



## Migration and psychotic experiences in the Tokyo Teen Cohort

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### ABSTRACT

**Background:** Immigration has been shown to be associated with an increased risk for psychotic experiences, with similar effect sizes for first-generation and second-generation migration (i.e., children whose parents had migrated). However, this association varies by country, and by ethnic group at the within-country level, such that risk is greatest among migrants facing substantial social exclusion and disadvantage. This is the first study to our knowledge to examine migration as a potential risk factor for psychotic experiences in Japan.

**Method:** Using data from the Tokyo Teen Cohort (N=3052), we tested whether migrant status was associated with the lifetime prevalence of psychotic experiences at age 10.

**Results:** Only 2.2% of the sample (n=68) had at least one migrant parent. Psychotic experiences were more common among children with at least one migrant parent, odds ratio (95% CI) = 2.06(1.26–3.35). This association appeared to be driven primarily by visual hallucinations and thought broadcasting, and specific to children with lower IQ at age 10.

**Discussion:** The findings suggest that migrant status is associated with increased likelihood of psychotic experiences at age 10 in Tokyo, Japan. Future prospective research should explore social exclusion as a potential underlying mechanism and can further clarify the protective role of IQ and related factors.

### 1. Introduction

Both migration and ethnic minority status have been linked to an increased incidence of schizophrenia and psychotic symptoms, although the magnitude and direction of this effect varies at the national, individual, and community levels. There is widespread variability in associations with psychotic disorder by country, with the largest effects appearing within Europe and relatively smaller effects in Israel and Canada (Selten et al., 2020). Findings have likewise been mixed in studies of psychotic experiences, which appear to be more strongly linked to ethnic differences rather than migration, although findings likewise vary by setting (Tortelli et al., 2018).

At the individual level, migration effects appear to be explained partly by other individual demographic characteristics, most notably race/ethnicity, although this is confounded with socioeconomic status in most countries. Other individual-level factors that are presumed to be at least partially responsible for the association between migration and schizophrenia are social disadvantage (e.g., structural barriers to success within the host country or indicators of lower social status; van der

Ven & Selten, 2018) and social exclusion (Henssler et al., 2019). Structural social disadvantage is difficult to separate from race/ethnicity and migration status in many countries due to discrimination and structural disadvantages bestowed upon some demographic groups related to racism or nationalism in the host country, or due to selection effects among those who have migrated to that country. Social exclusion has been easier to study, however, through studies of ethnic density, which have shown that the increased risk of psychotic disorders associated with ethnic minority status appears to attenuate or dissipate when one is residing in a neighborhood with others of the same racial/ethnic group (Veling et al., 2008; Anglin, 2020; Dykxhoorn et al., 2020). Notably, the literature linking migration and psychosis has primarily focused on psychotic disorders, which may not generalize to studies of psychotic experiences.

The relationship between ethnicity and migratory status and psychosis has been thoroughly tested in a small subset of European nations, as well as several other countries, but has never been studied in Asia, to the best of our knowledge (based on a recent systematic review: Selten et al., 2020). Japan in particular provides a unique context in

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which to study this phenomenon because it has (1) a very small population of migrants and people of non-Japanese ethnicity, which can potentially enhance social exclusion effects, yet has (2) strict immigration requirements that reduce the likelihood that migrants will be of substantially lower socioeconomic status compared to the non-migrant Japanese population. The aims of the present study were to test whether the prevalence of psychotic experiences varied by parental migration status (i.e., at least one parent born outside of Japan) at age 10 years among a cohort of youth residing in the Tokyo metropolitan area.

## 2. Methods

### 2.1. Cohort

Data were drawn from the Tokyo Teen Cohort (TTC; Ando et al., 2019), an ongoing prospective cohort study of youth living in three municipalities in metropolitan Tokyo (i.e., Setagaya Ward, Mitaka City, and Chofu City). Eligible residents were youth born between September 2002 and August 2004, who were identified based on the municipal resident register and recruited by mail around their tenth birthday. Interviews were completed over the course of two in-person visits at the participant's home, with additional self-report measures completed between the visits. The primary caregiver (typically the mother) and the child completed self-report questionnaires separately, typically in different rooms, and returned their anonymous and confidential responses to the interviewer in a sealed envelope. Of the 10,234 child-parent pairs who were contacted for this study, 4478 agreed to participate (response rate: 43.8%) in the antecedent cross-sectional survey (Tokyo Early Adolescence Survey: T-EAS). From the 4478 T-EAS participants, 3171 participants were recruited as the sample of TTC. We oversampled participants with low annual household income to ensure sufficient sub-sample sizes across income levels at follow-up. Detail of the oversampling method was previously described elsewhere (Ando et al., 2019). This study used data from the first wave (baseline, at age 10 years). The Tokyo Teen Cohort protocol was approved by the ethical committees of the Tokyo Metropolitan Institute of Medical Science, the University of Tokyo, and SOKENDAI (The Graduate University for Advanced Studies).

### 2.2. Measures

#### 2.2.1. Migrant status

At the baseline (age 10) interview, the primary parent respondent was directly asked: (1) which country are you from?; and (2) which country is your partner from? This was recoded into a single binary variable indicating whether either or both parents were from a country outside of Japan, thereby indicating second-generation migrant status of the child. This variable was coded as positive regardless of whether one or two parents were from another country, due to the low frequency of both parents being from another country ( $n=4$ ).

#### 2.2.2. IQ

We included a measure of IQ to test the exploratory hypothesis that cognitive ability may provide a buffering or protective effect against some of the stress or difficulties associated with migration. Adolescent cognitive ability was assessed using a short form of the Wechsler Intelligence Scale for Children (WISC-III), consisting of the information (i.e., general knowledge) and picture completion subsets (Inada and Kamio, 2010). The IQ estimates derived for this cohort study had good criterion validity, in that these estimates explained 78% of the variance in IQ scores from the full version of the WISC-III, when previously examined in this cohort (Yamasaki et al., 2019). Estimated IQ was dichotomized into above average ( $IQ \geq 100$ ) and below average ( $IQ < 100$ ) to allow the creation of sub-groups based on IQ and migrant status.

### 2.2.3. Psychotic experiences

Lifetime psychotic experiences were assessed using a set of items derived from the schizophrenia section of the Diagnostic Interview Schedule for Children (DISC-C; Costello et al., 1985). Psychotic experiences were assessed by the following five items: (1) "Have you ever heard voices that other people cannot hear?" (auditory hallucinations); (2) "Have you ever thought that people are following you or spying on you?" (persecutory thoughts); (3) "Have you ever seen things that other people could not see?" (visual hallucinations); (4) "Have other people ever read your thoughts?" (thought broadcasting); and (5) "Have you ever had messages sent especially to you through the television or radio?" (similar to delusions of reference, but termed "special messages" to clarify that they are sub-clinical). Respondents could choose "yes, definitely," "maybe," or "no" for each item. Only "yes, definitely" responses were considered positive responses, and each item was recoded as binary variable variables including the presence/absence of each individual psychotic experience, as well as any psychotic experience (i.e., at least one "yes, definitely" response), as has previously been done in studies of psychotic experiences in this cohort (Yamasaki et al., 2016; 2019). Psychotic experiences were assessed through child self-report.

### 2.2.4. Additional variables

Parental health and parental income were both examined as potential confounding variables. Parental health was assessed using a single binary item: "are you experiencing any physical and/or mental problems lasting more than a year?" Annual parental income was self-reported in one-million yen increments, for the entire household, beginning with 0–999,999 and ending with  $> 10,000,000$ , which was condensed into three categories for the present analyses.

### 2.3. Data analyses

Descriptive data were reported for all variables, including sex, income, parental health problems, migrant status, and psychotic experiences (including each individual sub-type of psychotic experiences). Missing data were handled using listwise deletion due to the low frequency of missingness. Specifically, all variables included in the analysis had  $\leq 2.1\%$  missing data. Logistic regression was used to calculate the associations between migrant status and psychotic experiences, adjusted for the sex of the child and reported as odds ratios. We also tested whether IQ may offer a protective effect for children of migrant parents by testing associations between psychotic experiences and sub-groups defined as (1) non-migrant, low IQ, (2) non-migrant, high IQ, (3) migrant, low IQ, and (4) migrant, high IQ.

## 3. Results

### 3.1. Descriptive data

There were 3171 respondents at baseline, of whom 3052 had complete parent and child data (the remaining 2.8% of respondents were excluded using listwise deletion). Respondents were coded as having migrant parents if the primary parental respondent reported either that they were from a country other than Japan or if their partner was from country other than Japan. Migrant status for the  $n=161$  (5.1% of baseline parental data) parent respondents who did not provide information on their partner were coded based on the country of origin of the primary caregiver respondent only. Migrant and non-migrant respondents did not vary in terms of gender of the index child, overall family income, or parental health status (Table 1). Parents migrated from a broad range of countries around the globe, with most countries yielding only one or two respondents, the exceptions being China ( $n=15$  parents) and Korea ( $n=8$ ).

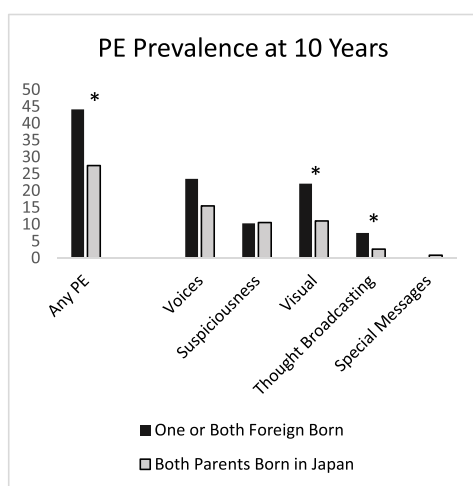
**Table 1**  
Descriptive data for the analytic sample, age 10-years.

	Migrant (n=68)		Non-Migrant (n=2984)		Total sample (N=3052)	
	N	%	N	%	N	%
<b>Gender</b>						
Male	41	60.3	1575	52.8	1616	52.9
Female	27	39.7	1409	47.2	1436	47.1
<b>Family Income<sup>1,2</sup></b>						
0-500	15	23.8	579	20.2	594	20.2
500-999	28	44.4	1424	49.6	1452	49.5
1000+	20	31.7	868	30.2	888	30.3
<b>Parental Health Problems<sup>1</sup></b>						
Past-year problems	9	13.4	445	15.0	454	15.0

Note: The migrant and non-migrant groups did not vary in terms of gender, income, or health status.

<sup>1</sup> Parental Health Problems data was missing for n=22 respondents, and income data was missing for n=118 respondents. Data are reported based on those who responded to these items. These variables are not included in subsequent analysis, but are provided here in order to better characterize the study cohort.

<sup>2</sup> Income values refer to self-reported annual household income (x 10,000 Yen).



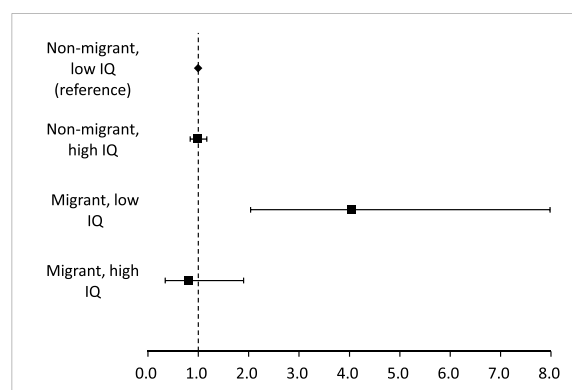
**Fig. 1.** The age-10 prevalence of psychotic experiences, including each psychotic experience sub-type, by migrant status.

### 3.2. Psychotic experiences at age 10

Taken together, at least one of any sub-type of psychotic experience was reported by 27.8% (n=847) of the baseline sample. Consistent with prior research using self-report screeners, hallucination-like symptoms were the most common, with hearing voices (n=480; 15.7%) followed by visual hallucinations (n=344; 11.3%). Suspiciousness was likewise commonly reported at age 10, by n=321 (10.5%) children. The other two delusion-like symptoms were less common, with thought broadcasting and special messages being reported by n=82(2.7%) and n=25(0.8%) children, respectively.

Psychotic experiences were more common among children with migrant parents, OR(95% CI) = 2.06(1.26–3.35) (Fig. 1). This effect appears to be primarily driven by visual hallucinations, OR(95% CI)=2.28(1.27–4.09), and thought broadcasting, OR(95% CI) = 2.99(1.17–7.66). Hearing voices was also more common among the children of migrants, but not statistically significantly so, OR(95% CI)=1.63(0.92–2.88). Suspiciousness had no numerical or statistically significant association with migrant status, OR(95% CI) = 0.95 (0.43–2.09), and the odds ratios could not be calculated for the “special messages” symptom, which was not endorsed by any child with migrant parents at age 10 or age 12.

When child’s IQ was included in the regression models, IQ was not independently associated with psychotic experiences, OR(95% CI)=0.73



**Fig. 2.** Associations between sub-groups, defined based on migrant status and IQ, and age-10 psychotic experiences. Associations are presented as odds ratios with 95% confidence intervals. Only the migrant / low-IQ groups significantly varied from the remaining groups.

(0.99–1.00). However, when groups were created based on parental migrant status and child’s IQ, logistic regression analyses suggested that higher child IQ was protective against the increased risk of psychotic experiences among migrants. Specifically, compared to non-migrants with low IQ, odds of psychotic experiences were higher among migrants with low IQ, OR(95% CI)=4.03 (2.04–7.98) but not migrants with high IQ, OR(95% CI)=0.81 (0.34–1.90); non-migrants with high IQ had similar odds of psychotic experiences as non-migrants with low IQ, OR(95% CI)=0.99 (0.84–1.17), as illustrated in Fig. 2.

## 4. Discussion

### 4.1. Main findings

The present findings from the Tokyo Teen Cohort shed some new light on the complex associations between migration, ethnicity, and psychosis risk, as the first study to our knowledge to research this topic in Japan. At age 10, we found a clear and consistently elevated prevalence of psychotic experiences among the migrant group compared to the non-migrant group, of a similar magnitude compared to the ethnicity and migration effects previously shown for psychotic disorder in Northern Europe (Selten et al., 2020). As an exploratory analysis, we tested for a potential protective effect of IQ by creating sub-groups based on the confluence of migrant status and IQ, finding that an above average IQ was protective against the increased risk of psychosis associated with migration (but had no effect among those with Japanese-born parents).

#### 4.2. Findings within a global context

Previous findings on migration and psychotic experiences have varied widely across countries, with negative associations in a large multinational sample (McGrath et al., 2017), null associations found in the U.S. (DeVylder et al., 2014; Oh et al., 2015), and positive associations in Australia (Scott et al., 2006). In a recent meta-analysis of incidence studies, it was noted that the magnitude of the migration-psychosis effect varied across nations and was generally greatest when studying dark-skinned migrants to European countries, implicating social exclusion as a potential mechanism (Selten et al., 2020). Further, in Sweden, refugees were found to be at significantly higher risk of developing schizophrenia compared to both the native-born population as well as non-refugee migrants from the same source countries (Hollander et al. 2016). The significant association between migrant status and psychotic experiences in our data may reflect social exclusion and marginalization of those who are viewed as “different,” as has been proposed to explain similar effects in other countries (Selten et al., 2020). In contrast, there was no significant consistent incidence effect in Canada across several migrant groups, which may be due to selective migration (Anderson et al., 2015). Similar selective migration effects may be expected to apply in Japan as well, where migration policies are similarly or perhaps more restrictive. Indeed, the lack of an effect of migrant status on household income in these data show that social disadvantage did not significantly differ between these groups, as would be expected in countries with restrictive or selective immigration policies. Further prospective research with larger sub-samples of migrant youth may be needed to clarify the respective roles of social exclusion and social selection, which both may influence the magnitude of association between psychosis and migration in Japan.

We used a conservative conceptualization of “minority” status, in which all migrant respondents were second generation rather than first generation migrants. Other studies have also shown risk among 2nd generation migrants (Saraiva et al., 2005; Weiser et al., 2008), in some cases higher risk than 1st generation (Oh et al., 2015), although risk appears to be similar overall in a recent meta-analysis of incidence studies (Selten et al., 2020). Most of our migrant respondents had one Japanese parent, often mixed with another Asian nationality. This may have led to less pronounced cultural differences than in some other groups that have been studied, such as Moroccans in the Netherlands (Selten et al., 2001) or Ethiopians in Israel (Weiser et al., 2008), for example, and therefore less social disconnection from the non-migrant Japanese population (McIntyre et al., 2016). This is consistent with evidence from a systematic review showing that associations between psychotic experiences and migration may be better explained by ethnicity-related marginalization or exclusion (Tortelli et al., 2018).

#### 4.3. Limitations and implications

This study had several potential limitations: (1) our variables do not preclude the possibility that some of the “migrant” group may have been foreign-born but of Japanese ethnicity; (2) the low number of children whose parents were born outside of Japan limited statistical power, and (3) we did not include a sub-sample of first-generation migrants, or non-migrant ethnic minorities. Despite these limitations, our findings suggest that there may be an elevated need for preventive mental health intervention or supports among children of migrants in Japan. As the first report on migration and psychosis from the Tokyo Teen Cohort, an ongoing prospective cohort study, we intend to revisit this issue pending the collecting of follow-up data that may further elucidate the relationship of migration to psychosis into later adolescence.

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#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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