaining the head injury?

Pre-Concussion Functioning

Part II: Understand pre-concussion developmental tasks and functioning

Visualize, or remember pre-concussion time period.

1) Did you value friendships/social skills at this time? If so, what goals did you have in the area of friendships/social skills?

2) What were the necessary plans toward achieving your goals in this area?

3) What concrete action steps were you taking toward achieving your goals/plans in this area?

(Repeat for each friendship/social skill goal)

What about school/work/career goal(s)?

- 2) What were the necessary plans toward achieving your goals in this area?
- 3) What concrete action steps were you taking toward achieving your goals/plans in this area?

What about romantic relationship goal(s)?

- 2) What were the necessary plans toward achieving your goals in this area?
- 3) What concrete action steps were you taking toward achieving your goals/plans in this area?

Part III: Understand key pre-concussion figures and university/community programs

- 1) Who were the important people in your life leading up to your head injury?
- 2) What were the main university/community programs you interacted with at this time?

Post-Concussion Functioning

Part IV: Understand acute phase post-concussion developmental tasks and functioning

Visualize, or remember post-concussion time period

- 1) Did you value friendships/social skills at this time? If so, what goals did you have in the area of friendships/social skills?
- 2) What plans could you identify as necessary toward achieving your goals in this area?
- 3) What concrete steps were you taking toward achieving your goals/plans in this area?

(Repeat for each friendship/social skill goal)

What about school/work/career goal(s)?

- 2) What plans could you identify as necessary toward achieving your goals in this area?
- 3) What concrete steps were you taking toward achieving your goals/plans in this area?

What about romantic relationship goal(s)?

- 2) What plans could you identify as necessary toward achieving your goals in this area?

3) What concrete steps were you taking toward achieving your goals/plans in this area?

Part V: Understand key post-concussion figures and university/community programs

1) Who were the important people in your life leading up to your head injury?

2) What were the main university/community programs you interacted with at this time?

Executive Functioning and Theory of Mind Effects on Developmental Tasks & Functioning

Part VI: Understand any executive functioning or theory of mind effects from concussion

1) Did you find you had difficulties paying attention or concentrating after your injury?

Did this affect any of your previously discussed life goals? Life plans? Ability to carry out action steps?

Repeat for other executive functions, asking about effects on goals/plans/functioning:

2) Inhibiting/stopping, or controlling your impulses, thoughts, or emotions?

3) Holding all the pieces of a problem in your mind, while trying to work the problem through?

4) Getting stuck while problem-solving, or thinking of novel ways to solve the problem?

Repeat for social cognition, asking about effects on goals/plans/functioning:

5) With real-time awareness of social cues coming from others' faces/bodies, voices, writing pieces, but never used to?

6) Reading between the lines and accurately discerning others' emotions from their face, body, voice, or writing, without them directly telling you?

7) Being able to take someone else's perspective to really "get" what they were thinking, feeling; why they did something, or thought something; what they were likely going to do next?

8) Knowing what to do in social situations, or planning in the moment how best to act or respond in a social situation?

Impact of Non-Injury Factors on Developmental Tasks and Functioning

Part VII: Understand how non-injury factors affect cognitive and social-cognitive effects

1) How did the important people in your life respond in the medium to long-term, after you had your injury?

2) Do you find these reactions affected any of the mind-problems we just discussed? If so, did this mean anything for your choice of life goals? Life plans? Action steps?

Attention:

inhibition:

Working memory:

Mental-flexibility:

Social Encoding:

Social Perception:

Theory of Mind:

Social Behaviour:

3) How did the key university/community programs in your life respond in the medium to long-term, after you had your injury?

4) Do you find these responses had an effect on any of the mind-problems we just discussed? If so, what then did this mean for your choice of life goals? Life plans? Action steps?

Attention:

inhibition:

Working memory:

Mental-flexibility:

Social Encoding:

Social Perception:

Theory of Mind:

Social Behaviour:

Conclusion and Wrap-Up