Are Refugee Bilingual Children Disadvantaged in Their Cognitive and Linguistic Abilities?

Özlem Yeter, Hugh Rabagliati, and Duygu Özge

1. Introduction

The Syrian civil war broke out in 2011, and caused has more than five million people to seek refuge outside the country. In the more than eight years since the war started, a large population of children have thus grown up as refugees, particularly in Turkey, which has absorbed the large majority of displaced Syrian families. However, very little is known about the cognitive and language development of these children. For instance, it is unclear how their traumatic displacement experiences might impact their development and how their language abilities would develop. Our focus group consists of individuals who were forced to leave their countries because of the life-threatening events they experienced. Nevertheless, they must learn to make their way in Turkish society, learning a new language, a new culture, and developing mature cognitive and social skills. For many displaced children, it is imperative to acquire a new community language – i.e., Turkish – but it is unclear what environment is optimal to encourage this. For instance, does immersive education in a Turkish language school promote strong Turkish language development or does it hinder children's cognitive and social development, since they may fail to engage in class or interact with their peers, leading to worse outcomes?

Previous studies highlight that the children who are exposed to such experiences caused by war suffer from post-traumatic stress disorder (PTSD) and mental health problems (Attanayake, et al., 2009; Ehntholt & Yule, 2006; Eruyar, Maltby, & Vostanis, 2019). A study by Özer, Sirin and Oppedal (2016) also

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revealed that the Syrian refugee children who live in refugee camps in Gaziantep (a city in southern Turkey) show the symptoms of depression and PTSD, as well as aggression and psychosomatic symptoms at a serious level although 20% of the participants reported no experiences of war. Tösten, Toprak and Kayan (2017) interviewed teachers and focused on the learning environments of Syrian refugee children in a Turkish public school. The teachers participating in the study observed that the refugee children suffer from PTSD and they show poorer performance in verbal classes due to the language barrier. This study is in line with several other studies focusing on the integration of Syrian refugee children into Turkish school system (Şeker & Sirkeci, 2015; Ugurlu, Akca, & Acarturk 2016; Sarmini, Topçu, & Scharbrodt, 2020). The strong relationship between the quality of education and children's cognitive development is well-documented in the literature (Kaplan, Stolk, Valibhoy, Tucker, & Baker, 2016).

One recent study has examined the association between refugee status and non-linguistic cognitive abilities. Chen et al. (2019) tested Syrian refugees in Jordan and Jordanian non-refugees between the ages 12-18 for their working-memory and inhibitory control abilities and their relation to adversity. They found that the Syrian refugees had more traumatic experiences, showed more PTSD symptoms and had a higher poverty rate. However, no association between traumatic events or PTSD was found with executive functions (EF). Still, children's working memory was found to be associated with family poverty and and the child's years of education. However, it is important to note that the refugee children in that study had resettled in an Arabic speaking country, children's bilingual status was not specified (i.e. monolinguals or bilinguals), and their language abilities were not tested. This is noteworthy because there are well-known (although controversial) claims that executive functions may correlate with bilingualism.

Specifically, a number of studies show evidence for a "bilingual advantage" in cognitive abilities such as working memory and executive functions (Bialystok, 2017; Whitford & Luk, 2019). Activating and suppressing multi-lingual system may indeed be enhancing executive function abilities (Whitford & Luk, 2019). However, other studies claim there is either no bilingual cognitive advantage (Hilchey & Klein, 2011) or it arises due to other factors such as IQ (Brydges et al., 2012) or SES (Morton & Harper, 2007; cf., Blom et.al., 2014).

Although the issues of adaptation, mental health and school environment are investigated in the literature, we could not identify a publication addressing the cognitive abilities of bilingual refugee children. We thus aimed to provide an initial pilot assessment of how refugee bilinguals perform in their language and cognitive abilities. We know that early life traumas may deteriorate cognitive functions in monolinguals (De Bellis, Hooper, Spratt, & Woolley, 2009; Pechtel & Pizzagalli, 2011; Wilson, Hansen, & Li, 2011). Refugee children suffer from depression or post-traumatic stress disorder (Özer et al., 2016). In the context of the bilingual advantage, however, it may be that being a bilingual could act as a protective shield, enhancing cognitive skills despite early life traumas.

In this study we investigate the current language and cognitive abilities of the bilingual Syrian refugee children in comparison to non-refugee bilingual children living in Turkey. We examine four executive function (EF) components: working memory, inhibitory control, fluid intelligence and shifting ability. In addition to these cognitive tests, we assess the children's language abilities through narrative and vocabulary tests both in Arabic and Turkish. The findings will provide an initial evidence base for clinical scientists, educators, and policy makers in planning intervention studies, curriculums, or educational policies. The results will also enable us to test theoretical claims about how bilingualism affects cognitive control abilities.

2. Method

2.1. Participants

49 children participated in this study and they were grouped based on their refugee status (i.e. refugee bilinguals, non-refugee bilinguals). 25 of the participants were early bilingual (Turkish-Arabic) Syrian refugee children living in Turkey (18 girls, 7 boys) at the age of 9 (*M=9;5 Range=8;11-10;03*). The remaining 24 children were non-refugee children from a minority group in Hatay region (a city in southern Turkey) who are simultaneous bilingual speakers of Arabic and Turkish (12 girls, 12 boys). We considered the Hatay children a natural comparison group, that could be matched in age (*M=9;4 Range=8;06-10;04*) and language background (Arabic and Turkish). Sampling of the refugee children was made through Association for Solidarity with Asylum Seekers and Migrants (ASAM) in Ankara and Gaziantep offices. Local authorities and teachers in the villages with Arabic speaking minorities were contacted for the recruitment of non-refugee bilingual children.

Mother's years of schooling ranged between 0-16 (*M=5.96 SD=3.91*) in Syrian refugee group. Two of the refugee children had lost both parents at a very early age and had been raised by their grandparents; their data was excluded in calculation of mother schooling. Mother's years of education was between 5-8 years *(M=6.13 SD=1.48*) in the non-refugee group.

Refugee children's age of arrival to Turkey varied between 2 and 7 (*M= 5.44 SD= 1.71*). Although systematic exposure to Turkish starts with schooling, onset of exposure to the language starts after arriving in Turkey, through interactions in the neighbourhood, through family members, and through television. No additional language (e.g. Turkmen, Kurdish) was spoken by refugee families. For the non-refugee group, both Arabic and Turkish were spoken at home, thus exposure to both languages starts at home from birth. Families were asked to informally rate their children's proficiency in both languages. All refugee children were reported to be more fluent in Arabic, while Turkish was the stronger language for all non-refugee children according to their families. Children's performance on vocabulary and narrative tests are consistent with families' language ratings.

Regardless of their refugee status, all participants attended Turkish state schools with Turkish as the medium of instruction and they received no schooling in Arabic. 80% of the refugee children had been going to Turkish-medium state schools for at least 3 years at the time of testing, and years of schooling ranged between 1-5 years (*M=2.88 SD=.83*). All of the children in the non-refugee Hatay group had received at least 3 years of schooling at the time of testing (*M=3.83 SD=.56*) with the range of 3-5 years.

The refugee families reported that they and their children had experienced significant hardships and traumatic events. Two out of 25 children lost both parents at the age of 2 and were raised by their grandparents, 5 of the children have lost their fathers, 1 of the children is abandoned by her mother and 2 of the children have divorced parents. All of the parents/grandparents reported that their houses were either destroyed or damaged prior to their arrival to Turkey. The families also mentioned experiencing financial hardships.

2.2. Materials and Procedure

A set of cognitive and linguistic assessment tasks was administered by two experimenters for this study. The bilingual experimenter, also the first author of this paper, is a bilingual speaker of Arabic (Levantine dialect spoken in Hatay) and Turkish. The bilingual experimenter administered Arabic tests and cognitive tests in refugee group and all tests in non-refugee group. The children were free to choose the language of administration for cognitive tasks, because we did not want their language proficiency to affect their cognitive performance. The second experimenter, who is a native speaker of Turkish and a master's student at the Department of Cognitive Science at METU, was trained and provided with the manuals by the first author. The Turkish experimenter administered Raven's Coloured Progressive Matrices, Turkish narrative and vocabulary tests for Syrian refugee children. Below we present the materials and the procedure for each test we used.

2.2.1. Backward Digit-Span Task

Being a component of Wechsler Intelligence Scales for Children-Revised (Wechsler, 1974), Memory for Digit Span assessment consists of two parts: forward digit-span dealing with short-term memory and backward digit-span dealing with working memory. There are 14 sets of increasing digits in both parts, thus 28 sets in total. The children were first asked to repeat the set of digits uttered by the experimenter in the same order for forward digit-span task and they were expected to do the same in reverse order for the backward digit-span task. Both tasks continue until the child commits two consecutive errors in two series of digits in the same length. Forward digit span was used only to familiarise the children with the second part and since we are interested in children's working memory abilities, we analysed only the backward digit-span task scores. The children received 1 point for each series they completed successfully and the

maximum score in this test was 14. All the children in the non-refugee group preferred to complete the task in Turkish while 12 out of 25 children in the refugee group chose to hear the digits in Arabic.

2.2.2. Raven's Coloured Progressive Matrices

Raven's Coloured Progressive Matrices (CPM) is a non-verbal measure of fluid intelligence and abstract reasoning abilities in children between the ages of 5 and 11 (Raven, Raven, & Court, 1998). For Turkey, reliability and validity of CPM has been tested for children between the ages of 4-6, and it was found to be strongly correlated with Bender-Gestalt Test, TONI-3 Test and WISC-R Test Scores (Kargin, 2017). The test consists of 3 sets (A, AB and B) with 12 items each. Problem items are ordered in an ascending difficulty. In each problem, the children are expected to complete a coloured drawing or a matrix by choosing the appropriate piece among six alternatives. The manual (Raven et al., 1998) was followed for the administration of the test and the answers were transferred to the scoring sheet by the experimenters. 1 point is given for every correct response and highest possible score for this test is 36. The sample sizes of the groups are not equal for the Raven's test since data collection process was interrupted by coronavirus outbreak. 17 out of 25 Syrian children and 10 out of 24 children from Hatay region took the test.

2.2.3. Stroop-like Happy-Sad Task

We used OpenSeasame (Mathôt, Schreij, & Theeuwes, 2012) to create a computerised version of the happy-sad task design by following the experiment design in the paper by Lagattuta, Sayfan and Mansour (2011) to test inhibitory control in children. There were 20 faces half of which looks happy whereas the other half looks sad. The faces for this task were taken from *NimStim* (Tottenham et al., 2009) from *http://www.macbrain.org/faces/index.htm*. Assignment of the emotion faces were counterbalanced by age and gender (i.e. both in refugee and non-refugee groups, half of the children saw male faces while the other half saw female faces).The children were instructed and given eight practice trials. Each child saw 10 happy and 10 sad faces (twenty in total) in mixed order and they were asked to tell the opposite of the what they see (i.e. say "*happy*" when they see a "*sad*" face and vice versa) as fast as they can. The order of the faces was automatically randomised every time the test was run.

The same experimenter collected all the children's responses in both groups by pushing a keyboard button assigned for "happy" and "sad" as the children orally responded to the faces. Whole testing process was audio-recorded and the keyboard responses were checked against oral responses before analysis. Percentage of the correct responses out of 20 responses and total reaction times were calculated for this task. The non-refugee group responded in Turkish while 13 out of 25 refugee children responded in Arabic.

2.2.4. Berg's Card Sorting Task

To assess the shifting ability in children, we used 64-trial version of Berg Card Sorting Test (BCST; Mueller, 2013), a computerised version of Wisconsin Card Sorting Test (Berg, 1948). 4 stimulus cards differing with respect to colour, shape and quantity are presented on the screen throughout the test. The participants are expected to sort the response card with one of the stimulus cards in every trial through feedback (i.e. *right* or *wrong*). The feedback appears on the screen after each response and the experimenter repeats it orally. The card sorting rule changed after ten consecutive correct responses, but the children were not given this information. All children were given the same instructions and were expected to give five consecutive correct responses to be able to begin the task. Wrong responses caused by the participant's use of previous sorting rule are called perseverative errors and lower number of perseverative errors indicates better shifting ability (Miyake et al., 2000). We analysed the percentages of perseverative errors which is found by division of total perseverative errors by number of trials then multipling by 100.

2.2.5. Turkish Expressive and Receptive Language Test (TİFALDİ)

Turkish Expressive and Receptive Language Test (TİFALDİ) was used to assess receptive and expressive vocabulary skills of the children (Berument & Güven, 2013). TİFALDİ consists of black-and-white illustrations with 101 items in receptive sub-scale and 80 items in expressive sub-scale. On receptive test, there are four numbered drawings on each image plate and the child points to the picture that best describes the word uttered by the experimenter. On the expressive vocabulary test, the child sees only one drawing and is asked to name the related drawing. The children's responses were coded to an excel sheet during the testing. The experimenter starts with the age-relevant item for both tests and the children are expected to give 8 consecutive answers to achieve a basal score. The number of correct responses after 8 consecutive correct responses are added on the basal score. This gives us the raw score and the standard score is determined based on the manual given for different age-ranges.

2.2.5.1. Modification of TİFALDİ to Test Arabic Vocabulary

To make sure we use the same vocabulary task across the two languages, we adapted the TIFALDI test into Arabic. Five Syrian university students translated the items in both sub-tests of TİFALDİ individually. The experimenter compared the translations. Later, the Arabic version of the test was applied to 6 different Syrian university students who did not see the drawings before. The final version of the test was determined after several revisions, feedbacks and discussions with all the Syrian university students. Item number 73, 100 and 101 (*devirmek/to knock down, viyadük/viaduct, faraş/dustpan*) were excluded from receptive sub-test for not having Arabic equivalents and item number 36 (papatya/daisy) was

replaced by “jasmine” for being a more widely-known flower than “daisy”. The final version of the test was also applied to 4 bilingual speakers of Arabic and Turkish from Hatay region and they reported that the language and pictures were appropriate.

2.2.6. Multilingual Assessment Instrument of Narratives (MAIN)

We assessed children’s Turkish and Arabic narrative abilities using Multilingual Assessment Instrument of Narratives (MAIN, Gagarina et al., 2012; 2019). There are four stories in MAIN, each consisting of 3 episodes, and with each episode depicted in two pictures. Stories are in parallel with regards to complexity: *Dog Story* with *Cat Story* and *Baby Birds* with *Baby Goats*. The latter parallel stories are slightly more complex than the former two (Kornev & Balčiūnienė, 2014). Only one language was assessed at a time and the test was administered in two sessions. The order of the stories and the languages were counterbalanced with regards to language and story type. The children started with either of the less complex parallel stories and continued with one of the more complex ones. In the end, the children told one simpler and one more complex story for both languages, so four stories in total. The mean of the days between the testing of two languages in non-refugee children was 9.4 (3 to 30 days), and 9.2 for the refugee children (3 to 50 days).

After explaining the task briefly, the experimenter placed the envelopes containing the copies of the same story on the table and asked the child to choose one. This led the child to think that the experimenter did not know the story, controlling for the shared knowledge effect (Gagarina et al., 2012). When the child was ready, the experimenter folded the sequence and let only pictures 1-2 (first episode) be visible. After the child finished narrating the first two pictures, the experimenter unfolded the pictures 3-4 (second episode) next to previous pictures. When the child finished narrating all episodes, all of the pictures were visible to him/her. All testing sessions were audio-recorded.

A group of university students contributed to both transcription and scoring process of the Turkish narratives. The transcriptions were checked by transcribers and the bilingual experimenter. The Arabic narratives were transcribed by two bilingual speakers of Arabic and Turkish. The Arabic transcriptions were later checked and revised both by the bilingual experimenter and two native speakers of Arabic. The transcriptions were made in CHAT-format and later analysed with program CLAN (MacWhinney, 2000). The narratives were scored in two main sections: production at macrostructural level and comprehension.

Macrostructure of a narrative is related to the plot and the organisation of the story dealing with the sequence of events. MAIN manual was followed for the scoring of the narratives. The children were awarded one point for each of the story elements and internal state terms (IST) presented in Table 1. The maximum score a child can get in this section is 17.

Table 1. Story structure components in MAIN

	Episode 1	Episode 2	Episode 3
Setting (time and place)	IST as initiating event Goal Attempt Outcome IST as reaction	IST as initiating event Goal Attempt Outcome IST as reaction	IST as initiating event Goal Attempt Outcome IST as reaction

Each narrative in MAIN is followed by 10 comprehension questions. To be able to tell a good story, children need to understand the story schema. This section assesses children's the ability to interpret the story pictures, story characters' goals and their internal states and the ability to explain and reason them orally. The ability to answer the questions correctly is related to children's memory, language abilities as well as Theory of Mind (Lindgren, 2018). Children were given one point for each correct answer, thus 10 points in maximum.

3. Results

Below we present the results for the cognitive and the linguistic measures separately. For each measure, we conducted one-way MANCOVA with the score from the test applied as our dependent variable and Group (refugee, non-refugee) as our independent variable. All analyses were conducted using the SPSS statistics program Version 24.0 for windows (IBM Corp., 2016). The label "Hatay" is used to refer to non-refugee children and the refugee children are labelled as "Syria" in the graphs.

3.1. Cognitive Tests

The analysis of the backward digit-span working memory task showed that non-refugee children performed significantly better than refugee children [$F(1,45) = 13.40$, $p = .001$, $\eta p2 = .23$] (Figure 1), so refugee children had poorer working memory abilities compared to non-refugee children.

For the Raven's CPM test of nonverbal IQ, there was also a significant effect of Group [$F(1,25) = 9.79$, $p < 0.05$, $\eta p2 = .28$] such that non-refugee children performed significantly better in fluid intelligence and reasoning abilities than the refugee children (Figure 2).

On the other hand, although the non-refugee children had more correct responses in the Stroop-like happy-sad task, the effect of group was not significant [$F(1,45)= .1.32$, $p = .225$, $\eta p2 = .029$], which indicated that the two groups did not differ with respect to their inhibition abilities (Figure 3).

Finally, in Berg's card sorting task (BCST), refugee children made significantly more perseverative errors [$F(1,45) = 7.89$, $p < .05$, $\eta p2 =.14$], indicating more difficulty with cognitive flexibility and shifting abilities compared to non-refugee children (Figure 4).

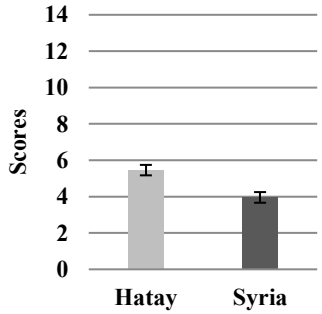

Figure 1. Backward digit-span task scores

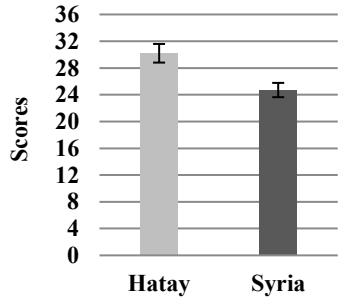

Figure 2. Raven's CPM scores

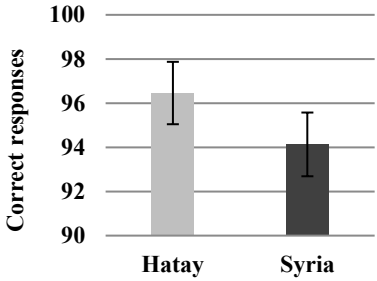

Figure 3. Percentage of correct responses In happy-sad task

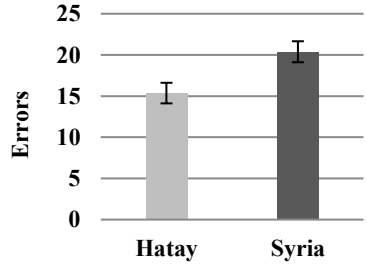

Figure 4. Percentage of errors in BCST

3.2. Linguistic Tests

The analysis of vocabulary test showed that refugee children performed significantly better than non-refugee children in the receptive vocabulary sub-test in Arabic [$F(1,45) = 75.90$, $p < .001$, $\eta p2=.63$] (Figure 5) while an opposite pattern was observed in the Turkish version of the test such that refugee children performed poorer than non-refugee children in the receptive vocabulary sub-test in Turkish [$F(1,43) = 11.28$, $p < .001$, $\eta p2=.72$] (Figure 6). In Arabic expressive vocabulary subtest, we were not able to compare the two groups, because none of the children in non-refugee group was able to achieve a basal score in Arabic; however, non-refugee children had significantly higher scores in Turkish expressive vocabulary subtest compared to refugee children [$F(1,38) = 186.03$, $p < .00$, $\eta p2 = .83$].

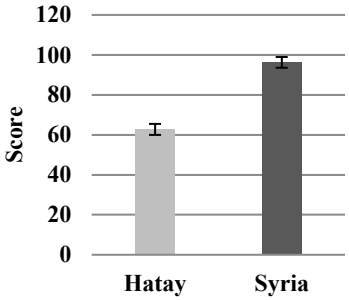

Figure 5. Arabic receptive vocabulary scores

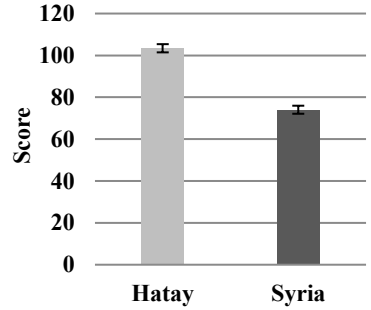

Figure 6. Turkish receptive vocabulary scores

According to the analysis of the production of the narratives in Turkish, the non-refugee children had significantly higher scores both in the first [$F(1,47) = 12.77$, $p = .001$, $\eta p2 = .21$] and the second stories they told, [$F(1,47) = 19.719$, $p < .001$, $\eta p2 = .29$] (see Figure 7).

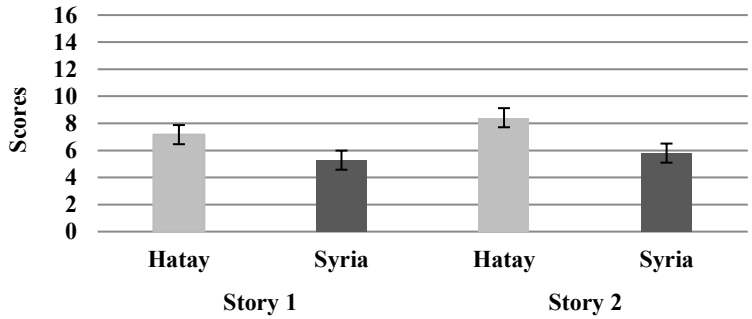

Figure 7. Narrative macrostructure production scores (out of 17) of first and second Turkish stories by groups

As for the narrative production in Arabic, the refugee children scored significantly higher both in the first Arabic stories [$F(1,47) = 30.54$, $p < .001$, $\eta p2 = .39$] and the second stories [$F(1,47) = 23.29$, $p < .001$, $\eta p2 = .33$] (see Figure 8). When we further analysed the two groups on the basis of their dominant language, we did not find any difference neither in the first stories [$t(23) = .07$, $p = .9$] nor in the second ones [$t(23) = .46$, $p = .6$]. When the analysis was made on the basis of their non-dominant language, the results were not significant (first stories [$t(23) = -1.21$, $p = .2$], second stories [$t(23) = -.22$, $p = .8$]).

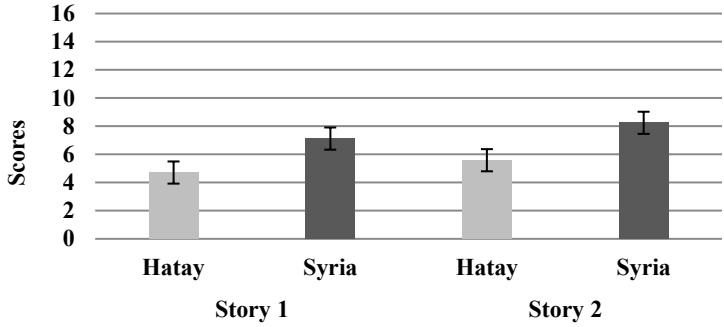

Figure 8. Narrative macrostructure production scores (out of 17) of first and second Arabic stories by groups

Finally, the analysis of narrative comprehension scores showed an effect of group only in the second stories told in Turkish [$F(1,47)=9.09$, $p < .05$, $\eta p2=.16$] such that non-refugee children had significantly higher performance compared to the refugee group; however, the groups did not differ in the second stories they told in Arabic, and no significant difference was found between groups in first stories in neither of the languages. Therefore, the analyses are not presented here. When the groups' comprehension scores in both stories were analysed on the basis of their dominant language, the results showed no significance (first stories [$t(23)=.00$, $p=1$], second stories [$t(23)=1.58$, $p=.1$]). However, results showed significance when the comprehension scores in both stories were analysed on the basis of the groups' non-dominant languages (first stories [$t(23)=2.05$, $p=.04$], second stories [$t(23)=2.27$, $p=.03$] such that non-refugee group scored significantly higher in their less dominant language (i.e. Arabic) for both stories while the refugee group scored significantly lower in their less dominant language (i.e. Turkish) for both stories in comprehension section.

4. Discussion and Conclusion

Previous studies have shown that early life traumas, specifically war experiences may cause PTSD, stress and mental health problems in children; however, there have been a limited number of studies showing that early life traumas may deteriorate cognitive functions (De Bellis, Hooper, Spratt, & Woolley, 2009; Pechtel & Pizzagalli, 2011; Wilson, Hansen, & Li, 2011). Our study provides an initial evaluation of how being a refugee might influence cognitive and linguistic abilities of a developing bilingual child. We used a set of cognitive tasks testing children's working memory, fluid intelligence, inhibitory control and shifting ability and a set of linguistic tasks testing children's vocabulary and narrative abilities.

The Syrian refugee children in this study provided lower scores in tasks of working memory, fluid intelligence, and shifting ability, compared to non-refugee

children. This is in-line with other studies showing that early life traumas may deteriorate cognitive functions (De Bellis, Hooper, Spratt, & Woolley, 2009; Pechtel & Pizzagalli, 2011; Wilson, Hansen, & Li, 2011). Both groups performed similarly in an inhibitory control task and this finding is parallel with the findings of the study conducted by Chen et al. (2019). Overall, however, the refugee children showed lower scores in the non-linguistic tasks. We return to this below, in the context of the bilingual advantage.

The picture for our linguistic tasks was nuanced. While the analysis of narrative production scores showed no significant difference on the basis of language dominancy (i.e. Turkish being the dominant language in non-refugee group, Arabic being the dominant language in refugee group), the comparison on the basis of their non-dominant language revealed that Turkish receptive vocabulary abilities of Syrian children were better than the Arabic receptive vocabulary abilities of non-refugee children. This may be related to Turkish being the majority/community language, whereas exposure to Arabic in non-refugee group is limited to the home context. This is in line with the finding that the non-refugee children were not able to achieve a basal score in Arabic expressive vocabulary test, and also with families' rating of the children's language proficiency. It appears that linguistic abilities of both groups were roughly matched: refugee children's Arabic skills appeared to be similar to non-refugee children's Turkish skills, and vice versa. This is important in the context of the refugee children showing lower performance across the cognitive tasks assessed; their matched language abilities indicate that these cognitive tasks may not be picking up on inherent differences between the groups, but rather differences that are a function of the children's very different backgrounds, including significant traumatic experiences in the refugee children.

This initial study was partly motivated by the possibility that becoming bilingual might offer some cognitive protective factor to refugee children, in the context of claims of a bilingual advantage. We found no evidence for this. Our refugee children, despite being bilingual, scored significantly below non-refugee children in our non-linguistic tasks.

Of course, significant additional data will be required to draw strong conclusions about any of the questions examined here, such as how displacement experiences affect cognitive and language development. This initial small-scale study provides an important first picture, with evidence for strengths in the refugee's heritage languages, and evidence consistent with prior claims that early life traumas (i.e. holding refugee status in our case) affect the performance on cognitive tasks (De Bellis, Hooper, Spratt, & Woolley, 2009; Pechtel & Pizzagalli, 2011; Wilson, Hansen, & Li, 2011). But a much larger sample size will be required to test these claims at scale, while also accounting for the highly heterogenous backgrounds of these participants. Nonetheless, the results highlight how holding a refugee status might affect executive functions, and they being a bilingual has not acted as a clear protective shield for refugee children's cognitive skills.

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