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Effects of Family Adversity and TV Consumption on Turkish Immigrant Children's Executive Functions (EFs)

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ABSTRACT

Immigrant and ethnic minority children are often exposed to high levels of family adversity and television time. Family adversity and extended TV consumption may be associated with decreased executive functions (EFs). To determine if immigrant children's exposure to family adversity and TVconsumption predicts EFs skills 12 months later. Data was collected as part of a large longitudinal cohort study on Turkish immigrant children (*N*=451, aged 5-15 years, 47% male, Table 1) in Germany, the Netherlands, and Norway. At T1, Turkish immigrant mothers reported on family adversity (daily hassles, depression screening, parents' relationship quality) and children's average hours spent watching TV per day. At T2, 12 months later, children were administered the computerized *Hearts and Flowers* task to assess three EF components, updating, shifting, and inhibition (efficiency scores, calculated as mean accuracy divided by median reaction time for correct items). Child age, gender, maternal education, and country of data collection were considered as additional predictors. Structural equation modeling showed that there were no significant effects of family adversity on TV consumption, TV consumption on EFs, or family adversity on EFs. However, age and gender predicted EFs. Model fit was good (χ^2 [chi-squared] = 23.663, *df* [degrees of freedom] = 14, *p* = .050, *CFI* = .992, *RMSEA* = .039, *95% CI* [.000, .066], *PCLOSE* = .720: variance explained in EF: R^2 [R squared] = .75). Despite failing to reject the null hypothesis, these results are important as this is the first known study of its kind. This study alone is not sufficient evidence. Others should try to replicate the findings so

that avenues for possible interventions and parent education among immigrant children and their families are not overlooked.

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CHAPTER ONE
INTRODUCTION

With a staggering 258 million people living outside of their country of birth as of 2017 (Stroud, Jones, & Brien, 2018), today's society is witness and host to the highest number of immigrants yet seen, and immigration is unlikely to slow down. Immigrant children grow up in a different context than their native peers. Though dependent on host country, immigrant children may face increased exposure to adversities (Dimitrova, Chasiotis, & van de Vijver, 2016; Schachner, He, Heizmann, & Van de Vijver, 2017). While some adversities faced by immigrant children and their families may be unique to the immigrant experience, studies have shown immigrant children and families face amplification of common household stressors, such as increased daily hassles, maternal depression, marital problems, and low SES, when compared to other non-immigrant participants (Fassbender & Leyendecker, 2018; Jaekel, Leyendecker, & Agache, 2016; Jäkel & Leyendecker, 2008; Jäkel, Leyendecker, & Agache; 2015; Leyendecker et al., 2018; Spiegler & Leyendecker, 2017; Spiegler, Sonnenberg, Fassbender, Kohl, & Leyendecker, 2018). In particular, this is true of Turkish immigrants in western Europe, who constitute a significant minority group in the region. Immigrant children's exposure to adversities has been linked to developmental outcomes critical to life course success, including not only school adjustment and psychological well-being (Frankenberg, Kupper, Wagner, & Bongard, 2013), but also important cognitive abilities such as executive functions (EFs) (Spiegler & Leyendecker, 2017). In order to prevent poor developmental outcomes and enact change, it is essential to determine what factors in the

environments of children in immigrant families place them at risk. It is possible immigrant children's elevated exposure to general family adversities indirectly affects their development of EFs by way of another environmental influence. Therefore, this paper examines some of the potential influences on Turkish immigrant children's EFs and their pathways. Specifically, we consider the effects of children's TV consumption, which has been shown to affect EFs, and its relationship to family adversity exposure and EF outcomes. We recognize fully remediating any potential environmental influences of family adversity on immigrant children's EFs may not be plausible. However, by determining if TV consumption mediates the effects of family adversity on the development of EFs, we may be able to develop successful avenues to intervention.

CHAPTER TWO
LITERATURE REVIEW

Executive Functions (EFs)

Paying attention, following rules, setting goals, and controlling one's self are essential to leading a successful life. Each of these critical skills are part of a family of cognitive mechanisms known as executive functions (EFs) (Diamond, 2013; Miyake & Friedman, 2012). EFs transpire in the prefrontal cortex of the brain (Barbas & Zikopoulos, 2007; Mesulam, 2002) As neurodevelopmental abilities, EFs are not directly observable and thus commonly conceptualized using a three-component latent variable construct, operationalized via different task components. These components include updating, inhibition, and shifting (Miyake & Friedman, 2012; Zelazo, Blair, & Willoughby, 2017). Updating refers to an individuals' working memory or the ability to take in new information, remember, and manipulate it (Diamond, 2013). Inhibition, or inhibitory control, allows children to filter out distractions and willfully direct their attention. The ability to be cognitively flexible is termed shifting. Shifting not only includes flexibility to adjust to new demands, but also the ability to switch perspectives or approaches to a problem.

EFs predict developmental outcomes for a variety of areas throughout life. Studies have found positive relationships between EFs and outcomes such as mental health (Baler & Volkow, 2006; Diamond, 2005; Fairchild et al., 2009; Lui & Tannock, 2007), physical health (Riggs, Spruijt-Metz, Sakuma, Chou, & Pentz, 2010), job success (Bailey, 2007), marital harmony (Eakin et al., 2004), public safety (Broidy et al., 2003; Denson,

Pedersen, Friese, Hahm, & Roberts, 2011; Moffitt et al., 2011), and overall life course success (Moffitt et al., 2011). EFs formed in early childhood strongly predict EFs in later life (Diamond, 2016), and they are critical for school success (Blair & Razza, 2007; Borella, Carretti, & Pelegrina, 2010; Duncan et al., 2007; Gathercole, Pickering, Knight, & Stegmann, 2004; McClelland et al., 2007).

Because the prefrontal cortex is shaped by prolonged development and increased neural plasticity during the early childhood years, EFs are malleable to both biological and environmental influences (Ardila, Rosselli, Matute, & Guajardo, 2005; Brocki & Bohlin, 2004; Huizinga, Dolan, & van der Molen, 2006; Huttenlocher, 2002; Klenberg, Korkman, & Lahti-Nuuttila, 2001; Nelson, de Haan, & Thomas, 2006). For instance, studies have demonstrated positive associations between EFs and characteristics of the early home and family environment, such as parent-child interactions (Blair, Raver, & Berry, 2014; Cheng, Lu, Archer, & Wang, 2018; Gueron-Sela, Camerota, Willoughby, Vernon-Feagans, & Cox, 2018; Meuwissen & Englund, 2016; Rhoades, Greenberg, Lanza, & Blair, 2011) and parenting stress (i.e. the stress of being a parent) (de Cock et al., 2017; Joyner, Silver, & Stavinoha, 2009). In a study examining quality of parent-child interactions and longitudinal outcomes for EFs, both mother's parenting (including supportive presence, quality of instruction, respect for autonomy, and structure and limit setting) and father figure's emotional support predicted EFs for securely attached children into middle childhood (Meuwissen & Englund, 2016). Another study looked at the relationship between parental bonding, parenting stress, and child EFs for both parents within the first 24 months of children's lives (de Cock et al., 2017). Parenting

stress directly affected child EFs and mediated the relationship of poor parental bonding for both parents and child EFs out comes. Additionally, a study found that parenting stress was cross sectionally linked to children's EFs at 8 to 12 years old (Joyner et al., 2009). Recent studies have also indicated maternal depression may play a significant role in the associations between mother-child interactions and children's EFs (Baker, 2018; Gueron-Sela et al., 2018). This could indicate how stressors for the parents, such as mental health problems, may be occurring away from the child, but still affects children indirectly via the parent's interactions with their children.

Other characteristics of the early home and family environment that have been positively associated with children's EFs are socioeconomic status (SES) (Clark et al., 2013; Hackman, Gallop, Evans, & Farah, 2015; Lipina et al., 2013; Raver, Blair, & Willoughby, 2013; Sarsour et al., 2011) and parent education (Aarnoudse-Moens, Weisglas-Kuperus, Duivenvoorden, Oosterlaan, & van Goudoever, 2013; Ardila et al., 2005; Catale, Willems, Lejeune, & Meulemans, 2012; Jacobsen, Mello, Kochhann, & Fonseca, 2017), which is often used as an alternative indicator of SES. For instance, Raver et al. (2013) found exposure to chronic poverty and the strains of financial hardship predicted lower EFs for a sample of over 1,000 young children. Although children cannot control the SES they are born into or raised in, SES does influence parent and caregiver stress levels, thereby shaping the child's environment and exposure to family adversity. Overall, children reared in environments characterized by escalated family adversities such as parenting stress and low SES, appear to be most at risk for poor EF development.

Immigrant Children

Ethnic minority and immigrant children (growing up with at least one parent whose first language is different from the majority language) face increased risk for exposure to family adversity (Jäkel & Leyendecker, 2008; Sektnam, McClelland, Acock, & Morrison 2010). Immigrant families have been found to have elevated general adversities such as low SES, increased daily hassles or day-to-day stressors, and poor psychological well-being, including depression and low life satisfaction (Fassbender & Leyendecker, 2018; Jäkel & Leyendecker, 2008; Jäkel et al., 2015; Jaekel et al., 2016). The studies aforementioned looked at Turkish immigrants, which represent a group of particular interest as the largest ethnic minority group in Germany, with sizable populations also residing in the Netherlands, Norway, and other Western European countries. In Germany alone there are roughly 3 million Turkish immigrants (Destatis, 2017). Many Turkish immigrants have moved to areas of Europe as migrant workers where they encounter low wages, loneliness, unattractive working conditions, and overt discrimination (Katzenson, 2016). Though they are from all social classes, Turkish immigrants are the immigrant group with the lowest income in Germany and have a poverty risk rate near 40% (Statistisches Bundesamt, 2018). Education is also typically low, with just under half of Turkish children growing up with parents who have neither a professional or university entrance qualification. Turkish immigrants can thus be considered a financially and educationally disadvantaged group (Fassbender & Leyendecker, 2018). Unsurprisingly, Turkish immigrant mothers in Germany experience higher levels of daily hassles than German mothers (Jäkel & Leyendecker, 2008). Turkish

immigrant mothers with low SES also report lower life satisfaction, more daily hassles, and more depression (Fassbender & Leyendecker, 2018). These stressors have the capacity to affect family well-being, and existing research shows children of immigrant background are at risk for lower psychological and academic adjustment, which is explained by their family adversity (Dimitrova et al., 2016; Jäkel et al., 2015; Jäkel, Schölmerich, Kassis, & Leyendecker, 2011). Moreover, some groups of immigrant children struggle in school, cognitively falling behind their nonimmigrant peers, while other immigrant children succeed (Browne, Wade, Prime, & Jenkins, 2018; Crul & Vermeulen, 2003; De Feyter & Winsler, 2009; Ha, Ybarra, & Johnson, 2017; Leventhal, Xue, & Brooks-Gunn, 2006; Leyendecker, Jäkel, Kademoğlu, & Yagmurlu, 2011; Sam, Vedder, Liebkind, Neto, & Virta, 2008). In a meta-analysis of immigrant children in Europe, Dimitrova et al. (2016) found that although, overall, immigrant children did not adjust as well as their native peers on measures of internalizing, externalizing, and academic outcomes, these effects were moderated by geographic area, developmental period, SES, cultural diversity, and the country's immigration policy. Another study comparing Turkish immigrant and German youths found family adversity and inconsistent parenting, rather than immigrant background, were cross-sectionally associated with mental health problems (Jaekel et al., 2016). Therefore, it is important to note that children's immigrant status is not creating differences in developmental risks and outcomes, but its association with certain demographic and cultural characteristics within a given society.

While research does show a relationship between immigrant families' risk for adversity and children's EFs, mechanisms behind this relationship need further exploration (Chen et al., 2015; Spiegler & Leyendecker, 2017). Spiegler and Leyendecker (2017) found a positive association between Turkish-German immigrant children's EFs and equal endorsement of both cultures in their study of identity acculturation and EFs. However Jaekel, Jaekel, Willard, and Leyendecker (2019) found there was no advantage in EFs for Turkish immigrant children who were bilingual compared to German monolingual children, and there was no gradual effect of bilingual language skills among Turkish immigrants (Jaekel et al., 2019). Another study of Chinese-American children in immigrant families examined direct and indirect effects of family contextual factors on children's effortful control and academic achievement (Chen et al., 2015). They found that parents' enculturation was positively associated with children's effortful control, and authoritarian parenting was negatively associated with children's effortful control. While these studies support the need to consider how joint influences from interpersonal, and cultural factors affect immigrant children's cognitive development, considering other environmental influences may help explain how family adversity influences ultimately affect immigrant children's EFs.

Influence of TV

One potential environmental influence that affects immigrant children's EFs is the influence of immigrant children's TV consumption. Watching TV is a common part of

many children's immediate environment, and TV consumption has been associated with the development of EFs (Lillard, Drell, Richey, Boguszewski, & Smith, 2015; Linebarger, Barr, Lapierre, & Piotrowski, 2014; Nathanson, Aladé, Sharp, Rasmussen, & Christy, 2014; Ribner, Fitzpatrick, & Blair, 2017). Nathanson et al. (2014) found that children who started watching television at a younger age, and who watched more television overall, had poorer EFs. Another study conducted by Linebarger et al. (2014) found increased exposure to background television predicted lower EFs for high-risk preschool children. Interestingly, Lingineni et al. (2012) found that among a sample of children aged 5 to 15 years, watching television for more than 1 hour per day was one of six factors that increased the odds of an ADHD diagnosis, which is a disorder characterized by impairment of EFs. Though the relationship can be complex, evidence suggests that excessive amounts of TV consumption results in lower EFs (Kostyrka-Allchorne, Cooper, & Simpson, 2017a). This is concerning as immigrant families may possibly utilize the TV as a tool for exposing their offspring to their home country's culture and language. A few studies have explored different immigrant groups' television usage and found it is a frequently consumed media for both assimilating to the new country and connecting to their heritage culture (Hargreaves & Mahdjoub, 1997; Lee, 2004; Lee & Tse, 1994; Stilling, 1997). Other studies, though not specific to immigrants, have found positive associations between other types of family adversity and increased TV consumption, including low SES and ethnic minority households (Kostyrka-Allchorne et al., 2017a; Ribner et al., 2017; Rideout, Lauricella, & Wartella, 2011; Stilling, 1997).

Given this evidence, we aimed to determine if Turkish immigrant children's exposure to family adversity and TV consumption longitudinally predicted EFs 12 months later, and if indirect effects of family adversity on immigrant children's EFs may be explained by the influence of children's TV consumption. We utilized structural equation modeling (SEM) to investigate the following hypotheses: (1) Family adversity is positively associated with children's daily TV consumption; (2) children's daily TV consumption has a negative direct effect on EFs; and (3) the indirect effects of family adversity on EFs are mediated by children's daily TV consumption. It was also hypothesized that age, gender, and maternal education would predict EFs. Furthermore, it was hypothesized maternal education would negatively predict family adversity.

CHAPTER THREE
METHODS

Participants and Procedures

Data was collected as a part of the SIMCUR project (Social Integration of Migrant Children—Uncovering Family and School Factors Promoting Resilience), a cohort-sequential study on the development of Turkish immigrant children in three European countries, including Germany, the Netherlands, and Norway (Leyendecker, Mesman, & Oppedal, 2016). Three cohorts of children were recruited and assessed in three waves, each 12 months apart. At wave one, the first cohort was in kindergarten, the second in 4th grade, and the third in 7th grade. Participants were screened through the telephone by a bilingual research assistant. The inclusion criterion for children was that one or both of their parents or grandparents had been born in Turkey. In addition, to prevent confounding bias, children eligible for participation were born after 32 weeks of gestational age, were not living in a foster family, and did not have a referral to a special needs school. All participants who responded and fulfilled these criteria were included. Families were allowed to choose if the study was conducted in their home or at the university lab. Interviews were conducted by trained ethnically matched native speakers and available in Turkish or the host country's language.

For this study, data were collected from Turkish immigrant children and their mothers (N = 451). Data were collected at two time points, T1 and T2. At T1 participants were aged 5 to 13 years (M = 8.24, SD = 2.70). T2 occurred 12 months later.

Demographics collected (Table 1) included child's age and gender, country of data collection and mother's level of education at T1. All tables and figures are located in the appendix. Also collected at T1 were measures of children's daily TV consumption and family adversity. Children's EFs were assessed at T2.

Measures

Maternal Education

Mother's level of education was assessed via structured interviews and then coded according to the International Standard Classification of Education (ISCED; ISCED, 2011). ISCED categories were no degree, primary education, lower secondary education, upper secondary education, post-secondary non-tertiary education, tertiary education, and PhD, and were treated as interval scaled in main analyses. The ISCED offers the advantage of standardizing educational levels, which may vary from country to country. This is especially advantageous for any comparisons of non-immigrant mothers and Turkish immigrant mothers, who may have been educated in Turkey and/or the host country.

Children's Daily TV Consumption

At T1, mothers reported their child's average daily TV consumption in hours. For participants in Germany and Norway, mothers reported the average daily TV consumption for weekdays and weekends. TV consumption for week days was multiplied by 5/7 and TV consumption for weekend was multiplied by 2/7. These were then combined to represent the child's average daily TV consumption. Participants from the

Netherlands only reported hours child watches TV per day with no differentiation for weekday or weekend. The calculated child's average daily TV consumption for German and Norwegian participants was combined with the Dutch participants' reported average daily TV consumption for the final variable, children's daily TV consumption. However, because child's daily TV consumption was not normally distributed, the variable used in the model was transformed into 10 percentiles based on parameters generated by SPSS and used as an interval scaled variable.

Family Adversity

Family adversity was measured at T1 via maternal self-report using the Family Adversity Index (FAI) (Jäkel et al., 2015). The FAI combines three measures that have previously been shown to be highly correlated, including the mother's depressive symptoms, daily hassles, and partner relationship quality. Mothers' depressive symptoms are assessed with the CES-D depression scale (Radloff, 1977) (α = .83), daily hassles are assessed with 13 specifically selected items of the original Hassles Scale (Kanner, Coyne, Schaefer, & Lazarus, 1981) (α = .87), and parents' relationship quality are assessed with the Partner Relationship Device (Koot, 1997) (α = .60). For all scales, higher scores indicate more problems. Finally, the z-standardized CES-D, daily hassles, and partner relationship items were combined into the cumulative FAI score (α = .89).

Hearts and Flowers EFs Task

Children's EFs were assessed at T2 using the computerized *Hearts and Flowers* task, which measures three EF components: updating, inhibition, and shifting (Wright &

Diamond, 2014). The assessment comprises three tasks, each representative of one EF component, which builds upon the previous task and increases in difficulty. The first task is the congruent task, hearts, in which children are instructed to press a computer key on the same side as the stimulus (heart) appears on the screen. The congruent task assesses updating abilities because the child has to remember the new rule and be able to respond appropriately. The incongruent task, flowers, is the next task. Children are instructed to press the button on the opposite side from which the stimulus (flower) appears. The incongruent task assesses the child's ability to inhibit the previously learned response to the congruent task directions of pressing the button on the same side as the stimulus. The third and final task combines both congruent and incongruent for the mixed EFs task to test the child's ability to shift from one rule to another. Throughout each task, children's accuracy and reaction times are automatically recorded. Reaction times are recorded in milliseconds (ms).

Two different types of scores were used and reported. For more meaningful descriptive statistics, participants median reaction time for correct items on each EF task was considered. For the best overall measure and in line with previous studies, efficiency scores for each task are calculated by dividing mean accuracy by median reaction time for correct items. These were then z-standardized.

Statistical Analysis

Data were analyzed with SPSS 24 and AMOS 24. Descriptive statistics were analyzed in SPSS 24. Frequencies were assessed for the categorical variables of child

gender and country of data collection, as well as the interval scale variable of mother education (ISCED). Mean, SD, and distribution was assessed for child age, daily TV consumption, FAI (including each of the three scales in the index), and the three task scores in the EFs latent variable construct. Z-standardized versions of the FAI and EFs scores were used in the model.

To examine the effects of family adversity on EFs and the mediating role of child's daily TV consumption, we performed structural equation modeling (SEM). The latent variable of EFs was first estimated. Next, a SEM was constructed to examine the direct and indirect effects of the continuous variables of family adversity and child's daily TV consumption on children's EFs 12 months later. Initial analyses included child age, gender, maternal education, and country of data collection as potential confounding variables. Goodness of model fit was determined with the model chi-square (χ^2), the comparative fit index (CFI), and the root-mean-square error of approximation (RMSEA) (Kline, 2005). The chi-square value assesses overall model fit and the degree of discrepancy between the sample and fitted covariances matrices (Hu & Bentler, 1999). An insignificant value (> .05) indicates a good model fit, but as every p-value, it is highly associated with sample size. For the CFI, values greater than .90 indicate acceptable fit. For the RMSEA, values of .05 or lower indicate close fit, and the PCLOSE, or the closeness of fit, should not be significant (> .05). The strengths of the pathways were indicated using standardized regression coefficients. Coefficients less than 0.10 indicate a small effect, values around 0.30 indicate a medium effect, and values around 0.50 indicate large effects (Kline, 2005). Indirect effects were estimated by calculating the

product of path coefficients, and the significance of indirect effects was tested using 2,000 bootstrap samples (Preacher & Hayes, 2008).

Maximum likelihood estimation was used to impute missing data points. Of the predictors, mother's education (ISCED) had missing data of 0.22%. Percentages of missing data for the Hearts and Flowers task scores loaded onto the EFs construct was no more than 1.78%. TV had no missing data. Percentages of missing data for the three questionnaires included in the FAI ranged from 1.77% to 6.65%. Overall, 2.4% of missing values for the FAI were imputed.

CHAPTER FOUR
RESULTS

Demographics collected are displayed in Table 1 and included child's age and gender, country of data collection and mother's level of education at T1. The mean child age was 8.24 years (*SD* = 2.70) and ranged from 5 to 13.42 years. Child gender was dichotomously coded as male = 1 and female = 2, and 47% of participants were males. For country of data collection, 51.9% of participants were from Germany (*N* = 234), 28.8% were from the Netherlands (*N* = 130), and 19.3% were from Norway (*N* = 87). Results for mother's level of education using ISCED codes showed 4.2% of the mothers had no degree, 21.2% had a primary education, 31.3% had a lower secondary education, 30.8% had an upper secondary education, 0% had a post-secondary non-tertiary education, 12.2% had a tertiary education, and 0.2% had a PhD.

Also displayed in Table 1 are descriptive statistics, including means and SDs, for child's daily TV consumption and FAI measures (daily hassles, depression, and partner relationship) at T1, and EFs at T2. For TV consumption, the mean hours of TV watched per day for the untransformed, non-normally distributed variable were 1.96 (*SD* = 1.26) but ranged from 0 – 10 hours. The mean for the TV consumption variable after being transformed into percentiles was 5.32 (*SD* = 2.93). For the three measures of the FAI, the unstandardized means were 7.24 (*SD* = 5.46) for depression, 29.17 (*SD* = 10.43) for daily hassles, and 5.80 (*SD* = 1.71) for partner relationship quality. The z-standardized FAI had a mean of 0 (*SD* = .76). The mean of participant's median reaction time for correct items for the updating EFs task was 413 ms (*SD* = 155). For the inhibition task *M* = 519 ms (*SD* = 188), and for the shifting task *M* = 724 ms (*SD* = 239), indicating that task difficulty

increased from updating to inhibition and shifting as expected. The EF variables used to form the latent construct in the model were efficiency scores (z-standardized mean accuracy divided by median reaction time for correct items). For updating the z-standardized efficiency mean was -.16 (*SD* = .97), -.16 (*SD* = .95) for inhibition, and -.15 (*SD* = .96) for shifting.

The hypothesized SEM is described graphically in Figure 1. The SEM sought to testthe hypotheses that: (1) Family adversity is positively associated with children's daily TV consumption; (2) children's daily TV consumption has a negative direct effect on EFs; and (3) the indirect effects of family adversity on EFs are mediated by children's daily TV consumption. It was also hypothesized that age, gender, and maternal education would predict EFs. Furthermore, it was hypothesized maternal education would negatively predict family adversity. Circles represented the latent variable of EFs, and squares represented other measured variables. For the latent variable construct portion of the model, the EFs latent construct showed that for every .80 increase in updating, .83 increase in inhibition, and .86 increase in shifting, EFs increased by 1 standard deviation. These predictors of EFs explained an estimated 75% of its variance (R^2 = .75). Model fit was good (χ^2 = 23.663, *df* = 14, *p* = .050, *CFI* = .992, *RMSEA* = .039, *95% CI* [.000, .066], *PCLOSE* = .720). Direct effects are detailed in Table 2. There was no significant direct effect of family adversity on TV consumption (β = .013, *p* = .712, *95% CI* [-.006, .100]), and no significant direct effect of TV consumption on EFs (β = -.034, *p* = .243, *95% CI* [-.083, .015]). Therefore, the first and second hypotheses were not supported. The third hypothesis that indirect effects of immigrant children's family adversity on EFs

were mediated through TV consumption was also not supported (β = .000, p = .448, *95% CI* [-.007, .001]). There was also no direct effect of family adversity on EFs. Ultimately, this path was not included in the model because it reduced statistical parsimony and did not offer any further explanation of the relationship between family adversity and EFs.

Child age and gender predicted EFs. Older children had higher EFs (β = .855, p < .001, *95% CI* [.823, .883]) and boys had higher EFs than girls (β = -.124, p < .001, *95% CI* [-.176, .072]). However, maternal education did not predict Turkish immigrant children's EFs skills and was deleted from the model for reasons of statistical parsimony.

CHAPTER FIVE
DISCUSSION

Using a hypothesis constructed with previous research this study sought to determine how immigrant children's exposure to elevated, typical family adversities and exposure to TV consumption influenced their EFs outcomes. Specifically, the SEM constructed aimed to support the hypothesis that the indirect effects of family adversity on immigrant children's EFs could be explained through the direct influences of TV consumption. That is, as family adversity increased, TV consumption would have increased, and as TV consumption increased, EFs would have decreased. Family adversity would not have directly affected EFs, because all potential affects would have been fully mediated by TV consumption. We based these hypotheses on existing findings of previous studies, but these studies did not specifically assess large samples of immigrant children. These findings indicated parent's stress and mental health influenced children's EFs by of way parent-child interactions (Baker, 2018; de Cock et al., 2017; Gueron-Sela et al., 2018; Joyner et al., 2009), and that increased TV consumption negatively affected children's EFs (Kostyrka-Allchorne et al., 2017a; Linebarger et al., 2014; Nathanson et al., 2014). Among Turkish immigrant families, it has been found these parents, specifically mothers, experience elevated levels of common stressors and adversities (Fassbender & Leyendecker, 2018; Jaekel & Leyendecker, 2008; Jäkel et al., 2015). It has also been indicated Turkish immigrant mothers show lower involvement and more inconsistent behavior (Leyendecker et al., 2011). Furthermore, TV has been used by immigrants as a tool for learning about their host country as well as connecting

with their native country culture (Hargreaves & Mahdjoub, 1997; Lee, 2004; Lee & Tse, 1994; Stilling, 1997). Therefore, we deducted TV consumption may contribute to explanations of family adversities effects on children's EFs. That is, increased stressors and family adversities experienced by immigrant parents might lead to poor or less frequent interactions with children, which may subsequently lead to children's increased TV consumption. We suspected overtime increased TV consumption would result in decreases in quality of EFs outcomes, and that TV consumption might account for the effects of family adversity of immigrant children's EFs outcomes.

However, this hypothesis was not supported by the SEM results. This study found that environmental influences of TV consumption did not mediate the potential influences of family adversity on immigrant children's EFs. The relationship between family adversity, TV consumption, and EFs was not significant. Child's average daily TV consumption at T1 did not have a significant direct effect on EFs at T2. Family adversity at T1 did not have a significant direct effect on child's average daily TV consumption at T1. Family adversity had no direct or indirect effect on EFs. Therefore, there was no mediation of family adversity effects on EFs through TV consumption. Ultimately, the influences of TV consumption and family adversity on children's EFs outcomes could not be confirmed among this population of Turkish immigrant children. Despite the lack of evidence to support the main hypothesis, model fit was still good as indicated by the three fit indices: the model chi-square, CFI, and RMSEA. The model chi-square was acceptable at 23.663 ($\chi^2 = 23.663$, $df = 14$, $p = .050$). Ideally, p-value for the model chi-square should be insignificant. However, Kenny and McCoach (2003) maintain that that

the estimated chi-square is a bias estimator and that bias is dependent on sample size. Chi-square estimates may be a generally reasonable measure of fit for smaller sample sizes (i.e. N = 75 to 200), but for models of sample sizes of 400 or more, the chi-square is almost always statistically significant. Therefore, it is unsurprising that the significance for our estimated chi-square is $p = .050$. The CFI for our model was .992, which is above the minimum standards of .90 for acceptable fit, and therefore can be considered very good. RMSEA for the model was also considered good (*RMSEA* = .039, *95% CI* [.000, .066], *PCLOSE* = .720) because it was below .05 and had a PCLOSE that was not significant at the .05 level (i.e. > .05). Regarding effect sizes, the only effect above .50, and thus considered to have a large effect, was age on EFs with .855. Gender on EFs also had a considerable effect size albeit considered small at -.124. All other effect sizes, including family adversity on TV consumption and TV consumption on EFs, were extremely small and nonsignificant.

Looking at descriptive statistics, the overall mean of Turkish immigrant children's average daily TV consumption was 1.96 hours (*SD* = 1.26). However, the range was large at 10 hours, with a variance of 1.59. The mean score for mother's CES-D depression screenings was low but had a large standard deviation (*M* = 7.24, *SD* = 5.46). Similarly, mean daily hassles scores were around the middle of the scale, but also had a larger standard deviation (*M* = 29.17, *SD* = 10.43). The mean of the partner relationship quality measure was also low at 5.80 (*SD* = 1.71). Though the means of the scales that comprised the FAI were not extremely high, each showed considerable variance. Lastly, EF results were consistent with what has previously been found, that is updating was the

simplest of these skills and shifting was the most difficult (Miyake & Friedman, 2012; Zelazo et al., 2017). Therefore, updating had the shortest median reaction time for correct items at 413ms (*SD* =155), inhibition the next shortest at 519ms (*SD* = 188), and shifting had the longest at 724ms (*SD* = 239). The standardized regression weights for the efficiency score used in the latent construct showed the increasing difficulty and overlap in these skills as they build upon one another towards explaining EFs (updating β = .80, inhibition β = .83, shifting β = .86). It is also worth noting that a high percentage of variance in the EFs construct (75%, R^2 = .75) was explained by its predictors. Also consistent with the literature was the influence of children's age on EFs (Best, Miller, & Naglieri, 2011; Brocki & Bohlin, 2004; Huizinga et al., 2006; Jacobsen et al., 2017; Klenberg et al., 2001). The *Hearts and Flowers* Task (Wright & Diamond, 2014) has shown that both speed and accuracy improve as children's age increases. Our study found age positively predicted EFs (β = .855, p < .001). However, the influence of children's gender is more complex. Some studies have found gender differences in performance on EFs assessments (Brocki & Bohlin, 2004; Klenberg et al., 2001; Voyer, Voyer, & Saint-Aubin, 2017). However, the results seem specific to the type of assessment and the EF component being assessed (Grissom & Reyes, 2019). In trials of the *Hearts and Flowers* Task (Wright & Diamond, 2014), there were no gender differences in speed or accuracy on the inhibitory or shifting task trials. Girls were more accurate than boys on the updating task trials, though there was no significant difference in speed. In our study, boys (coded as 1) exhibited higher EFs than girls (coded as 2) (β = -.124, p < .001).

For other hypothesized predictors, we explored whether children's EFs outcomes might vary by country of data collection but found no significant differences. The results that maternal education, which was indicative of SES among our sample (Fassbender & Leyendecker, 2018), did not predict EFs was not consistent with previous literature (Catale et al., 2012; Hackman et al., 2015; Jacobsen et al., 2017). It was also peculiar that maternal education did not predict family adversity, as Fassbender and Leyendecker (2018), using the same instruments from our study, have shown Turkish immigrant mothers in the lowest education cluster had both increased depression and daily hassles compared to Turkish immigrant mothers from a more economically advantaged cluster. They found these results were stable over the course of a year after a follow up with a reduced sample. However, this study did take in to account income where we did not. Though there were two separate clusters assessed in their study, both low education and low income, measuring and accounting for income may have been an integral part of the results. Furthermore, though both our studies assessed depression and daily hassles, Fassbender and Leyendecker (2018) assessed satisfaction of life, along with these measures, towards an assessment of overall psychological well-being, where as our study assessed partner relationship in conjunction with depression and daily hassles as a part of the FAI.

Prior studies of immigrant children have not considered the specific effects of exposure to elevated common family adversities (directly experienced by the parents) on immigrant children's EFs. Nor have they considered the role of TV consumption on EFs outcome for immigrant children and not just minorities. Our study did both of these while

also considering how TV may mediate the relationship between family adversity and EFs outcomes and may explain any indirect effects of family adversity on TV consumption. While our study did produce null results, it is the first known study to consider the relationship among immigrant children's family adversity, TV consumptions, and EFs. Therefore, it should not be overlooked, but improved upon and assessed among other immigrant populations.

Limitations

The most prominent limitations of our study were in regard to the measurements used. In particular, the measure of daily TV consumption presented an unexpected challenge for our study. First and foremost, we were unable to take into account the content children were watching or the child's proximity to the TV and degree of engagement. The existing literature shows that these factors can make a significant difference on the measured effects on children's EFs (Kostyrka-Allchorne et al., 2017a). For instance, some studies show positive relationships between watching educational programming and EFs (Mares & Pan, 2013). Others show extended exposure to certain types of programming can negatively affect EFs. Specifically, in a longitudinal study Barr, Lauricella, Zack, and Calvert (2010) found high levels of programs for adults at age 1 and high levels of household television at age 4 both predicted poorer EFs at age 4. Other longitudinal studies have shown the effects of early TV consumption patterns may be even further reaching, predicting outcomes through high school (Anderson et al.,

2001). Though degree and duration of negative effects are also still being explored, it does appear excessive amounts of TV exposure negatively affects children EFs development (Kostyrka-Allchorne et al., 2017a). Even background television, which the child is not directly engaged with, has been shown to negatively affect EFs (Linebarger et al., 2014). Adult directed background television during parent child interactions has been shown to interrupt both the child's attention to play and the parent's responsiveness and involvement in child's play (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009; Setliff & Courage, 2011). This is concerning as quality of parent child interactions has also been shown to influence EFs (Blair et al., 2014; Gueron-Sela et al., 2018). Still, the relationship between TV consumption and children's EF development may be impacted by a multitude of complex factors.

Another limitation of this measure was that it only prompted parents to consider TV consumption, but as the scope of availability to screen-based activities has dramatically changed in passing years, literature is increasingly moving towards looking at "screen time" (Huber, Yeates, Meyer, Fleckhammer, & Kaufman, 2018; Lauricella, Wartella, & Rideout, 2015; Yan, 2018). Screen time considers any time spent with electronic devices where a screen may be viewed. This includes not just TV, but tablets, computers, cell phones, and other platforms where children may be watching or interacting with a screen. Recent findings have indicated screen time on tablets and mobile devices has significantly increased over the last decade and is preferred over TV by some age groups of children (Kostyrka-Allchorne, Cooper, & Simpson, 2017b; Rideout, 2017). Only TV was specified in our study. As data collection began in 2011,

total screen time may not have shown as big of an impact as it might today. However, this would be an interesting avenue for future research. Another limitation of child's daily TV consumption was that it was a self-report from the mothers. Therefore, it is unlikely to be a 100% accurate estimation. Mothers may not have known how much TV their children watched or lied for reasons of social desirability. This may have played a part in the skewed distribution of child's daily TV consumption. Furthermore, during data collection the question was framed in two different ways dependent on country. This was remedied through calculations, but still presented challenges and would have been best if consistently phrased.

Further limitations of our study were related to assessment of family adversity. The term family adversity could be potentially misleading or misconstrued if not correctly clarified. We highlight that our study was looking at types of adversity common to many families, which have been found to be exasperated among Turkish immigrant mothers (Fassbender & Leyendecker, 2018; Jaekel & Leyendecker, 2008; Jäkel et al., 2015). Though immigrants face many kinds of adversities, we only looked at adversities mundane to family life, not specific adversities related to immigrant status, such as acculturation challenges or encounters with discrimination. More specifically though, we recognize our measure of family adversity was only an assessment of mother's self-reported perceptions. Mother's experience of depressive symptoms, daily hassles, and partner relationship quality have been found to effect immigrant children (Jäkel et al., 2015). However, a more complete picture of family adversity for the entire family, and not just mother's adversity, may have been achieved by inclusion of fathers.

It must also be acknowledged that there are always limitations involved in measuring EFs, because EFs are occurring within the brain and are thereby not directly observable (Zelazo et al., 2017). Researchers have made this problem easier to address by specifying three EF constructs with observable skills, i.e. updating, inhibition, and shifting, allowing a latent variable with measurable constructs to be formed (Miyake & Friedman, 2012). Still, while many reliable instruments have been made for measuring these constructs, there will always be difficulties in observing and harnessing accurate measurements for what technically cannot be seen. A true comprehensive assessment of EFs would require multiple levels of analysis for brain, cognition and behavior (Zelazo et al., 2017). This was not feasible for our large sample. Also, because of the nature of executive functions it is difficult to accurately isolate one part of the construct from the other. Skills often overlap and build upon each other. This is part of a challenge in assessing EFs known as the measurement impurity problem, which denotes there are no pure measures of any specific EFs skill (Miyake et al., 2000). For instance, as it is in *Hearts and Flowers* task (Wright & Diamond, 2014), if the updating task is to remember a new rule and follow it, and the following inhibition task is to do the opposite of the previous rule, the inhibitory task still requires the individual to take in new information and manipulate it, while also adding the new layer of controlling impulses to react in the previously learned way. The *Hearts and Flowers* task is still a validated and widely used instrument. This is simply the nature of EFs and a limitation for any studies seeking to assess them.

Conclusion

Although our hypothesis was carefully constructed using previous research, our results found no evidence that Turkish immigrant children's exposure to family adversity and TV consumption was longitudinally predictive of EFs outcomes, or that children's TV consumption mediated indirect effects of family adversity on their EFs. There was also no indication of a significant direct relationship between any of these aforementioned variables. However, while null results are often overlooked in the research community, our study still adds relevant information to the growing body of research on immigrant children's EFs, which are crucial skills for life-course success (Moffitt et al., 2011). Our study is the first to consider TV consumption as the missing link between immigrant children's exposure to family adversity and EF outcomes, and one study alone cannot definitively answer a research question. Instead, our study should be improved upon and replicated, both among Turkish immigrant children and other immigrant populations. Just because our study showed no relationship, does not mean one does not exist. As it is, United States pediatricians have reached only one in five parents with their recommendations about children's media use and have been more successful in reaching white, higher income, and higher-educated parents (Rideout, 2017). This also likely true for other countries as well, and specifically highlights that immigrant families, who are typically in the minority and may have additional language barriers, are likely not receiving this important information concerning their children's TV consumption. Further research, asking questions like ours, is needed to bring more attention to these potential risks in the environments of immigrant children, and garner

support for investigation and action. It is imperative researchers do not neglect an opportunity that may still lead to avenues for positive interventions in the lives of immigrant children.

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APPENDIX

Table 1. Turkish Immigrant Participants' Descriptive Sample Characteristics (N = 451)

Variable	Mean or Percentage
Child age (years) at T1	8.24 (2.70)
Child sex (male)	47.0%
Country of data collection	
Germany	51.9%
The Netherlands	28.8%
Norway	19.3%
Mother's level of education (ISCED)	
No degree	4.2%
Primary education	21.1%
Lower secondary education	31.3%
Upper secondary education	30.8%
Post secondary non-tertiary	0%
Tertiary	12.2%
PhD	0.2%
TV consumption (average hours per day)	1.96 (1.26)
Family Adversity Instrument (FAI)	
CES-D depression screening	7.24 (5.46)
Daily hassles	29.17 (10.43)
Partner relationship quality	5.80 (1.71)
Executive Functioning at T2 (12 months later)	
Updating (median reaction time for correct items, ms)	413 (155)
Inhibition (median reaction time for correct items, ms)	519 (188)
Shifting (median reaction time for correct items, ms)	724 (239)

Data is presented as mean (SD) for continuous variables and percentages (%) for categorical variables.

Table 2. Correlations

		Child Age	Child Gender	Family Adversity	Child's Daily TV Consumption	Updating	Inhibition	Shifting
Child Age	Pearson Correlation	1	-.057	.012	.071	.670**	.703**	.755**
	Sig. (2-tailed)		.226	.802	.131	.000	.000	.000
	N	451	451	451	451	451	451	451
Child Gender	Pearson Correlation	-.057	1	-.079	-.063	-.111*	-.145**	-.159**
	Sig. (2-tailed)	.226		.096	.183	.018	.002	.001
	N	451	451	451	451	451	451	451
Family Adversity	Pearson Correlation	.012	-.079	1	.013	.012	.003	.014
	Sig. (2-tailed)	.802	.096		.784	.801	.947	.761
	N	451	451	451	451	451	451	451
Child's Daily TV Consumption	Pearson Correlation	.071	-.063	.013	1	.002	.026	.053
	Sig. (2-tailed)	.131	.183	.784		.959	.586	.266
	N	451	451	451	451	451	451	451
Updating	Pearson Correlation	.670**	-.111*	.012	.002	1	.669**	.705**
	Sig. (2-tailed)	.000	.018	.801	.959		.000	.000
	N	451	451	451	451	451	451	451

Table 2 Continued

		Child Age	Child Gender	Family Adversity	Child's Daily TV Consumption	Updating	Inhibition	Shifting
Inhibition	Pearson Correlation	.703**	-.145**	.003	.026	.669**	1	.705**
	Sig. (2-tailed)	.000	.002	.947	.586	.000		.000
	N	451	451	451	451	451	451	451
Shifting	Pearson Correlation	.755**	-.159**	.014	.053	.705**	.705**	1
	Sig. (2-tailed)	.000	.001	.761	.266	.000	.000	
	N	451	451	451	451	451	451	451

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 3. Regression Weights Using SEM

	Unstandardized				Standardized		
	B	SE	LB	UB	β	*P* value	R^2
Direct effects							
Executive Function							0.75
Child age	.020	.001	.019	.022	.855	<.001	
Child gender	-.190	.046	-.275	-.112	-.124	<.001	
Child daily TV consumption	-.009	.008	-.022	.004	-.034	.243	
Child daily TV consumption							
Family adversity	.050	.182	-.231	.385	.013	.712	
Indirect effects							
Family adversity via TV consumption	.000				.000		

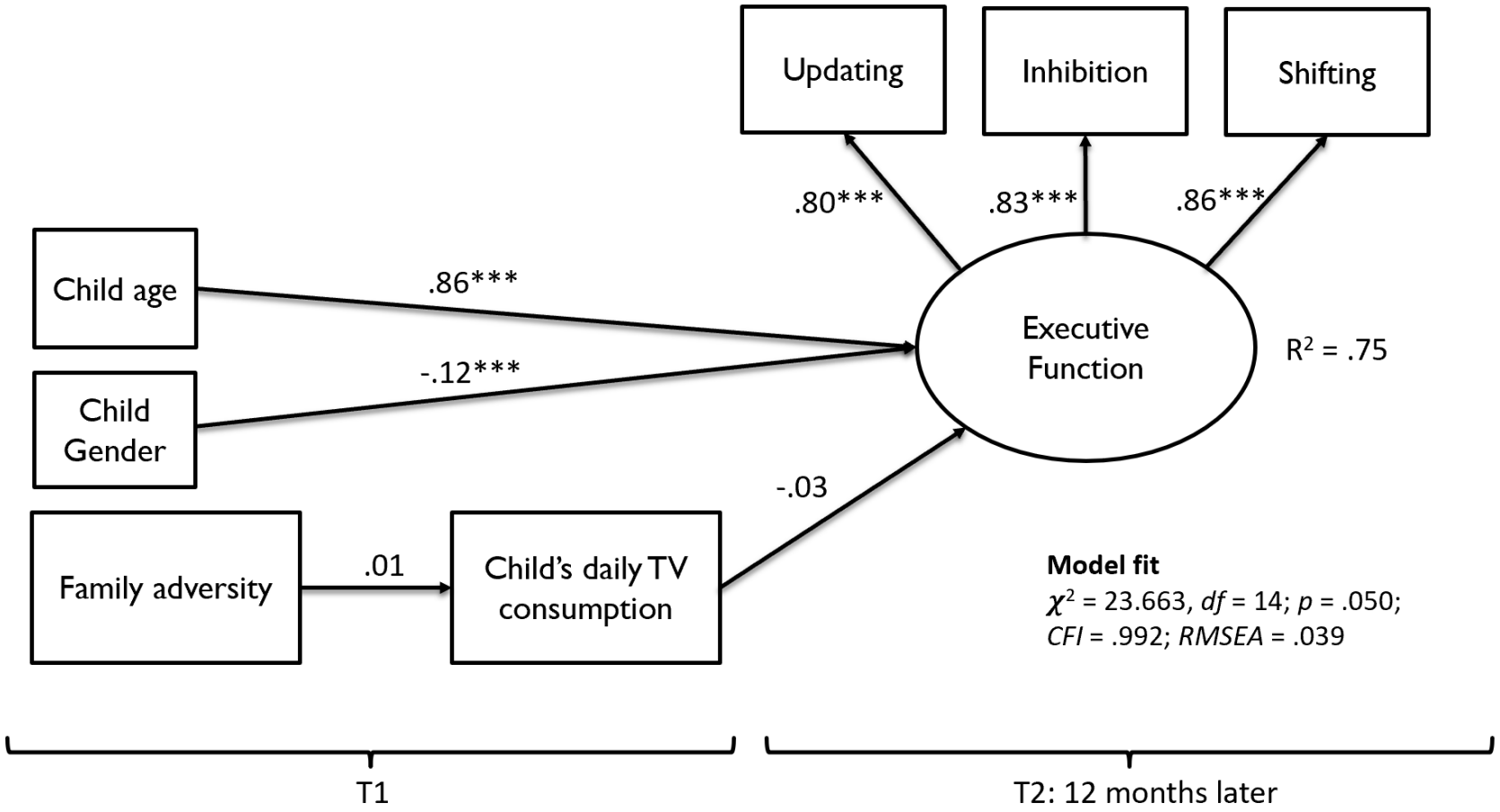

Figure 1. Structural Equation Model

Structural equation model showing standardized direct and indirect effects of family adversity and children's daily TV consumption on executive functioning after 12 months (N = 451). Solid lines represent hypothesized effects. *** p <.001

VITA

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