Article

A national transgender health survey from China assessing gender identity conversion practice, mental health, substance use and suicidality

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Gender identity conversion practice (GICP) refers to interventions that intend to alter an individual's gender identity that is incongruent with societal expectations based on the sex assigned at birth. In this study, the term GICP refers to both professional conversion efforts (also called Gender Identity Conversion Efforts, GICE, performed by psychologists, psychiatrists and so on) and non-professional conversion efforts (performed by family members and so on). Here data were analysed from the Chinese Transgender Health Survey covering transgender, nonbinary and gender diverse (TNG) adolescents and adults, with 7,576 respondents from mainland China entering the analysis following the application of exclusion criteria. Results showed that GICP is a risk factor for multiple mental health problems including depression, anxiety, post-traumatic stress disorder symptoms, suicidal ideation and suicidal plan in the previous 12 months, suicide attempts in both the previous 12 months and in lifetime, non-suicidal self-injury in the previous 12 months, and alcohol use. Participants with experience of professional GICP reported suicide attempts more frequently than those with experience of non-professional GICP. Compared with other age groups, GICP tended to associate with more severe mental health problems in TNG aged ≤17 years old. Evidence suggests that GICP worsens the mental health problems faced by the TNG population (especially adolescents) and reveals the equivalent detrimental effects from both professional GICP and non-professional GICP. It is necessary for the public to become more aware of the devastative impact of GICP on the TNG population.

Conversion therapy is based on the unscientific assumption that being from sexual and gender minorities (LGBTQ+) is pathological and should be suppressed or treated. It attempts to change sexual orientation to 'heterosexual' or gender identity to 'cisgender'[1,2]. Although sexual orientation and gender identity and expression should be viewed as a variation rather than a pathology, conversion therapy has been reported in at least 60 countries worldwide and is closely linked to homophobia and transphobia[3]. Increasing evidence shows the association

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between mental health concerns and conversion therapy[4,5], and the mental health aftermath is often associated with an elevated rate of self-harm, suicidality, depression and anxiety[6,7]. However, most studies in the literature have focused on the relationship between sexual minority groups and sexual orientation change efforts[8–11], and insufficient studies have focused on the influence of gender identity conversion efforts (GICE) on TNG individuals[7]. TNG is an umbrella term used to describe an individual's gender not aligned with normatively expected assigned sex or within the binary conception of gender[12]. GICE has been discouraged and labelled as an ineffective and unethical practice by professional organizations, including but not limited to the American Psychiatric Association, the American Academy of Child and Adolescent Psychiatry, the American Medical Association and the American Academy of Paediatrics, and it has been legally banned in several states in the United States of America (USA)[7,13]. GICE refers to professionals, including psychologists, religious advisors or counsellors, making efforts to alter individuals' gender identities to their sex assigned at birth[7]. However, TNG people often also face non-professional efforts to change their gender identity. Specifically in Chinese culture, parents tend to have low tolerance for their children to identify as TNG[14]. Research in the USA has also showed that family unsupportive of one's gender identity is associated with a history of 'detransition', which discontinues gender affirmation or returns an individual to their birth-assigned sex[15].

Researchers have emphasized that the most important thing to support TNG people is to "let them express themselves freely"[16]. Additionally, affirmation of TNG people's gender identity has been shown to be related to favourable mental health outcomes[17]. Nevertheless, GICP continues despite the urge from prominent associations to terminate the practice. Notably, GICP is prevalent among TNG populations, with a lifetime prevalence of 14% in the USA[7], 17% in New Zealand[18], 19% in Canada[1] and 11.5% in South Korea[19]. Considering approximately 1–2% of the global population identify as TNG[12], many individuals may have suffered and will suffer from GICP in the near future.

A recent large-scale cross-sectional survey in the USA covering 27,715 TNG individuals showed that TNG individuals who underwent GICP experienced severe psychological distress, manifested in higher odds of lifetime suicide attempts compared with individuals not exposed to GICP[7]. This is consistent with general conversion therapy results found in New Zealand and Canada: that the effort to change one's gender identity is associated with poor mental health outcomes[1,18]. A landmark study provided evidence on the association between childhood exposure to professional GICP and adverse mental health outcomes in adulthood, with outcome measurements including suicidality, severe psychological distress, binge drinking, cigarette use and illicit drug use[7]. However, as the study acknowledges, exposure to GICE from other people, such as family members, was not captured. Despite the existing influential research, there is still insufficient information regarding the Asian population, among which family members harbour a crucial negative attitude towards TNG gender identity[14]. Specifically, under the influence of traditional Chinese culture and a lack of appropriate healthcare services[14,20–22], it is likely that TNG people in China could face more severe GICP exposure and more devastating consequences compared with those in other developed countries. Mental healthcare for TNG individuals should go beyond practitioners' clinical competency (for example, clinical knowledge) by also considering practitioners' cultural competency, such as practitioners' ability to focus on the TNG-specific social contexts while remaining inclusive regarding gender diversity[23]. Thus, it is urgent to provide scientific proof of the harmful associations with GICP in the Asian population and to investigate the risk factors associated with GICP in Asia to promote legal prohibition of GICP.

There is also insufficient data on the influence of GICP on different age groups, particularly adolescents ≤17 years old. Research in Canada found that conversion therapy was more prevalent among younger cohorts (15–19 years old) compared with older cohorts (older than

20 years old)[1]. Research in the southern USA also identified that younger respondents were more likely to experience conversion therapy[4]. Due to the census age, previous recalled exposure to GICP research did not include participants below 18 years old[7]. As suggested previously, GICP exposure during childhood showed stronger adverse adult mental health outcomes than GICP exposure during adulthood. Thus, future research should examine the mental health impact resulting from GICP among young people[24]. In addition, the previous study did not clarify severe psychological distress into specific psychiatric problems, such as depression, anxiety and post-traumatic stress disorder (PTSD)[7].

Here, we investigated the different types of GICP and different referrers (that is, the specific person who suggested GICP or forced the individual into it). We aimed to quantify the prevalence of GICP exposure and the prevalence of different types of GICP among TNG individuals in mainland China, as well as to investigate the GICP-associated mental health concerns. We comprehensively screened mental health outcomes, including PTSD, depression, anxiety, non-suicidal self-injury (NSSI), suicide attempts and substance use (for example, cigarettes and alcohol), and compared age group differences (for example, adolescents ≤17 years old versus adults). We hypothesized that there would be a positive association between exposure to GICP and adverse mental health outcomes, including suicidality, depression, anxiety, substance use, PTSD and NSSI. We also hypothesized that different types of GICP would lead to different levels of mental health damage. Finally, we hypothesized that there could be an age group difference, with adolescents (≤17 years old) suffering more severe mental health concerns associated with GICP.

Results

Sociodemographic characteristics of the participants

Of the 7,576 participants from mainland China included in the analysis, 213 (2.8%) had experienced GICP, in which 34 (16.0%) participants were ≤17-year-olds, 130 (61.0%) participants were 18–24-year-olds and 49 (23.0%) participants were ≥25-year-olds. Of the 213 participants who had experienced GICP, 161 (75.6%) had experienced professional GICP and 52 (24.4%) had experienced non-professional GICP. A comparison between participants with and without experience of GICP revealed significant differences with the following groups more likely to suffer from GICP: male sex assigned at birth, transgender woman or woman gender identity, partnered marital status, father educated to bachelor's or junior college, father very unsupportive or unsupportive of gender identity, and mother very unsupportive or unsupportive of gender identity (Table 1). Regarding sex assigned at birth, the proportion of participants who had reported GICP who were birth-assigned males was higher, compared with nearly 50% among participants who had not reported GICP ($\chi^2 = 38.47$, $P = 0.001$). As for gender identity, 63.8% of the participants who had reported GICP identified themselves as women or transgender women ($\chi^2 = 72.92$, $P < 0.001$). Regarding marital status, participants who did not report GICP had a higher proportion of being single ($\chi^2 = 38.77$, $P < 0.001$). Participants who reported GICP had fathers with higher education levels than those who did not report GICP ($\chi^2 = 14.28$, $P = 0.011$). Participants who reported GICP had lower paternal support levels ($\chi^2 = 279.61$, $P = 0.001$) and maternal support levels ($\chi^2 = 206.62$, $P < 0.001$) than those who did not report GICP. We also used univariate logistic regression and multivariate logistic regression to analyse the demographic risk factors of GICP (Extended Data Table 1).

As in Extended Data Table 2, the only significant difference between professional and non-professional GICP was that participants who experienced professional GICP revealed higher fear of conversion practice ($t = 3.71$, $P = 0.002$). We found no significant difference between groups in all sociodemographic variables.

Description of GICP

According to different conversion methods, GICP was divided into professional GICP and non-professional GICP in the current study.

Table 1 | Characteristics of the study population by GICP response

Characteristic	Conversion practice group, n (%)	Non-conversion practice group, n (%)	χ² test or t test	Adjusted P
Age cohort			$\chi^2=0.57$	0.828
≤17 years	34 (16.0)	1287 (17.5)		
18–24 years	130 (61.0)	4511 (61.3)		
≥25 years	49 (23.0)	1565 (21.3)		
Birth-assigned sex			$\chi^2=38.47$	0.001
Male	161 (75.6)	3986 (54.1)		
Female	52 (24.4)	3375 (45.8)		
Other	–	2 (0.03)		
Gender identity			$\chi^2=72.92$	<0.001
Transgender man or man (birth-assigned as female)	34 (16.0)	1419 (19.3)		
Transgender woman or woman (birth-assigned as male)	136 (63.8)	2688 (36.5)		
Nonbinary or genderqueer	28 (13.1)	2050 (27.8)		
Cross-dresser	7 (3.3)	297 (4.0)		
Questioning	5 (2.3)	774 (10.5)		
Other	3 (1.4)	135 (1.8)		
Sexual orientation			$\chi^2=0.41$	0.995
Asexual	21 (9.9)	759 (10.3)		
Bisexual	44 (20.7)	1552 (21.1)		
Gay, lesbian or same gender loving	37 (17.4)	1348 (18.3)		
Heterosexual or straight	39 (18.3)	1318 (17.9)		
Pansexual	61 (28.6)	2054 (27.9)		
Other	11 (5.2)	332 (4.5)		
Ethnicity			$\chi^2=0.56$	0.663
Han	200 (93.9)	6813 (92.5)		
Other	13 (6.1)	550 (7.5)		
Education level			$\chi^2=1.63$	0.737
Less than high school	18 (8.5)	496 (6.7)		
High school or technical secondary school	55 (25.8)	1774 (24.1)		
Bachelor's or junior college	123 (57.7)	4524 (61.4)		
Master's or higher	17 (8.0)	569 (7.7)		
Religious belief			$\chi^2=0.82$	0.587
Yes	26 (12.2)	758 (10.3)		
No	187 (87.8)	6605 (89.7)		
Marital status			$\chi^2=38.77$	<0.001
Married	7 (3.3)	179 (2.4)		
Partnered	113 (53.1)	2600 (35.3)		
Single	85 (39.9)	4461 (60.6)		
Other	8 (3.8)	123 (1.7)		
Childhood family type			$\chi^2=0.62$	0.929
Nuclear	123 (57.7)	4082 (55.4)		
Extended	44 (20.7)	1678 (22.8)		
Single parent	24 (11.3)	840 (11.4)		
Other	22 (10.3)	763 (10.4)		
Annual family income			$\chi^2=0.70$	0.670
Less than ¥100,000	91 (42.7)	3339 (45.2)		
¥100,000 or more	122 (57.3)	4020 (54.6)		
Not asked	–	4 (0.1)		
Education level of father or male guardian			$\chi^2=14.28$	0.011

Table 1 (continued) | Characteristics of the study population by GICP response

Characteristic	Conversion practice group, *n* (%)	Non-conversion practice group, *n* (%)	χ^2 test or *t* test	Adjusted *P*
Less than high school	56 (26.3)	1961 (26.6)		
High school or technical secondary school	38 (17.8)	1775 (24.1)		
Bachelor's or junior college	92 (43.2)	2796 (38.0)		
Master's or higher	23 (10.8)	480 (6.5)		
Other (including unspecified and not applicable)	4 (1.9)	351 (4.8)		
Education level of mother or female guardian			$\chi^2=6.53$	0.246
Less than high school	74 (34.7)	2337 (31.7)		
High school or technical secondary school	42 (19.7)	1925 (26.1)		
Bachelor's or junior college	85 (39.9)	2551 (34.6)		
Master's or higher	8 (3.8)	345 (4.7)		
Other (including unspecified and not applicable)	4 (1.9)	205 (2.8)		
Paternal support of gender identity			$\chi^2=279.61$	<0.001
Very unsupportive	96 (45.1)	811 (11.0)		
Unsupportive	31 (14.6)	575 (7.8)		
Neutral	31 (14.6)	842 (11.4)		
Supportive	9 (4.2)	232 (3.2)		
Very supportive	2 (0.9)	83 (1.1)		
Other (including unaware of gender identity and not applicable)	44 (20.7)	4820 (65.5)		
Maternal support of gender identity			$\chi^2=206.62$	<0.001
Very unsupportive	81 (38.0)	813 (11.0)		
Unsupportive	40 (18.8)	795 (10.8)		
Neutral	39 (18.3)	1042 (14.2)		
Supportive	17 (8.0)	453 (6.2)		
Very supportive	5 (2.3)	199 (2.7)		
Other (including unaware of gender identity and not applicable)	31 (14.6)	4061 (55.2)		
Depression			$\chi^2=26.65$	<0.001
No symptoms (0–9)	34 (16.0)	2114 (28.7)		
Low risk (10–16)	54 (25.4)	2160 (29.3)		
High risk (17–27)	125 (58.7)	3089 (42.0)		
Anxiety			$\chi^2=36.41$	<0.001
No symptoms (0–4)	36 (16.9)	2255 (30.6)		
Mild symptoms (5–9)	66 (31.0)	2549 (34.6)		
Moderate symptoms (10–14)	51 (23.9)	1405 (19.1)		
Severe symptoms (15–21)	60 (28.2)	1154 (15.7)		
PTSD			$\chi^2=40.93$	<0.001
Low risk (0–5)	60 (28.2)	3711 (50.4)		
High risk (6–10)	153 (71.8)	3652 (49.6)		
Suicidal ideation in previous 12 months			$\chi^2=30.64$	<0.001
Yes	169 (79.3)	4461 (60.6)		
No	44 (20.7)	2902 (39.4)		
Suicidal plan in previous 12 months			$\chi^2=59.03$	<0.001
Yes	142 (66.7)	2974 (40.4)		
No	71 (33.3)	4389 (59.6)		
Suicide attempt in lifetime			$\chi^2=96.25$	<0.001
Yes	160 (75.1)	3050 (41.4)		
No	53 (24.9)	4313 (58.6)		
Suicide attempt in previous 12 months			$\chi^2=113.53$	<0.001

Table 1 (continued) | Characteristics of the study population by GICP response

Characteristic	Conversion practice group, n (%)	Non-conversion practice group, n (%)	χ² test or t test	Adjusted P
Yes	115 (54.0)	1664 (22.6)		
No	98 (46.0)	5699 (77.4)		
NSSI in previous 12 months			χ²=40.76	<0.001
Yes	108 (50.7)	2225 (30.2)		
No	105 (49.3)	5138 (69.8)		
Frequency of NSSI in previous 12 months			χ²=42.30	<0.001
None	105 (49.3)	5138 (69.8)		
1–4 times	51 (23.9)	1157 (15.7)		
5–7 times	18 (8.5)	331 (4.5)		
8 times or more	39 (18.3)	737 (10.0)		
Alcohol use			χ²=7.75	0.010
Non-hazardous use	165 (77.5)	6222 (84.5)		
Hazardous use	48 (22.5)	1141 (15.5)		
Cigarette use			χ²=2.64	0.691
Very low (0–2)	179 (84.0)	6288 (85.4)		
Low (3–4)	24 (11.3)	683 (9.3)		
Medium (5)	3 (1.4)	181 (2.5)		
High (6–7)	7 (3.3)	195 (2.6)		
Very high (8–10)	–	16 (0.2)		
E-cigarette use			t=0.79	0.587
Mean (s.d.)	0.43 (1.61)	0.53 (1.88)		

Between-group differences were examined using a Pearson's χ^2 test for categorical variables and an independent-sample t test for the continuous variable. All tests were two-tailed. P values were adjusted for FDR.

Comparison between two types of GICP on mental health and the effect of age groups difference were examined.

Professional GICP. 'Prescribed psychiatric medication' had the highest frequency among all professional GICPs, followed by 'aversion therapy', 'hypnotherapy', 'hospitalization', 'religious rituals', 'injection/infusion' and 'punishment shock'. There were no significant differences between all three age groups in the frequency of participants suffering from professional GICP (Fig. 1).

Non-professional GICP. Of non-professional GICP types, 'verbal aggression or insult' had the highest frequency, followed by 'forced to change physical characteristics and dressing style', 'personal insult', 'restricting freedom of movement', 'hitting' and 'forced into marriage'. We found significant differences between age groups. In particular, compared with participants ≥25 years old, those ≤17 years old and those aged 18–24 years old were more likely to suffer from verbal aggression or insult, personal insult and restricted freedom of movement. Participants ≤17 years old were also more likely to be hit than participants ≥25 years old. Forced change to physical characteristics and dressing style was more likely to happen to participants aged 18–24 years old than to participants ≥25 years old (Fig. 1).

Comparison between professional and non-professional GICP. It can be seen from Fig. 1 that most participants experienced various kinds of non-professional GICP, and the proportion who experienced professional GICP is lower. Among all types of GICP, the five most frequently experienced are all non-professional GICPs. Additionally, only non-professional GICPs showed significant differences between age groups. We found a common result in all age groups: TNG individuals were most likely to be suggested or forced to participate in GICP by their parents or guardians, followed by psychiatrists, friends of parents, relatives and counsellors (Extended Data Fig. 1).

Effect of GICP on mental health outcomes and substance use. After controlling for socio-demographic variables, we found that GICP is a risk factor for multiple mental health conditions, including depression (B = 0.59; 95% confidence interval (CI), 0.31–0.87; $P < 0.001$), anxiety (B = 0.64; 95% CI, 0.38–0.89; $P < 0.001$) and PTSD symptoms (adjusted odds ratio (aOR) = 2.36; 95% CI, 1.72–3.24; $P < 0.001$). GICP would also increase the risk of suicidality, which was reflected in the fact that participants who have experienced GICP had a higher risk of suicidal ideation in the previous 12 months (aOR = 1.91; 95% CI, 1.33–2.74; $P < 0.001$), suicidal plan in the previous 12 months (aOR = 2.29; 95% CI, 1.68–3.13; $p < 0.001$), suicide attempts in lifetime (aOR = 3.16; 95% CI, 2.26–4.40; $P < 0.001$) and suicide attempts in the previous 12 months (aOR = 2.89; 95% CI, 2.13–3.92; $P < 0.001$) than participants who had no GICP. Similarly, we found that GICP was also a risk factor for NSSI in the previous 12 months (aOR = 2.21; 95% CI, 1.64–2.98; $P < 0.001$), frequency of NSSI in the previous 12 months (B = 0.57; 95% CI, 0.37–0.77; $P < 0.001$) and alcohol use (aOR = 1.68; 95% CI, 1.19–2.37; $P = 0.004$) (Table 2).

In addition, after controlling socio-demographic variables, conversion practice in previous 12 months, and fear of conversion practice, we also found that professional GICP had greater impact on suicidality than non-professional GICP, including suicidal plan in previous 12 months (aOR = 4.61, 95%CI [1.53–13.84], p = 0.023), suicide attempts in lifetime (aOR = 12.42, 95% CI [3.89–39.63], p < 0.001), and suicide attempts in previous 12 months (aOR = 5.46, 95%CI [1.82–16.38], p = 0.010) (see Table 3). A visual comparison between professional and non-professional GICP experiences' impacts on mental health and substance use is shown in Fig. 2.
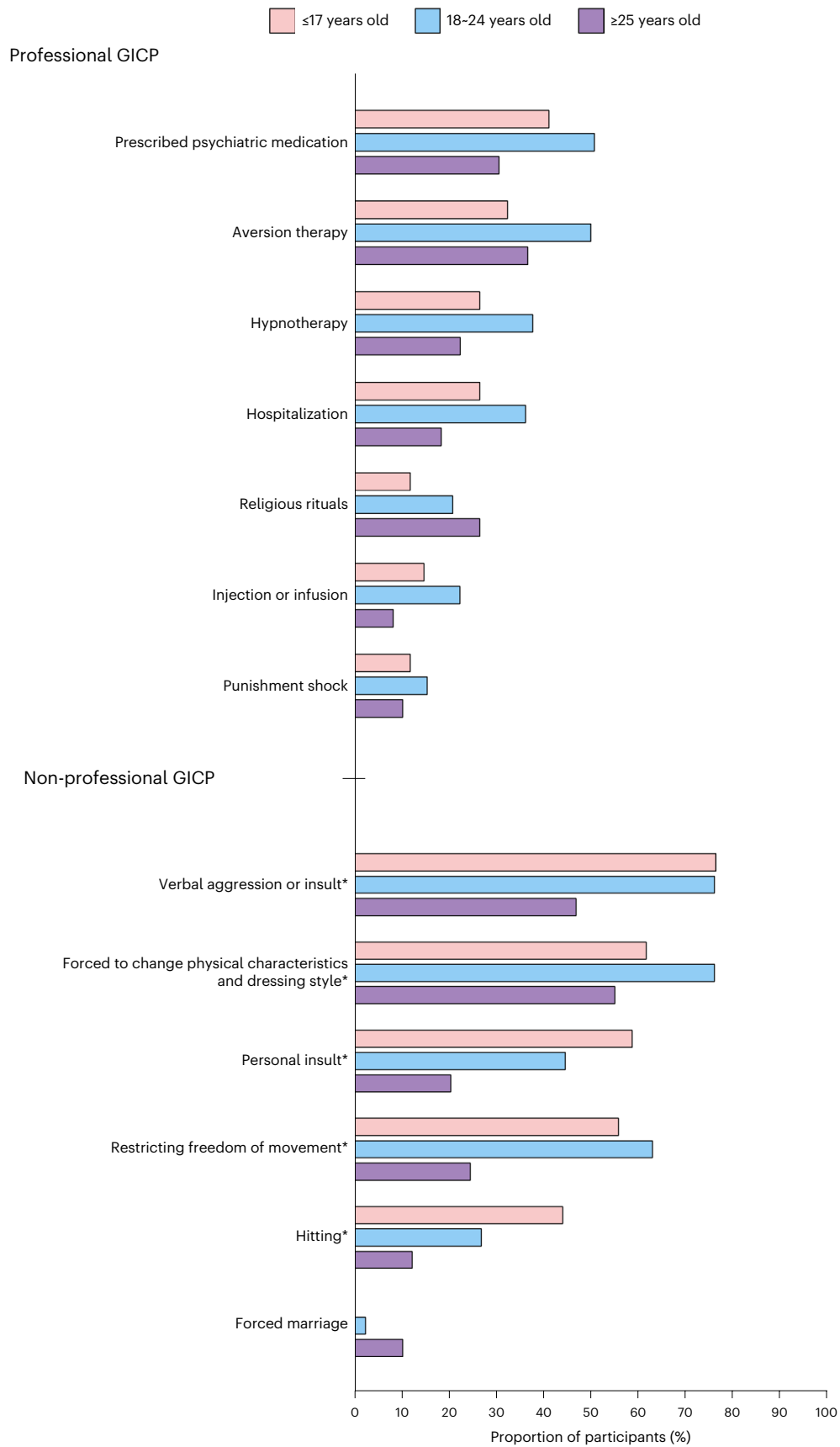
Fig. 1 | Types of GICP. Asterisks indicate differences between age groups. The analysis used a Pearson's χ^2 test with a statistical significance level of 5% for a two-sided test. Significance levels were adjusted for FDR.

Table 2 | Mental health and substance use outcomes for those with exposure to GICP

Variables	aOR or *B* (95% CI)	Adjusted *P*
Mental health		
Depression[a]	0.59 (0.31, 0.87)[b]	<0.001
Anxiety[a]	0.64 (0.38, 0.89)[b]	<0.001
PTSD symptoms[c]	2.36 (1.72, 3.24)[d]	<0.001
Suicidality		
Suicidal ideation in previous 12 months[c]	1.91 (1.33, 2.74)[d]	<0.001
Suicidal plan in previous 12 months[c]	2.29 (1.68, 3.13)[d]	<0.001
Suicide attempts in lifetime[c]	3.16 (2.26, 4.40)[d]	<0.001
Suicide attempts in previous 12 months[c]	2.89 (2.13, 3.92)[d]	<0.001
NSSI		
NSSI in previous 12 months[c]	2.21 (1.64, 2.98)[d]	<0.001
Frequency of NSSI in previous 12 months[a]	0.57 (0.37, 0.77)[b]	<0.001
Substance use		
Cigarette use[a]	0.14 (−0.21, 0.49)[b]	0.442
E-cigarette use[e]	−0.12 (−0.38, 0.14)[b]	0.401
Alcohol use[c]	1.68 (1.19, 2.37)[d]	0.004

Mental health and substance use outcomes were compared between individuals exposed to GICP and those without exposure to GICP (reference group), adjusting for age cohort, sex assigned at birth, gender identity, sexual orientation, ethnicity, education level, religious belief, marital status, childhood family type, annual family income, education level of father or male guardian, education level of mother or female guardian, paternal support of gender identity and maternal support of gender identity. *P* values were adjusted for FDR. [a]Ordinal logistic regression. [b]*B*. [c]Binary logistic regression. [d]aOR. [e]Linear regression.

Table 3 | Mental health and substance use outcomes for those with exposure to professional and non-professional conversion practice

Variables	aOR or *B* (95%CI)	Adjusted *P*
Mental health		
Depression[a]	0.40 (−0.40, 1.20)[b]	0.469
Anxiety[a]	0.51 (−0.16, 1.18)[b]	0.272
PTSD symptoms[c]	2.67 (1.03, 6.96)[d]	0.110
Suicidality		
Suicidal ideation in previous 12 months[c]	0.88 (0.22, 3.53)[d]	0.956
Suicidal plan in previous 12 months[c]	4.61 (1.53, 13.84)[d]	0.023
Suicide attempts in lifetime[c]	12.42 (3.89, 39.63)[d]	<0.001
Suicide attempts in previous 12 months[c]	5.46 (1.82, 16.38)[d]	0.010
NSSI		
NSSI in previous 12 months[c]	1.00 (0.41, 2.45)[d]	0.996
Frequency of NSSI in previous 12 months[a]	0.27 (−0.27, 0.82)[b]	0.469
Substance use		
Alcohol use[c]	1.49 (0.54, 4.11)[d]	0.546

Mental health and substance use outcomes were compared between individuals exposed to professional GICP and those exposed to non-professional GICP (reference group), adjusting for age cohort, sex assigned at birth, gender identity, sexual orientation, ethnicity, education level, religious belief, marital status, childhood family type, annual family income, education level of father or male guardian, education level of mother or female guardian, paternal support of gender identity, maternal support of gender identity, conversion practice in previous 12 months and fear towards conversion practice. *P* values were adjusted for FDR. [a]Ordinal logistic regression. [b]*B*. [c]Binary logistic regression. [d]aOR.

Age group differences. Our results showed that compared with the other two age groups, participants ≤17 years old with GICP demonstrated higher rates of suicidal plans in the previous 12 months ($\chi^2 = 17.83$, $P < 0.001$) and higher risk of suicide attempts in the previous 12 months ($\chi^2 = 19.87$, $P < 0.001$). Compared with participants ≥25 years old, those ≤17 years old with GICP revealed more severe depression ($\chi^2 = 12.70$ $P = 0.015$), more severe PTSD symptoms ($\chi^2 = 11.56$, $P = 0.005$), higher risk of suicidal ideation in the previous 12 months ($\chi^2 = 25.69$, $P < 0.001$), higher risk of suicide attempts in lifetime ($\chi^2 = 27.54$, $P < 0.001$), higher risk of NSSI in the previous 12 months ($\chi^2 = 13.41$, $P = 0.002$), and more frequent NSSI in the previous 12 months ($\chi^2 = 18.29$, $P = 0.008$) (Extended Data Table 3). Extended Data Fig. 2 presents a visual comparison of differences between age groups.

By comparing the impact of professional and non-professional GICP on mental health outcomes in different age groups, we found that the proportion of participants who attempted suicide in their lifetime was higher for those who experienced professional GICP compared with non-professional GICP both in 18–24-year-olds ($\chi^2 = 14.38$, $P = 0.002$) and ≥25-year-olds ($\chi^2 = 8.39$, $P = 0.050$). In addition, our results also show that in the ≥25 years old age group, participants who had experienced professional GICP were more likely to have attempted suicide in the previous 12 months than those who had experienced non-professional GICP ($\chi^2 = 8.65$, $P = 0.050$).

Discussion

This Chinese national health survey on the well-being of TNG people utilized multi-dimensional mental health measurements. The prevalence of GICP among TNG individuals was 2.8%, for ≤17-year-olds it was 2.6%, for 18–24-year-olds it was 2.8%, and for ≥25-year-olds it was 3.0%. Results proved that exposure to GICP was significantly associated with all measured mental health concerns, including depression, anxiety, PTSD, suicidality and NSSI.

Research on TNG individuals has emphasized that non-professional GICP from family members can lead to detrimental mental health consequences[14]. However, no study had systematically measured non-professional GICP and compared the influence of professional and non-professional GICP. Our national-scale study comprehensively measured and compared both types of GICP. We found that although professional GICP was prevalent, constituting over three-quarters of the proportion of GICP, non-professional GICP accounted for an alarming proportion of almost one-quarter. Abundant research has provided empirical evidence on the harmful consequences of professional GICP, however, this study has revealed the high proportion of non-professional GICP. Importantly, we found that, as with professional GICP, non-professional GICP also led to significant mental health problems, warranting urgent attention. Compared with professional GICP, there is no significant difference across the detrimental mental health measurement in non-professional GICP, despite professional GICP leading to a higher risk of lifetime suicidal attempts. That is, the neglected research area of non-professional GICP produces almost equivalent destructive consequences to TNG individuals.

Previous research found that recalled lifetime exposure to GICP was 14.0% for all the transgender participants and 19.6% for those who discussed their gender identity with a professional[7]. Between 2010 and 2015, the prevalence of transgender participants reporting exposure to professional GICP in the USA was 5% nationally (range, 1.2–16.3%)[24]. The prevalence of GICP found in the Chinese population was much lower than in Western countries. It is possible that religious beliefs and religious refusals are prominent rationales underlying conversion therapy in Western societies[25]. Conversion therapy was most common
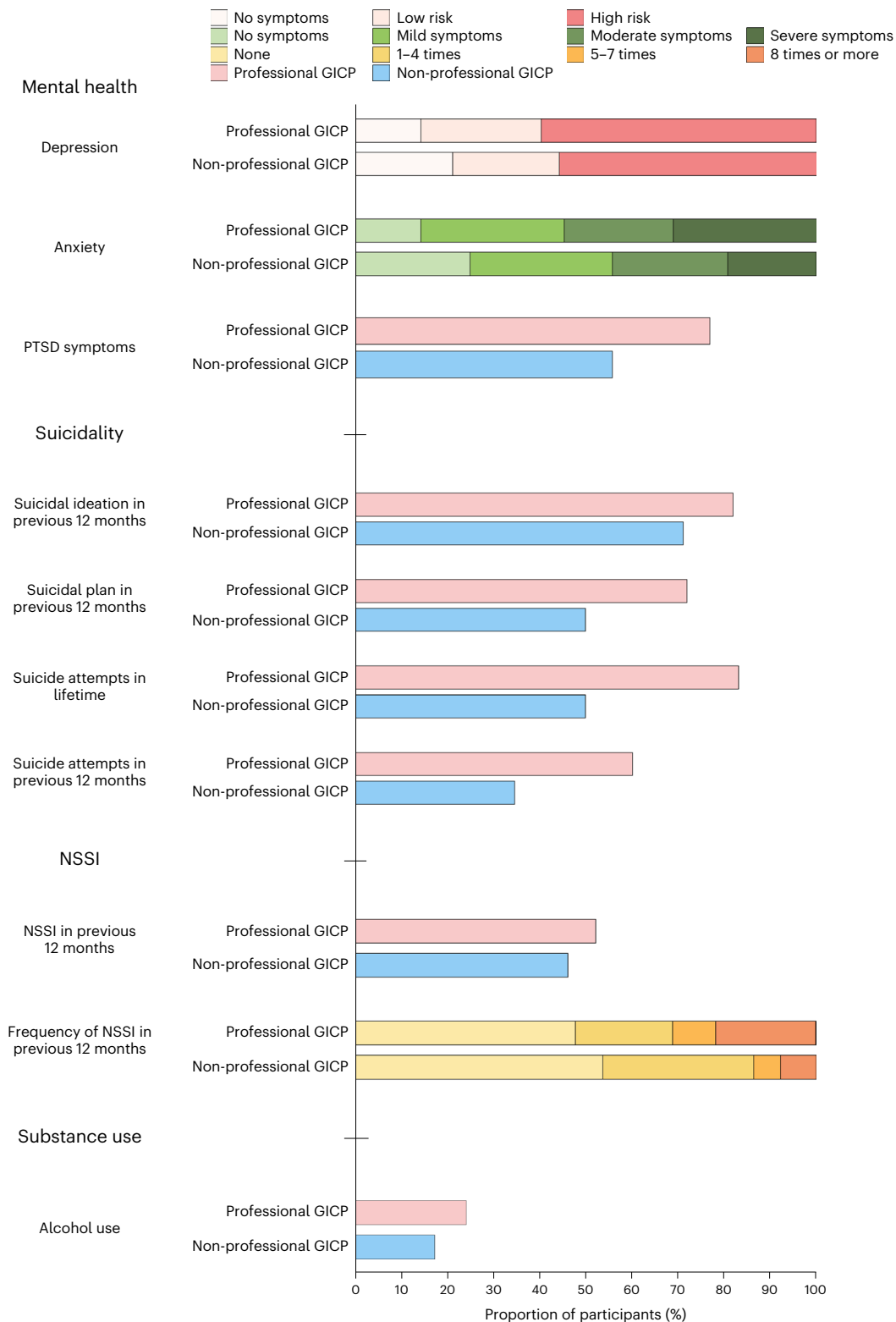
Fig. 2 | Comparison of mental health problems between professional GICP and non-professional GICP. The proportion of participants who experienced Professional GICP and Non-professional GICP in Mental Health, Suicide, and NSSI was presented.

in religious and faith-based settings (67%), followed by licensed health-care provider offices (20%) in Canadian sexual and gender minority groups[1]. GICP in American TNG individuals followed a similar pattern, with the most prevalent type being through religious leaders and clergies (10.0%), followed by mental health practitioners (9.1%)[4]. Connecting to the current study, to some extent, we consider that the

low religious belief prevalence may lead to the low rate of GICP in the Chinese population. A previous study found that individuals who experienced GICP were twice as likely to report attempted suicide[7,26]. Here, we found that GICP exposure resulted in 3.09-fold increase in suicide attempts, which is much higher than previous reports. Accordingly, although the prevalence of GICP in the Chinese population is relatively

low, the suicidality risk for those who experienced GICP is much higher. Notably, our results show that compared with non-professional GICP, professional GICP leads to an even more severe risk of lifetime suicidal attempt. This is the only significant difference we recorded in mental health outcomes between professional and non-professional GICP. For TNG individuals who suffered from professional GICP, it is urgent to provide suicide prevention intervention.

TNG individuals assigned male sex at birth and fathers with higher education levels were significantly more likely to report exposure to GICP. Unlike previous research in the USA, which found that TNG individuals who were assigned female sex at birth showed higher odds of GICP exposure[7], our sample showed that individuals assigned male sex at birth showed higher odds of GICP exposure. Past research also showed that lower education levels were correlated with a higher likelihood of TNG individuals receiving GICP[4]. A previous study showed that respondents from socioeconomically disadvantaged groups, such as low educational backgrounds, tended to report exposure to professional GICP[7]. In our sample, participants' education levels did not show significant differences between GICP and non-GICP groups, while participants with fathers with higher educational levels were significantly more likely to report exposure to GICP. This indicated that, unlike in the USA, participants with higher socioeconomic backgrounds might suffer more commonly from GICP in China. This may be because disadvantaged families do not have access to professional GICP due to financial constraints. Nevertheless, owing to the cross-sectional nature of the study, we cannot offer a solid causal interpretation.

These results highlight the importance of recognition of gender diversity and stress the adverse associations of GICP. This study is validation and expansion of landmark research, which consistently showed GICP was associated with psychological distress and suicidality[7], although this study further details measured psychological distress in terms of depression, anxiety and PTSD. In addition, the previous study showed that early exposure to GICP was associated with worse mental health outcomes and indicated that rejection of gender identity at earlier stages could elevate lifetime suicide attempts[7]. However, owing to a lack of adolescents ≤17 years old, they did not investigate the GICP impacts on different age groups. Compared with other age groups who suffered from GICP, participants ≤17 years old who suffered from GICP demonstrated more severe depression, suicidal ideation, suicidal plans, suicide attempts (both in the previous 12 months and lifetime) and NSSI. Our results demonstrate that TNG adolescents ≤17 years old tended to have more severe mental health associations with GICP. Researchers have warned that it is critical to focus on younger generations, because half of received conversion therapy is during childhood or adolescence[10,13].

Researchers have proposed that GICP exposure might elevate stigma-related minority stress, which could lead to general emotional dysregulation and mental health concerns[7]. Aside from emotional abuse, GICP could encompass rejection based on gender identity and produce internalized stigma, all risks that are strongly associated with suicidality[26]. Conversion therapy was also associated with poor self-esteem, internalized stigma and discrimination[5,6,14,20]. In our current findings, regarding TNG individuals who reported GICP, higher self-esteem was shown to be a protective factor for the three primary outcomes (mental health, suicidality and NSSI), while fear of GICP was shown to be the risk factor for the three primary outcomes. It was also worth noting that internalized transphobia was a risk factor for the mental health of TNG people.

We found that most TNG individuals who suffered from GICP were referred by their parents. Such a finding is consistent with results from two previous Chinese studies, which suggested that parents tend to avoid and reject the gender identity of their TNG children[14,27]. Thus, it is crucial to psychoeducate parents to support rather than suppress their children's gender identity. We propose providing parents of TNG individuals with psychoeducation sessions on the diversity of gender identity, the negative consequences of GICP, as well as supportive techniques for their TNG children's mental health. More importantly, supporting families with understanding the adverse and destructive consequences of GICP on TNG adolescents' mental health. Considering the aftermath of GICP, healthcare providers should stand firmly against conversion therapy on a personal level. Previous research found that recalled lifetime exposure to GICP of those who discussed gender identity with a professional was higher than for the total transgender participants (14.0% versus 19.6%)[7]. This might indicate that professionals may not act according to their ethical doctrine as they are supposed to. It is essential for healthcare providers to self-educate, advocate for TNG individuals' rights to not undergo GICP and offer gender affirmative therapy to improve the mental health of TNG individuals[28]. Moreover, we recommended that TNG communities provide consulting hotlines to support individuals who suffered from GICP. There is a long way to go for the prohibition of GICP, which will require efforts from policymakers. We hope that our research findings could move things forward.

There are several limitations that need to be addressed. Firstly, the cross-sectional nature of this study limits the study's ability to infer and establish causality between GICP and adverse mental health outcomes. Future longitudinal studies are needed to investigate causal relationships of GICP on mental health outcomes. Secondly, we did not measure the intensity of GICP, including the frequency, duration or date of GICP. We recommend further studies to collect detailed information about GICPs to measure the potential mental health variations caused by different GICPs on victims. Thirdly, the survey used a convenience sample collected through online and offline advertisements. Thus, the sample may not be representative of all TNG individuals in the nation, especially those who are not frequent social media users.

Conclusions

In conclusion, based on a large sample size of the TNG individuals, we repoted that GICP increased risk for multiple mental health problems including suicidality. Compared with non-professional GICP, professional GICP demonstrated more severe harm. Compared with other age groups, GICP tended to associate with more severe mental health problems in TNG people aged ≤17 years old. Our results support the standpoint that GICP should be avoided and banned urgently. GICP is an unethical practice that elevates the risks of mental health concerns in a population already facing severe mental health risks. Despite its pervasive nature and lack of scientific credibility, our findings add to the substantial evidence suggesting that GICP is associated with various mental health concerns and substance use, including suicidality and NSSI. It is necessary for the public to become more aware of the devastating impact of GICP on the TNG population.

Methods

Study design

The data used in this study are from the 2021 Chinese Transgender Health Survey. This cross-sectional health survey was conducted from 6 May to 26 December 2021, covering all province-level administrative divisions in mainland China (Extended Data Figs. 3 and 4). It is larger than previous health survey on the TNG population in China[29–31]. The Chinese Transgender Health Survey protocol was reviewed and approved by the ethics committee of the Second Xiangya Hospital of Central South University, Changsha, Hunan, China.

Participants

A total of 9,390 responses were received: 9,161 respondents completed all components of the survey and 229 participants declined consent. Therefore, the response rate was 97.6%. To ensure the authenticity and reliability of the data, data cleaning was conducted according to the following criteria: (1) participants correctly answered two of the three attention detection questions; (2) a combination of IP (Internet Protocol) address and contact information did not indicate a repeated

submission; (3) the answers to 'sex assigned at birth' and 'gender identity' indicated TNG identity (for example, those questions were not answered randomly or illogically); (4) the participant lives or grew up in mainland China. This excluded 1,585 respondents leaving 7,576 participants (mean age was 21.61 years ± 5.15) in the final sample for analysis, with an effective rate of 82.7%. To find out the differences between age groups, we divided the participants into three: ≤17 years old, 18–24 years old and ≥25 years old. The cut-off values of these three age groups were based on the legal definition of minors in China and guidelines published by the World Health Organization (WHO). We classified ≤17 years old as adolescence because this is a legal age boundary for adults and adolescents in China[32]. This group represented adolescents who did not have legal and medical autonomy. We further set the other age groups as 18–24 years old (adolescents with legal and medical autonomy) and ≥24 (adults), as WHO sets 24 years old as the upper limit for young adults[33–35].

Defining the TNG population

Participants' sexes assigned at birth and gender identities were each measured by a self-report item, which was used to define the TNG population. Sex assigned at birth was measured by asking each participant, 'Which sex were you assigned at birth?' The options included male, female and other (to be filled in by participants). Gender identity was measured by asking each participant, 'If only one item can be chosen, which of the following is a better description of you?' The options included man, woman, transgender man, transgender woman, non-binary/genderqueer, cross-dresser, questioning and none of the above. According to participants' choices on these two items, we divided the participants into six categories (Table 1).

Recruitment

Owing to the COVID-19 restrictions, convenient sampling and snowball sampling were employed for online participant recruiting. The promotion of online recruitment advertising has been promoted by many LGBTQ+ community organizers. Online posters and links have been released through multiple social media channels and platforms, such as WeChat or QQ groups, which are popular in the Chinese TNG community. The online questionnaire was prepared on the 'Wenjuanxing' platform, and a QR (quick response) code was automatically generated for distribution. TNG individuals who agreed to participate in this survey were provided with the QR code for online survey entry. Participants who completed the entire survey had a chance to win a cash reward in a prize draw. All questionnaires were anonymous and online informed consent was acquired prior to the study. Participants were informed of the right to withdraw from the study at any time. Participants were also provided with information on accessing mental health support should they become upset at any point during or after the study.

Measures

Sociodemographic characteristics. Participants' sociodemographic characteristics, including age group, sex assigned at birth, gender identity, sexual orientation, ethnicity, education level, religious belief, marital status, family category, annual family income, education level of father or male guardian, and education level of mother or female guardian were collected.

Measurements of GICP. In this study, we focus on any treatments or other practices enforced with the purpose of changing a person's gender identity[36]. We defined GICP as practices with the purpose of changing one's gender identity conducted by any person with authority, including both professional and non-professional personnel. In the current study, non-professional GICP were measured separately to professional GICP (that is, GICE, as described previously, in which conversion therapy was conducted by professionals)[1,7]. Furthermore, non-professional GICP is defined in this study as measures conducted by non-professional personnel (for example, parents, guardians, relatives, teachers, education practitioners and partners). The definition of non-professional GICP is rooted in the notion of the existing non-professional practice of gender identity change efforts from previous studies[1]. A previous study[37] measured and reported that gender identity and expression conversion attempts come from 'parent(s), family member(s)', 'friends or acquaintances', 'relationship (ex-)partner(s)', which corresponds to the non-professional GICP defined in the current study.

Professional GICP included hypnotherapy, aversion therapy, religious rituals, punishment shock, hospitalization, injection or infusion and prescribed psychiatric medication[38]. In these conversion practices, hypnotherapy and aversion therapy belong to psychological intervention techniques[39], which need to be conducted by professional psychotherapists. In addition, punishment shock, hospitalization, injection or infusion and prescribed psychiatric medication need to be implemented by doctors or mental health practitioners in psychiatric hospitals or psychiatric departments of comprehensive hospitals[5]. Besides, religious rituals are usually carried out by church leaders[40]. Therefore, we defined these conversion practices conducted by personnel who have received professional medical or psychological training as professional GICPs. Non-professional GICP experience measured in this study included verbal aggression or verbal insult, being forced to change one's physical characteristics and dressing style, facing personal insult, facing restrictions on freedom of movement, facing physical abuse and being forced into marriage[41].

All of the participants answered the screening item, 'Have you ever experienced gender identity conversion?' Because conversion therapy includes sexual orientation, gender identity and gender expression[37], and we focused on the negative influences of GICP on the TNG population, if participants chose 'no', they would skip this section. Otherwise, participants answered four more detailed questions: (1) 'Which types of GICP did you experience?', (2) 'Who forced or suggested you participate in gender identity conversion?', (3) 'Did the conversion therapy occur within the last 12 months?', and (4) 'What degree of fear did you feel towards gender identity conversion?' The first question assessed participants according to the definitions of professional and non-professional GICP. The degree of fear of gender identity conversion assessed the overall fear of participants' gender identity conversion experience, including both fears of professional and non-professional GICP.

Mental health outcomes and substance use. We compared differences between participants who reported GICP and who did not report GICP in the following outcome variables: mental health, including the level of depression in the past week (a short version of the Center for Epidemiologic Studies depression scale (CES-D-9), Cronbach's alpha = 0.92)[29,42], the level of anxiety in the past week (Generalized Anxiety Disorder 7-item (GAD-7), Cronbach's alpha = 0.92)[29,43], and PTSD symptoms (Trauma Screening Questionnaire (TSQ), Cronbach's alpha = 0.87)[44]; suicidality[31], including suicidal ideation in the previous 12 months, suicide plan in the previous 12 months, suicide attempt in the previous 12 months, and lifetime suicide attempt; NSSI, including whether there was NSSI in the previous 12 months and the times of NSSI behaviours in the previous 12 months, and substance use, including use of alcohol (Alcohol Use Disorder Identification Test (AUDIT), Cronbach's alpha = 0.76), cigarettes (Fagerström test for nicotine dependence (FTND), Cronbach's alpha = 0.85) and e-cigarettes (e-FTND, Cronbach's alpha = 0.79)[45,46].

Statistical analysis. The sample characteristics were presented using mean and standard deviation (s.d.) for continuous variables and percentages for categorical variables. Firstly, we compared differences between participants with GICP and participants without GICP in sociodemographic characteristics, mental health, suicidality, NSSI and

substance use. Secondly, we divided participants into two groups (professional GICP versus non-professional GICP) according to the types of GICP experienced. Participants who reported experiencing hypnotherapy, aversion therapy, religious rituals, punishment shock, hospitalization, injection or infusion and prescription of psychiatric medication were allocated to the professional GICP group, and the others were allocated to the non-professional GICP group. We compared the differences between these two groups regarding participants' sociodemographic characteristics, conversion practice in the previous 12 months and fear of conversion practice.

Chi-squared tests were performed to verify whether there was any significant difference in categorical variables. If the variable was continuous, an independent sample t test was performed. The proportion of GICP types and who suggested or forced participants into GICP were described for different age groups, and mental health variables were also compared for different GICP groups. Logistic regression analysis and linear regression analysis were conducted to explore the effect of GICP on mental health, suicidality, NSSI and substance use outcomes by adjusting for sociodemographic variables. Furthermore, we compared the effects of professional GICP and non-professional GICP on all the above outcomes by adjusting the sociodemographic variables, conversion practice in the previous 12 months and fear of conversion practice. Adjusted OR and beta with 95% CI were used to show the degree of effects. Data were analysed using SPSS (v. 26.0), with a P-value lower than 0.05 (two-tailed) considered to be statistically significant. All P-values were respectively adjusted for FDR in each analysis, using R (v. 4.1.0).

Reporting summary

Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability

Data are not publicly available due to their containing information that could compromise research participant privacy/consent. Data will be made available only to potential collaborators with ethical approval after they submit a research proposal application by contacting the corresponding authors.

Code availability

SPSS code for data analysis and R code for the adjustment of P-values are available upon request to the corresponding authors.

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Author contributions

Y.W., M.H., J.O., G.L., Z.M. and R.C. designed the study. M.H. and Y.Z. conducted the statistical analyses and cross-checked the analyses. Yuanyuan W., M.H., Y.Z. and Yinzhe W. wrote the first draft of the manuscript. G.L., Z.H. and Z.M. provided critical input to the interpretation of the analyses. R.C. and J.O. are the principal investigators, providing resources and supervising all aspects of the project. All authors contributed to the interpretation of the analyses and the review and editing of the manuscript, and approved the submission of the final version.

Competing interests

The authors declare no competing interests.

Additional information

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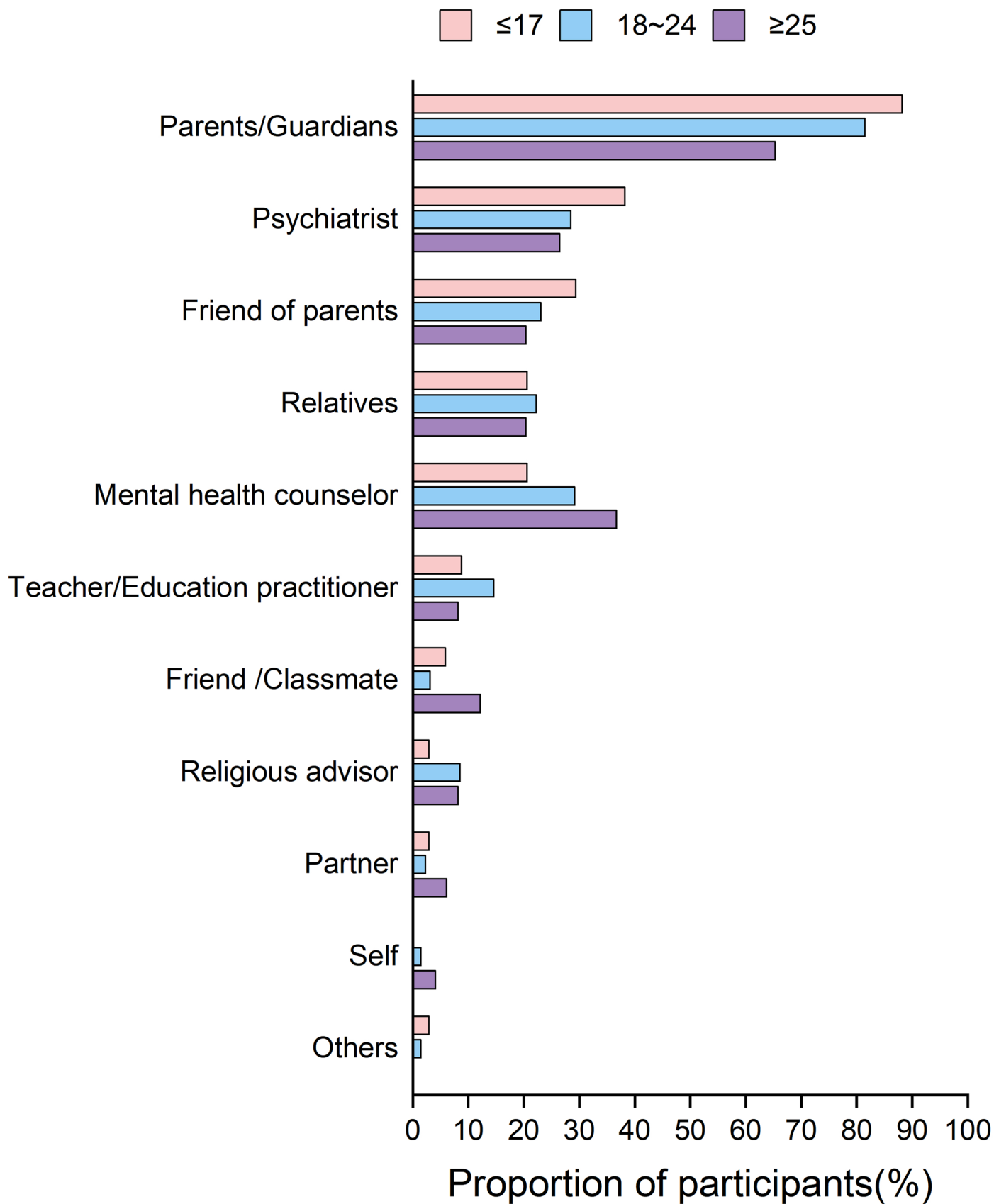
Extended Data Fig. 1 | Bar chart of age differences. Age differences of the item 'Who recommend or force you into gender identity conversion practice'.
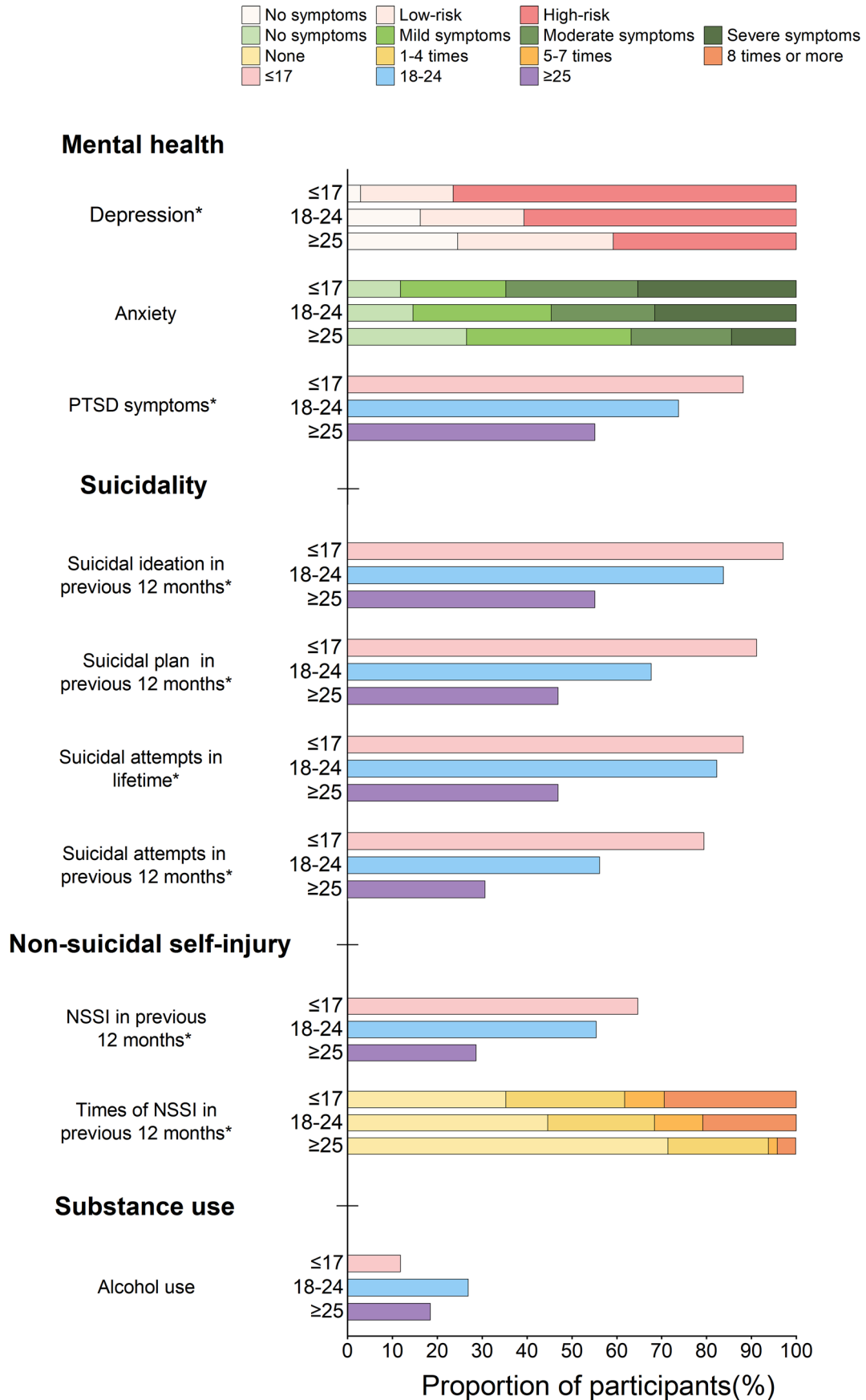
Extended Data Fig. 2 | Comparison of mental health problems associated with gender identity conversion practice among different age groups. Note: PTSD: post-traumatic stress disorder. Asterisks indicate differences between age groups. The analysis used a Pearson's χ2 test with a statistical significance level of 5% for a two-sided test. Significance levels were adjusted for FDR.
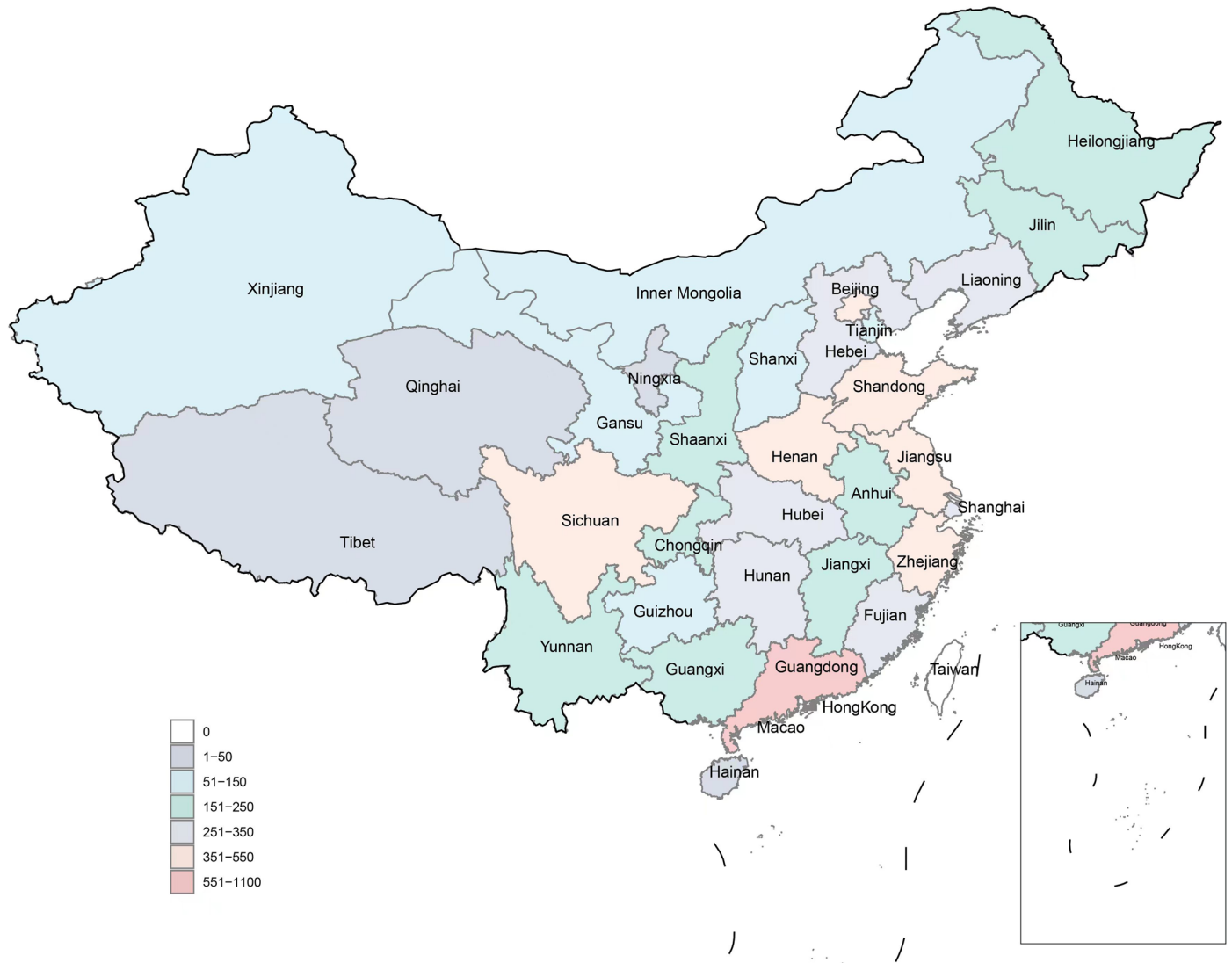
Extended Data Fig. 3 | Distribution map of birth place of TNG participants. The figure visually shows the distribution of participants' birthplaces in different province-level administrative divisions in Mainland China.
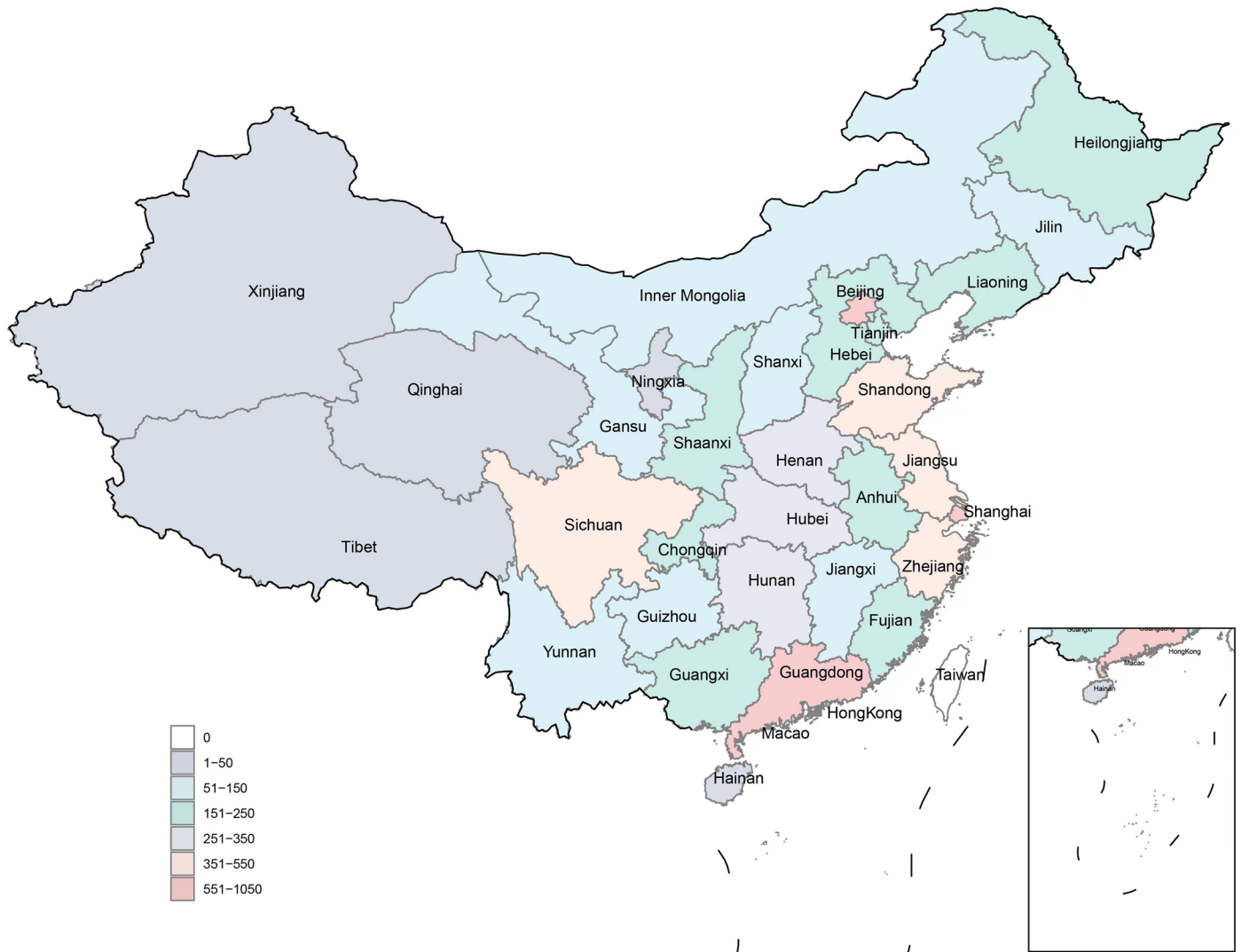
Extended Data Fig. 4 | Distribution map of current residence of TNG participants. The figure visually shows the distribution of participants' current living places in different province-level administrative divisions in Mainland China.

Extended Data Table 1 | Prevalence of gender identity conversion practice estimated with univariate and multivariate logistic regression models

Variables	Univariate model		Multivariate model	
	OR (95%CI)	Adjusted p	OR (95%CI)	Adjusted p
Age				
≤ 17	1 (Referent)		1 (Referent)	
18-24	1.09 (0.74-1.60)	0.855	1.06 (0.65-1.73)	0.966
≥ 25	1.19 (0.76-1.85)	0.673	1.05 (0.58-1.89)	0.966
Sex assigned at birth				
Male	1 (Referent)		1 (Referent)	
Female	0.38 (0.28-0.52)	<0.001	0.67(0.35-1.29)	0.530
Others	-	-	-	
Gender identity				
Transgender man or man (assigned as female at birth)	1 (Referent)		1 (Referent)	
Transgender woman (male to female) or woman (assigned as male at birth)	2.11 (1.44-3.09)	<0.001	1.06 (0.50-2.29)	0.966
Nonbinary or genderqueer	0.57 (0.34-0.94)	0.089	0.63 (0.33-1.19)	0.392
Cross-dresser	0.98 (0.43-2.24)	0.977	1.08 (0.38-3.03)	0.966
Question	0.27(0.11-0.69)	0.022	0.40(0.14-1.12)	0.344
Others	0.93(0.28-3.06)	0.970	1.06(0.30-3.82)	0.970
Sexual orientation				
Asexual	1 (Referent)		1 (Referent)	
Bisexual	1.03 (0.61-1.74)	0.973	0.75 (0.43-1.32)	0.649
Gay, Lesbian, or same gender-loving	0.99 (0.58-1.71)	0.977	0.75 (0.43-1.33)	0.649
Heterosexual or straight	1.07 (0.63-1.83)	0.921	0.68 (0.39-1.21)	0.454
Pansexual	1.07 (0.65-1.78)	0.921	0.80 (0.47-1.36)	0.680
Others	1.20 (0.57-2.51)	0.851	0.99 (0.45-2.16)	0.980
Ethnicity				
Han	1 (Referent)		1 (Referent)	
Others	0.81 (0.46-1.42)	0.673	0.91(0.51-1.64)	0.966
Educational				
Less than high school	1 (Referent)		1 (Referent)	
High school/Technical secondary school	0.85(0.50-1.4)7	0.793	0.77 (0.43-1.37)	0.680
Bachelor/ Junior college	0.75(0.45-1.24)	0.561	0.62 (0.34-1.13)	0.392
Master or high	0.82(0.42-1.62)	0.793	0.71 (0.32-1.55)	0.680
Religious belief				
Yes	1 (Referent)		1 (Referent)	
No	0.83(0.54-1.25)	0.673	0.83 (0.54-1.23)	0.680
Marital Status				
Married	1 (Referent)		1 (Referent)	
Partnered	1.11(0.51-2.42)	0.921	0.95 (0.40-2.23)	0.966
Single	0.49(0.22-1.07)	0.185	0.53 (0.22-1.26)	0.392
Others	1.66(0.59-4.71)	0.673	1.46 (0.47-4.48)	0.703
Type of family grow up in				
Nuclear	1 (Referent)		1 (Referent)	
Extended	0.87(0.61-1.23)	0.673	0.88 (0.61-1.26)	0.702
Single-parent	0.95(0.61-1.48)	0.921	1.21 (0.75-1.95)	0.683
Others	0.96(0.60-1.52)	0.938	1.03 (0.64-1.68)	0.966
Annual family income, ¥				
Less than 100 000	1 (Referent)		1 (Referent)	
100 000 or more	1.11(0.85-1.47)	0.673	1.08 (0.79-1.47)	0.842
Not asked	-	-	-	-
Educational of father/male guardian				
Less than high school	1 (Referent)		1 (Referent)	
High school/Technical secondary school	0.75(0.49-1.14)	0.398	0.85 (0.54-1.34)	0.702
Bachelor/ Junior college	1.15(0.82-1.61)	0.673	1.30 (0.83-2.03)	0.559
Master or high	1.68(1.02-2.75)	0.118	2.26 (1.18-4.32)	0.146
Others (include unspecified, not applicable)	0.39(0.14-1.11)	0.186	0.65 (0.20-2.08)	0.702
Educational of mother/female guardian				
Less than high school	1 (Referent)		1 (Referent)	
High school/Technical secondary school	0.69(0.47-1.01)	0.153	0.65 (0.42-1.00)	0.289
Bachelor/ Junior college	1.05(0.77-1.44)	0.921	0.87 (0.56-1.36)	0.736
Master or high	0.73(0.35-1.53)	0.673	0.44 (0.18-1.04)	0.320
Others (include unspecified, not applicable)	0.62(0.22-1.70)	0.673	0.98 (0.31-3.17)	0.980
Father support of gender identity				
Very unsupportive	1 (Referent)		1 (Referent)	
Unsupportive	0.46(0.30-0.69)	<0.001	0.58 (0.37-0.91)	0.146
Neutral	0.31(0.21-0.47)	<0.001	0.43 (0.26-0.70)	0.014
Supportive	0.32(0.16-0.66)	0.009	0.44 (0.20-0.97)	0.289
Very supportive	0.20(0.05-0.84)	0.089	0.30 (0.07-1.40)	0.392
Others (include Not knowing the gender identity, not applicable)	0.08(0.05-0.11)	<0.001	0.23 (0.13-0.41)	0.002
Mother support of gender identity				
Very unsupportive	1 (Referent)		1 (Referent)	
Unsupportive	0.51(0.34-0.75)	0.005	0.70 (0.46-1.06)	0.364
Neutral	0.38(0.25-0.56)	<0.001	0.65 (0.41-1.03)	0.320
Supportive	0.38(0.22-0.64)	<0.001	0.64 (0.34-1.18)	0.392
Very supportive	0.25(0.10-0.63)	0.012	0.46 (0.17-1.28)	0.392
Others (include Not knowing the gender identity, not applicable)	0.08(0.05-0.12)	<0.001	0.31 (0.16-0.57)	0.002

The analysis was using logistic regression models. p value was adjusted by false discovery rate (FDR).

Extended Data Table 2 | Characteristics of the study population by professional and non-professional gender identity conversion practice response.

Characteristic	professional conversion practice n. (%)	non-professional conversion practice n. (%)	χ^2-test/ t test	Adjusted P
Age *cohort*			χ^2=0.85	0.969
≤ 17	25(15.5)	9(17.3)		
18-24	101(62.7)	29(55.8)		
≥ 25	35(21.7)	14(26.9)		
Sex assigned at birth			χ^2=3.88	0.336
Male	127(78.9)	34(65.4)		
Female	34(21.1)	18(34.6)		
Gender identity			χ^2=7.35	0.576
Transgender man (female to male) or man (birth-assigned female)	22(13.7)	12(23.1)		
Transgender woman (male to female) or woman (birth-assigned male)	109(67.7)	27(51.9)		
Nonbinary or genderqueer	21(13.0)	7(13.5)		
Cross-dresser	5(3.1)	2(3.8)		
Question	2(1.2)	3(5.8)		
Others	2(1.2)	1(1.9)		
Sexual orientation			χ^2=14.51	0.096
Asexual	14(8.7)	7(13.5)		
Bisexual	32(19.9)	12(23.1)		
Gay, Lesbian, or same gender-loving	32(19.9)	5(9.6)		
Heterosexual or straight	24(14.9)	15(28.8)		
Pansexual	53(32.9)	8(15.4)		
Others	6(3.7)	5(9.6)		
Ethnicity			χ^2=0.61	0.969
Han	150(93.2)	50(96.2)		
Others	11(6.8)	2(3.8)		
Education level			χ^2=0.55	0.969
Less than high school	13(8.1)	5(9.6)		
High school/Technical secondary school	41(25.5)	14(26.9)		
Bachelor/ Junior college	95(59.0)	28(53.8)		
Master or high	12(7.5)	5(9.6)		
Religious belief			χ^2=2.66	0.572
Yes	23(14.3)	3(5.8)		
No	138(85.7)	49(94.2)		
Marital Status			χ^2=2.23	0.969
Married	4(2.5)	3(5.8)		
Partnered	89(55.3)	24(46.2)		
Single	62(38.5)	23(44.2)		
Others	6(3.7)	2(3.8)		
Type of family grow up in			χ^2=1.20	0.969
Nuclear	91(56.5)	32(61.5)		
Extended	36(22.4)	8(15.4)		
Single-parent	18(11.2)	6(11.5)		
Others	16(9.9)	6(11.5)		
Annual family income, ¥			χ^2=0.01	1.000
Less than 100 000	69(42.9)	22(42.3)		
100 000 or more	92(57.1)	30(57.7)		
Education level of father/male guardian			χ^2=2.76	0.969
Less than high school	39(24.2)	17(32.7)		
High school/Technical secondary school	30(18.6)	8(15.4)		
Bachelor/ Junior college	71(44.1)	21(40.4)		
Master or high	17(10.6)	6(11.5)		
Others (include unspecified, not applicable)	4(2.5)	-		
Education level of mother/female guardian			χ^2=3.11	0.969
Less than high school	52(32.3)	22(42.3)		
High school/Technical secondary school	32(19.9)	10(19.2)		
Bachelor/ Junior college	69(42.9)	16(30.8)		
Master or high	5(3.1)	3(5.8)		
Others (include unspecified, not applicable)	3(1.9)	1(1.9)		
Father support of gender identity			χ^2=3.22	0.969
Very unsupportive	70(43.5)	26(50.0)		
Unsupportive	25(15.5)	6(11.5)		
Neutral	22(13.7)	9(17.3)		
Supportive	8(5.0)	1(1.9)		
Very supportive	1(0.6)	1(1.9)		
Others (include Not knowing the gender identity, not applicable)	35(21.7)	9(17.3)		
Mother support of gender identity			χ^2=2.21	0.969
Very unsupportive	60(37.3)	21(40.4)		
Unsupportive	30(18.6)	10(19.2)		
Neutral	29(18.0)	10(19.2)		
Supportive	14(8.7)	3(5.8)		
Very supportive	5(3.1)	-		
Others (include Not knowing the gender identity, not applicable)	23(14.3)	8(15.4)		
Conversion practice in Previous 12 months			χ^2=0.05	0.969
Yes	49(30.4)	15(28.8)		
No	112(69.6)	37(71.2)		
Fear towards conversion practice			t=3.71	0.002
M (SD)	8.35(2.77)	6.15(3.97)		

Between-group differences were examined using a Pearson's chi-squared test for categorical variables and an independent-sample t-test for continuous variable. All tests were two-sided. p value was adjusted by false discovery rate (FDR).

Extended Data Table 3 | Age group differences of mental health and substance use among who exposure to gender identity conversion practice

Variables	≤ 17	18-24	≥ 25	χ^2-test	Adjusted p
Mental health					
Depression				χ^2=12.70	0.015
No symptoms (0-9)	1(2.9)	21(16.2)	12(24.5)		
Low-risk (10-16)	7(20.6)	30(23.1)	17(34.7)		
High-risk (17-27)	26(76.5)	79(60.8)	20(40.8)		
Anxiety				χ^2=9.76	0.135
No symptoms (0-4)	4(11.8)	19(14.6)	13(26.5)		
Mild symptoms (5-9)	8(23.5)	40(30.8)	18(36.7)		
Moderate symptoms (10-14)	10(29.4)	30(23.1)	11(22.4)		
Severe symptoms (15-21)	12(35.3)	41(31.5)	7(14.3)		
PTSD symptoms	30(88.2)	96(73.8)	27(55.1)	χ^2=11.56	0.005
Suicidality					
Suicidal ideation in previous 12 months	33(97.1)	109(83.8)	27(55.1)	χ^2=25.69	<0.001
Suicidal plan in previous 12 months	31(91.2)	88(67.7)	23(46.9)	χ^2=17.83	<0.001
Suicidal attempts in lifetime	30(88.2)	107(82.3)	23(46.9)	χ^2=27.54	<0.001
Suicidal attempts in previous 12 months	27(79.4)	73(56.2)	15(30.6)	χ^2=19.87	<0.001
Non-suicidal self- injury (NSSI)					
NSSI in Previous 12 months	22(64.7)	72(55.4)	14(28.6)	χ^2=13.41	0.002
Times of NSSI in previous 12 months				χ^2=18.29	0.008
None	12(35.3)	58(44.6)	35(71.4)		
1-4 times	9(26.5)	31(23.8)	11(22.4)		
5-7 times	3(8.8)	14(10.8)	1(2.0)		
8 times or more	10(29.4)	27(20.8)	2(4.1)		
Substance use					
Alcohol hazardous use	4(11.8)	35(26.9)	9(18.4)	χ^2=4.18	0.135

Between-group differences were examined using a Pearson's chi-squared test. All tests were two-sided. p value was adjusted by false discovery rate (FDR).

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Reporting Summary

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Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	The online questionnaire was prepared on the "Wenjuanxing" platform, and a quick response code was automatically generated for distribution. TNG individuals who agreed to participate in this survey will be provided with the quick response code for online survey entry.
Data analysis	Data were analysed using SPSS, version 26.0. All p values were respectively adjusted by false discovery rate (FDR) in each analysis, using R, version 4.1.0.

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Data are not publicly available due to their containing information that could compromise research participant privacy/consent. Data will be made available only to potential collaborators with ethical approval after they submit research proposal application by contacting corresponding authors.

Human research participants

Policy information about studies involving human research participants and Sex and Gender in Research.

Reporting on sex and gender	Transgender, nonbinary, and gender diverse (TNG) population
Population characteristics	See above
Recruitment	Data were recruited from the Chinese National Transgender Survey in 2021, which was conducted between May 6th and December 26th, 2021 and distributed through community-based organizations covering TNG adolescents and adults from all provinces level administrative divisions in mainland China.
Ethics oversight	The protocol was reviewed and approved by the ethics committee of The Second Xiangya Hospital of Central South University, Changsha, Hunan, China.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

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Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	The current study was a retrospective cross-sectional health survey using an online questionnaire.
Research sample	A total of 9161 Transgender, nonbinary, and gender diverse (TNG) people completed all the contents of the survey. Participants of the current sample cover all provinces level administrative divisions in mainland China, which make sure our sample is representative.
Sampling strategy	Due to the COVID-19 restrictions, convenient sampling and snowball sampling were employed for online participant recruiting. The current study was a pre-registration health survey on OSF registration platform(https://osf.io/2gxus), with a target sample size set up before the study begin. The ideal sample size was set as 5000 valid questionnaires and the current study collected 7576 valid respondents which constitute the final sample and meet expected sample size.
Data collection	The promotion of online recruitment advertising has been promoted by many LGBTQ community organizers. Online posters and links have been released through multiple social media channels and platforms, such as WeChat or QQ groups, which were popular in the Chinese TNG community. The online questionnaire was prepared on the "Wenjuanxing" platform, and a quick response code was automatically generated for distribution. TNG individuals who agreed to participate in this survey will be provided with the quick response code for online survey entry. Participants who completed the entire survey would get a chance to win a cash reward in a lucky draw. All questionnaires were anonymous in nature, and online informed consent was acquired prior to the study. Participants were informed of the right to withdraw from the study at any time. Participants were also provided with information on accessing mental health support should they become upset at any point during or after the study. As the current study was using a risk factor analysis, it need the researchers know the risk factors and the outcomes to be able to analyse. Therefore, no blinding is possible.
Timing	This cross-sectional health survey was conducted from May 6th to December 26th, 2021
Data exclusions	In order to ensure the authenticity and reliability of the data, data cleaning was conducted according to the following criteria: (a) answer two of the three attention detection questions correctly; (b) according to the combination of IP address and contact information, participants who answer repeatedly are excluded; (c) according to the answers of "sex assigned at birth" and "gender identity", participants who were not or suspected not to be TNG were excluded (e.g., answering those questions randomly or illogically) ; (d) participants who did not currently live in mainland China or did not grow up in mainland China were not included in the analysis.
Non-participation	A total of 9390 respondents were received, with 9161 respondents completed all contents of the survey and 229 participants declined the consent. The response rate was 97.6%. 1585 respondents were excluded according to the excluded criteria, and 7576 participants(mean age was 21.61 ± 5.15) constituted the final sample for analysis, with an effective rate of 82.7%.
Randomization	We used retrospective analysis of all included participants in an cross-sectional health survey, thus the randomization was not possible.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
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☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging